

THE SOCIAL COSTS OF BUSINESS ENTERPRISE

K. WILLIAM KAPP

SPOKESMAN

To my wife

First published under the title
The Social Costs of Private Enterprise
1950

Second edition, extensively revised and rewritten
1963

This revised and extended edition published 1978, and reprinted in 2000 by
Spokesman, Russell House, Bulwell Lane,
Nottingham NG6 0BT

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CONTENTS

<i>Editor's Preface</i>	vii
<i>Preface to the Second Edition</i>	xxiv
<i>Preface</i>	xxix
1. ECONOMIC ANALYSIS AND SOCIAL COSTS	1
2. THE NATURE AND SIGNIFICANCE OF SOCIAL COSTS	13
Social Costs and Social Change 17; Quantification and Measurement 21; Cumulative Causation and Social Costs 23	
3. EARLIER DISCUSSIONS OF SOCIAL COSTS	28
The Classical Economists 29; The Historicists 31; The Socialists 31; Welfare Economics 37; Veblen on Social Costs 42; Recent Developments 44	
4. THE SOCIAL COSTS OF AIR POLLUTION	47
Air Pollution and Human Health 51; Damages to Agriculture: Effects on Plant and Animal Life 58; Corrosion and Deterioration of Materials 61; Some Quantitative Estimates of the Social Costs caused by Air Pollution 63, Air Pollution and the Future 66	
5. THE SOCIAL COSTS OF WATER POLLUTION	74
The Causes of Water Pollution 75; Negative Effects of Water Pollution 81; The Social Costs of Water Pollution 85	
6. SOCIAL COSTS AND RENEWABLE RESOURCES	93
The Ecological Balance 94; The "Critical Zone" in the Utilization of Renewable Resources 95; Institutional Comparisons 98; Deforestation 107; Wildlife and Fisheries 110; Summary and Conclusions 111; Note on the Fictitious Optimum 114	
7. NON-RENEWABLE RESOURCES and SOCIAL COSTS	122
The Competitive Recovery of Petroleum Resources 127; The Competitive Recovery of Coal Reserves 131	
8. SOCIAL COSTS IN RESOURCE UTILIZATION: EVIDENCE AND ESTIMATES	136
Wildlife 137, Deforestation 143; Soil Deterioration and Erosion 146; Social Costs of Petroleum Production 148; Surplus Capacity and Premature Abandonment of Coal Mines 150; Summary and Conclusions 152	

CONTENTS

9.	THE IMPAIRMENT OF THE HUMAN FACTOR OF PRODUCTION	155
	Human Costs and the Price System 155; The Impairment of the Human Factor: Evidence and Estimates of Social Costs 159; Occupational Diseases and Social Costs 171; The Social Losses of Woman and Child Labor 175; Summary and Conclusions 176	
10.	TECHNOLOGICAL CHANGE, UNEMPLOYMENT AND SOCIAL COSTS	179
	Technological Change and Social Costs 180; The Earlier Controversy 181; The Contemporary Situation 187; The Social Costs of Unemployment 195; The Social Costs of Depressions 200; Summary and Conclusions 202	
11.	DUPLICATION, EXCESS CAPACITY AND SOCIAL COSTS	205
	Duplication and Excess Capacity in Transportation 207; Duplication and Excess Capacity in Retailing 214; Duplication in Industrial Research and the Patent System 218	
12.	THE SOCIAL COSTS OF CUT-THROAT COMPETITION, PLANNED OBSOLESCENCE AND SALES PROMOTION	224
	Cut-throat Competition and Administered Prices 224; Planned Obsolescence and Social Costs 229; Sales Promotion and High Pressure Sales Publicity 233; The Psycho-Cultural Impact of Sales Promotion 237	
13.	THE RETARDATION OF SCIENCE AND THE SOCIAL COSTS RESULTING FROM "MISLOCATION" AND OVERCONCENTRATION	248
	The Retardation of Science 248; Small Business and Scientific Research 255; The Impact of Innovations on Existing Capital Investments 256; Depressions and Research 257; "Mislocation" and Overconcentration in Urban Centers 258	
14.	SUMMARY AND IMPLICATIONS	264
	Summary 264; Social Costs and Equilibrium Analysis 269	
15.	TOWARD A NEW SCIENCE OF POLITICAL ECONOMY	281
	Return to Philosophy 281; The Broadening of the Scope of Economic Investigation 284; The Reformulation of Basic Concepts 289; Social Value and Social Choice 292	
	APPENDICES	
I	SOCIAL COSTS, NEO-CLASSICAL ECONOMICS AND ENVIRONMENTAL PLANNING	305
II	RECYCLING IN CONTEMPORARY CHINA	319
	INDEX	335
	LIST OF PUBLICATIONS BY K. WILLIAM KAPP	344

EDITOR'S PREFACE TO THE NEW ENGLISH EDITION

The Environmental Crisis

The social costs of two centuries of largely untrammelled business enterprise are with us with a vengeance. All those living in the urban areas of Britain or Japan, North America or Northern Europe, Australia or South Africa have long known what these costs were in pollution of air, land and water, destruction of environment, squandering of resources, unemployment and degradation of labour. Those who have been more recently drawn into the urban centres of Russia, India, South East Asia, South America or Africa have now in their turn learnt the costs of economic progress. There is no longer any escape either for those who could afford to move out into the suburbs and coastal resorts. Clear blue skies, lakes to fish in, beaches to swim on, woods to walk through become ever rarer. Even sailors plying small craft across the oceans find the garbage of New York City in mid-Atlantic.

We are all environmentalists now. The Confederation of British Industries has published a pamphlet on the *Social Responsibilities of Business*. Trade Unions struggle to put teeth into legislation to promote Health and Safety at work. Conservation societies proliferate. Historic Departments of State are amalgamated into a Department of the Environment. A new book appears every week or so on Resources and the Environment and on the costs of economic growth. But our economic thinking — alike in systems of private or of state enterprise — still regards all this as an unfortunate side-effect that is important but marginal to the main drives of consumer societies.

K. William Kapp was a pioneer in challenging the authority of economic theories that regarded as marginal such ecological unbalance and profligate waste. His first book was written more than twenty five years ago when he was a Professor at Wesleyan University under the title of *The Social Costs of Private Enterprise* (Harvard University Press 1950) and was translated into six different

languages. In a second and revised edition published in India in 1963 he changed the title to *The Social Costs of Business Enterprise* and it is this edition which is reprinted below. He made the change in order to take account also of the same social costs where state enterprises in the Soviet Union and elsewhere were guided by similar principles of economic calculation. But K. William Kapp was much more than an early environmentalist. He specifically warned against too great a preoccupation with environmental disruption, while recognising that "The damages and costs resulting therefrom constitute one of the most fundamental, dangerous and long-run issues which mankind has ever faced".¹ Here is Kapp's warning:

"... invitations to 'wage war' on the disruption of nature ... may be not much more than an attempt to restore a consensus evidently severely shaken by such issues as the undeclared war in Indochina, the unresolved consequences of slavery and racial discrimination, the pernicious effects of a secular inflation and the continued poverty in the midst of plenty. Indeed, the problem of environmental disruption may well be used as an issue designed to restore a failing political unity which threatens both the 'establishment' and society. The declaration of war on the disruption of the environment just as the earlier 'war on poverty' may turn out to be not much more than a diversion of attention and a fixation on a problem which seems to be less controversial and easily subject to manipulation without interfering all too radically with customary ways of thinking and established methods of conducting business, modified only by a few *ad hoc* controls. The current advocacy of *ex post* remedies by offering incentives and disincentives via subsidies and taxes may turn out to be just as ineffective as the Sherman Anti-Trust Act. This legislation too was passed to pacify a wide-spread populist dissatisfaction with policies and practices of big business oligopolies but was actually incapable of stopping the trend towards administered prices and the 'planning' of production and sales by large industrial concerns. It would not be surprising if the contemplated legislation against environmental disruption by underestimating its significance achieves not much more than the passing on to consumers or to society as a whole the costs of 'cleanliness', without really coming to terms with the serious problems raised by the current disruption of our environment."²

1. K.Wm. Kapp, "Environmental Disruption and Social Costs: A Challenge to Economics", *Kyklos*, Vol.23, 1970, Fasc. 4, p.833-848.
2. *Ibid.* p.835

The Critique of Economic Theory: Neglect of Social Costs

Kapp's critique of economic theory was fundamental. But he engages the neo-classical economists in particular, in their own language and on their own terms. For non-economists the language may sometimes present difficulties. For this reason I shall attempt to summarise both the theory and Kapp's critique of it. For this reason also I have introduced after the main text of his book an article he wrote in 1971 as a direct reply to one who responded to his critique from the stance of current economic theory.³ In this article he defends his book and denounces his critics. To enter the argument of this article and to understand the first three chapters of the book we have to summarise the basic assumptions of neo-classical economic theory and especially its development in modern Welfare Economics. These may be stated very crudely as follows:

1. Economic elements can be isolated from the totality of social processes and regarded for purposes of analysis as self regulating;
2. Economic elements in social processes comprise those ends (satisfactions) and means (costs) which can be measured in terms of money (exchange values) in a market;
3. The choices of economic agents (producing firms and consumers) are rational and the market accurately reflects preferred satisfactions and opportunity costs of particular resource uses (i.e. the costs of things forgone by choosing any particular satisfaction);
4. Changes in demand preferences and in supply costs tend, because of competition in the market, to move towards an equilibrium where imbalances are corrected;
5. The possibilities of achieving economies external to individual firms are realised through integration inside large firms; and the threat of such firms with monopoly positions to the competitive market can be offset by reducing barriers to free competition between giant firms operating internationally;
6. Any social costs beyond the cost to the firm can be corrected by imposing taxes on the perpetrators and paying subsidies to the sufferers and by legal enforcement of individual claims to compensation, since welfare is only to be measured in terms of each individual's satisfactions and dissatisfactions.

3. K.Wm.:Kapp, "Social Costs, Neo-Classical Economics, Environmental Planning: A Reply", *Social Science Information* 11, No.1, Feb. 1972, pp.17-28. Reprinted in *Environmental Policies and Development Planning in Contemporary China*, The Hague, Moulton, 1974, p.175, ff.

Apart from creating the legal and physical framework to make possible and to defend the free working of the competitive market, the state should keep out of economic affairs. Most problems will be solved by the resulting increase in the national income. Some of the social costs referred to above may nevertheless need to be corrected by more positive measures, e.g. to redistribute incomes in favour of very poor persons and to provide those services like public roads and parks which no individual will build for himself since others can use the service as soon as it is provided.

What Kapp shows in his book is that social costs are major, typical and regular occurrences, and much more significant even than those that the state has recognised. His definition of social cost is any cost incurred by business activity which falls upon third persons or the community at large and is not therefore accounted for by business decision-making based upon the principle of profit-making without regard to possible negative effects. Chapter by chapter in the book he details these costs: not only air and water pollution, soil erosion, the destruction of wild life and of ecological balance, the spoilation of non-renewable resources, but the impairment of human beings through occupational diseases, radiation and unemployment, the costs of duplication and excess capacity, of planned obsolescence and sales promotion, the retardation of science and its harnessing to instruments of destruction, society's over-concentration on urban centres and sacrifice of human well-being to the processes of production. Some of these costs may be measured in money terms in loss of earnings or the cost of correction after the event; but most are widely dispersed through any community and not such that an individual or groups of individuals can measure and claim compensation for, let alone anticipate and avoid.

In economic theory these costs are marginal. Costs of production are thought to be adequately represented by business outlays; prices are supposed to reflect opportunities forgone. Welfare economics allows only for marginal corrections by the principle of compensation. K. William Kapp makes his first criticism of such economic theorising by showing that the "political history of the last 150 years can be interpreted as a revolt of large masses of people (including small business) against social costs . . . an integral part of the gradual access to political power by groups formerly excluded from such power".⁴

4. *Social Costs of Business Enterprise*, pp. 15-16.

But he goes on to say:

"Despite this shift in the balance of power, the main body of neo-classical value theory has continued to regard social losses as accidental and exceptional cases or as minor disturbances . . . Close analysis of existing preventive regulation reveals that present restraints are still highly ineffective in minimising social losses. . ."⁵

In a telling phrase, which others, myself included, have used without being aware of the originator, Kapp speaks of the welfare economists' correction of social cost by means of compensating devices as being reminiscent of the cosmology of Ptolemy. In order to 'harmonise' the accepted theory (that the sun and planets moved round the earth) with the 'facts' and observations, Ptolemy had constantly to introduce new epicycles (or extra loops) to the course which the sun and planets supposedly followed.⁶ What was needed was a new theory; and so Kapp says that it is with economics today.

Institutional Economics and Cumulative Causation

Kapp's alternative view is derived from what was called in the 1920's the American school of 'Institutional Economics'.⁷ This school looked back to early American critics of classical economics – in particular to Thorstein Veblen. Kapp's debt to the Swedish economist, Gunnar Myrdal, whom he claims as an 'institutionalist', is equally evident. The extraordinary wealth of Veblen's insights into the institutions of American capitalism make his work a rich, if often confused, source of criticism of neo-classical economics. What Kapp draws from Veblen is his insistence on the openness of purely economic aims and means to the power and coercion of business interests – the industrial-military complex of which General Eisenhower complained at the end of his Presidency, the 'power elite' of which C.Wright Mills wrote so pungently.⁸ But Kapp's institutional economics comes very close to Marxism, without what Kapp would call Marx's classical economic pre-occupation with capitalism as a self-regulating economic system. Emphasis on the

5. *Ibid.*, pp.16-17.

6. K.Wm. Kapp, "Environmental Disruption and Social Costs", *Kyklos*, 23, 1970, pp.833-4.

7. K.Wm. Kapp, "The Nature and Significance of Institutional Economics", *Kyklos*, Vol.29, No.2, 1976, pp.209-232.

8. C.Wright Mills, *The Power Elite*, New York, 1956.

interaction of economic processes with technological change, sociological perception, anthropological development, above all with legal and political institutions is central to Marxian political economy; and that emphasis is not at all dissimilar from Kapp's own approach.

Economics cannot be examined as a closed system, isolated from business power, property laws, capital intensive production, class antagonisms, national and group consciousness and a host of historical attitudes and traditional values. Whether we are looking at developed or underdeveloped societies, the economic elements that can be isolated, even in the relations between the two, provide only the most partial explanation of development and underdevelopment. Economic models taken from developed societies are likely to be useless, if not positively harmful, when applied to the underdeveloped. The aims of different groups of people cannot be simply separated from the means by which aims are realised, so that economics are said to deal with means and politics with ends. The two interpenetrate. There can be no 'positive' economics that is value free, but only an assumption that money values, the values of the market, must predominate; and such an assumption is challenged by every one of the social costs that Kapp elaborated in his book.

It was Gunnar Myrdal's ridiculing of the effort to free economics from value judgements, as much as his introduction of sociological insights and political preconceptions into the study both of developed and underdeveloped societies, that attracted William Kapp.⁹ But what Kapp draws from Myrdal is his principle of "interlocking intercircular dependencies within a process of cumulative causation" as the central principle of the social sciences. In direct contrast to the economist's faith in a natural order that tended to equilibrium, Myrdal posits the concept of cumulative causation.¹⁰ For unto every one that hath shall be given, and he shall have abundance and from him that hath not shall be taken away even that which he hath." "Wealth attracts and poverty repels." "The more it grows, the more it goes on growing." "Virtuous and vicious circles, upward and downward spirals . . . these are the simple everyday phrases that offer the Time Paradigm of the social process, not the self-regulating balance of the human endocrine glands or the equilibrium of mechanical motion. In the process of cumulative causation, many dif-

9. G. Myrdal, *The Political Element in the Development of Economic Theory*, Harvard University Press, Cambridge, Mass., 1954.

10. G. Myrdal *Economic Theory and Undeveloped Regions*, Duckworth 1957, p.12.

ferent factors are involved in circular interdependence – the natural environment, technology, work and class relations, institutions, laws, ideas and values.” This is how Kapp relates Myrdal’s thinking to his own problem of developing an economic theory that will explain social costs and thus enable us to create a social system that is free of them.

Kapp is extraordinarily generous to Myrdal’s work; but his own writing in the first edition of the *Social Costs of Private Enterprise* (1950) and in his remarkable study of *Hindu Culture, Economic Development and Economic Planning* (1963) precede respectively Myrdal’s *Economic Theory and Underdeveloped Regions* (1957) and his *Asian Drama* (1968).

Interacting Interdependence

Kapp summarises a recent essay of Myrdal’s as follows:¹¹

“However, it was left to Myrdal to develop the principle of interlocking interdependencies within a process of cumulative causation in a systematic way, and to have shown its significance and its implications as an alternative analytical framework for the entire field of social relations. He has done this in a continuous critical confrontation with the closed system of neo-classical equilibrium analysis, its hidden political or normative elements and in his life-long preoccupation with concrete and persistent problems such as race discrimination in America, international disparities, and the intractable problems of underdevelopment and poverty in Asia. In dealing with these problems Myrdal has developed a new explanatory theoretical framework which consists of a matrix of ordered and specified elements of social conditions which, in their reciprocal interdependencies, can be shown to influence the evolution and transformation of social processes. As an exemplary illustration we choose the relationship between developed and underdeveloped countries and the interpretation of the process of development and underdevelopment. The problems to be accounted for are the empirically observed disparities and the persistence of development differentials between ‘rich’ and ‘poor’ countries or regions. Both rich and poor regions are characterized by a number of specific conditions which can be classified or categorized in different ways. Myrdal considers the following conditions as relevant for the analysis and interpretation of the process of underdevelopment; *Productivity* (output/worker; income/population); *condi-*

11. K.Wm. Kapp, “The Nature and Significance of Institutional Economics”, *Kyklos*, April, 1976, pp.229-30.

tions of production (techniques, scale, capital intensity, savings and investment, social overheads, labour utilization and employment); *levels of living* (nutrition, housing, hygiene, medical attention, education and training, literacy and income distribution); *attitudes* to production, work and living (discipline, punctuality, prejudice, apathy, world outlooks, religion, absence of birth control, etc.); *institutions* (man-land relations, tenure conditions, market structures, class, caste and kinship systems, structure of national and local government and administration, etc.) and *policies and legislation* (the 'soft state', lack of law enforcement, taxation, mobilization of actual and potential surplus). Needless to say, this does not represent a complete list of possible relevant factors and conditions; moreover, they may have to be classified in a different manner depending upon problems and regions to be investigated. However, the important point is that, among all the conditions, there exists a causal relationship, and this relationship is to a large extent, but not always, of a circular character. In other words, the principle of circular interdependencies postulates a mutual responsiveness, i.e. a capacity of the different conditions to react upon changes of one or several elements. It is this circular and cumulative interaction which shapes the dynamics of the system which institutional analysis has to elucidate and to determine. In addition, it is essential to study the specific circular inter-relationships between the different factors and conditions before it will be possible to define objectives, to develop appropriate criteria of choice, and to make decisions with regard to long-run strategies as well as specific developmental policies. For, the formulation of such strategies and policies will require detailed, regional and local empirical studies designed to ascertain the concrete relationships between the different endogenous factors and conditions including their responsiveness to one another as well as the possible time lags and, in some cases, the lack of responsiveness of one or several of them to induced changes initiated by policy measures."¹²

Kapp then concludes:¹³

"In short, economic processes can be understood and must be represented for analytical purposes as radically open systems which exchange energy and matter with the environment in the course of which qualitative changes take place both with respect

12. Kapp is summarising: G. Myrdal, *The Unity of the Social Sciences*, Society of Applied Anthropology, Amsterdam, March 21, 1975.

13. K.Wm. Kapp, *op.cit.*, pp.222-4.

to the environment and the process itself. That is to say, socio-economic processes move in a definite direction and this direction needs to be ascertained.

"However, even if we could get away from the fundamental fact of entropy, the analogy to mechanics with the notion of stable equilibrium would still be problematical and usually misleading for the analysis of contemporary social conditions. For, these conditions are no longer, if they ever were, characterized by the interaction of a great number of more or less equal units in perfect competition none of which exert a dominating influence on the direction of the process and its outcome (e.g. prices, quantities produced and sold, inputs chosen, technologies adopted, and locations selected). Exchanges between dominating and dominated units give rise to unequal exchanges and unequal terms of trade and to a choice of inputs, technologies and locations which are bound to result in self-reinforcing movements and an unequal distribution of income, growing disparities and polarization. In short, in the normal course of exchange relations between dominating and dominated units, between 'centre' and 'periphery', between 'growth poles' and dependent economies, there is no assurance that inequalities and domination will cease or 'backwash' effects will be compensated by expansionary 'spread' effects.

"Under these circumstances, it becomes clear why the new theoretical framework of circular interdependence and cumulative causation is justified to reject the analogy to mechanics with its notion of stable equilibrium as a paradigm for problem solving in the social sciences. In fact, the new paradigm assumes that 'the system is by itself not moving towards any sort of balance between forces, but is constantly on the move away from such a situation. In the normal case a change does not call for countervailing changes but, instead, supporting changes, which move the system in the same direction as the first change but much further. Because of such circular causation a social process tends to become cumulative and often to gather speed at an accelerating rate'.¹⁴ The principle does not prejudice the direction of the cumulative response nor the final outcome. In fact, it does not imply only 'vicious' circles."

Marxists will regard it as a weakness in this exposition that there is no hierarchy or logical ordering of the many variables — nature, technology, production relations, legal and political institutions, ideas. Each is assumed to be of equal importance and none prior to

14. Kapp is quoting here from Myrdal: G. Myrdal, *Economic Theory and Underdeveloped Regions*, Duckworth, London, 1957, p.13.

another. The dynamic of change is thus indeterminate. Marxism does not, of course, assume that everything is determined by economics or even by technology — as its critics like to suggest. But Marx did believe that the economic structure of production relations did have to correspond to the necessities of the struggle with nature and to the different stages of human productive capacities, and that political and legal superstructures and dominant ideologies corresponded to the economic structure, not *vice versa*. Change then emerged dialectically through the consciousness of men and women of growing contradictions between their productive capacities and relations in production, especially class relations.

Without such a perspective the list of variables in the equations which Myrdal suggests for the scientific solution of problems are, as he himself concedes, necessarily "ideal and far beyond the horizon":

"an interconnected set of quantitative equations describing the movement — and the internal changes — of the system studied under the various influences which are at work."¹⁵

To this Kapp adds his own doubts:

"Moreover, I doubt that we possess or will ever possess the data and the type of mathematics needed for the quantitative formulation of mutual circular interdependencies and thus for a precise expression of co-efficients of interaction. In any event, it would be questionable if not illogical to require, or to make action dependent upon, a degree of quantitative precision of our knowledge which may be neither attainable nor necessary for the formulation of public policies."¹⁶

Measuring Costs or Setting Standards

The impossibility of reaching precise mathematical formulations is not regarded by Kapp as any reason for avoiding the task of selecting goals and deciding on means for counteracting the extra-market flows which give rise to environmental disruption. This is the more necessary because it is Kapp's conviction,

"that we are faced with a tendency of an increasing impairment of the environment and hence of increasing social costs resulting

15. Gunnar Myrdal, *Economic Theory and Underdeveloped Regions*, op.cit., p.19.

16. K.W. Kapp, *The Nature and Significance of Institutional Economics*, op.cit., p.225.

therefrom . . . we are confronted with a change of quantity into quality. Today's transformation of the environment is no longer an expression of an increasing mastery of the world we live in but is instead a sign of loss of such mastery."¹⁷

It is Kapp's view that social costs and social benefits cannot be measured in money terms, and this is so precisely because they are extra-market phenomena. Monetary values fail to take sufficient account of three factors, he says,

- "a. actual markets are far from perfect — in fact they are 'oligopolistic' in character,
- b. the consequences of environmental disruption are highly heterogeneous and cannot be compared quantitatively with one another, and
- c. the benefits obtainable from environmental control are equally heterogeneous and can neither be compared quantitatively with one another nor with the outlays for control."¹⁸

Kapp continues:

"More specifically, the social benefits sought by environmental control are social or public goods and must be dealt with as such. That is to say, they are above all goods or services which diffuse themselves throughout society; no one can nor should be excluded from their enjoyment; they are 'non-rival' that is, their use or enjoyment by one does not necessarily reduce their supply. For this reason we will have to look for other methods of assessment than those available or suggested in terms of market values. We will have to face political decisions based on evaluations arrived at outside the market under conditions of possible disagreements and lack of unanimous consent. Such decisions are similar to those which were made in the past and continue to be made with regard to labour legislation (including workmen's compensation for accidents and occupational diseases), to social security legislation and legislation regulating standards of food and drugs, provisions of educational facilities, etc. No cost-benefit analysis helps us in these instances and no market values and indeed no compensatory principle and no Pareto optimum can help us now in deciding whether and which controls are to be adopted. As in all decisions of this kind, we will have to act even

17. K.W.Kapp, *Environmental Disruption : General Issues and Methodological Problems*. Proceedings symposium of the International Social Science Council in Tokyo, March, 1970. Reprinted in *Social Science Information* (International Social Science Council), No.9, (4), 1970, pp.21-23.
18. *Ibid.* p.25.

if some industries may be worse off or fail to give their consent initially as was the case with regard to the aforementioned cases of legislation. In fact, the more we admit that all benefits (secondary, indirect, intangible, etc.) of control-measures ultimately have to be included in benefit-cost calculations the more problematical becomes any evaluation in terms of one single monetary standard. In short, I fail to see that cost-benefit analyses as they stand today have a solution of the problem of evaluating either the social costs of the disruption, or the social benefits of the improvement of our environment by control measure.

"And yet, my position should not be interpreted as a counsel in favour of arbitrary action; nor should economists who hold similar views be accused of preaching a gospel of license. In order to act rationally, we must know and assess the consequences of our action or non-action. To this effect we will have to draw the necessary inferences from what I have called the complex and cumulative character of the causal chain and to make an inventory of the actual and potential damages and losses caused by investment decisions and government action or non-action. To this effect, we need a co-operative multi-disciplinary research effort on a national and perhaps an international basis. In fact, in modern industrial societies it has always been important and is steadily becoming more urgent to anticipate the actual and potential effects of damages before investment decisions are taken. What are needed are inventories of the fullest possible range of the consequences which new technologies and inputs are likely to have on man and his environment. There can be no rational action and decision-making any more without systematic prior scientific analysis and prognosis. Many (though perhaps not all) of the unanticipated negative consequences and social costs which confront us today could have been anticipated by prior research and adequate outlays for scientific analysis. Today when we can build upon the accumulated experiences and lessons of the past, the pay-off of such prior research and prognosis is likely to be considerable.

"Analysis and prognosis, by assessing the consequences of decision-making, will provide us with an inventory of the nature of the damages and social costs of private and public investments; it will at the same time yield the necessary data and facts in the light of which it will be possible to evaluate and revise our aims and objectives and thereby to improve our policy-making. However, far from denying that measurement is important and that science is measurement (and all that), I want to emphasize that what is even more important than precision in measurement is the

selection of the goals, i.e., the distinction of what is essential and what is less essential; this indeed will call for more than data and facts concerning the possible consequences of alternative courses of action. It calls above all for some general standards in terms of which it may be possible to agree on and select the social goals we seek. Once agreed and stipulated, it would then be necessary to compare the real costs of attaining such stipulated ends by different courses of action or methods of control."¹⁹

Kapp concludes:

"The magnitude of the threat and the values at stake seem to me to call for a line of attack which must be directed towards the design and technique of production. What needs to be changed and controlled are the 'input mix', the technical process and the location of concentration of the process of production. This is perhaps best illustrated by a concrete example: if we want to avoid the destruction of plants by insects and pests, we can use insecticides and pesticides. We have done so in the past only to discover that the insects and disease carriers develop immunity and the increasing amounts of chemicals or their residues pollute our environment and tend to become serious health hazards to man. Instead of developing more and 'better' pesticides which, moreover, tend to attack not only pests but insects in general, plant geneticists and plant breeders are experimenting today with breeding plants with greater resistance to attacks by insects and pests. This type of control, by changing the nature of capital inputs, may be more economical and more effective in the long run than the use of chemicals, while at the same time avoiding the dangers of the pollution of the environment. Similarly, the control of air pollution by automobiles seems to me to be more economical and more certain by the design of new and more effective engines and/or by substitutes for gasoline than by indirect controls or better law enforcement. . . ."

". . . Since the disruption of the environment is clearly a function of the location and relative congestion of an area it is imperative to consider these factors in all future decisions concerning industrial and residential sites. In other words, a rational determination of land use requires that we extend the unit of investigation and the area of environmental control in accordance with the actual physical interdependencies in an area as determined by its waterways, its topography, its climatic and meteorological conditions as well as its density of settlement. This broader perspective in

19. *Ibid.* pp.25-27.

location theory will become more and more urgent with the growing exposure to the dangers of pollution from radioactive waste materials and possible accidents from radioactive sources such as atomic reactors. Instead of purely local zoning regulations, a rational location policy requires planning based upon a complete inventory of physical conditions and existing population densities on a regional, national and perhaps even international basis. In short, choices of site and location problems in general, whether residential, commercial or industrial, can no longer be made solely with reference to traditional market factors and costs such as outlays for transportation, materials and labour. Here too, costs and benefits will have to be evaluated in the light of inventories of hazards established by multidisciplinary research efforts. Whether the practical implications of such studies will be a dispersal or a concentration of industries and residential areas and which methods of control will be called for is today an open question."²⁰

Producing to Meet Human Needs

In another and more recent essay, on *The Socio-Economic Effects of Low and High Employment*, Kapp summarised the latest results of a system that treats human beings as instruments, whether as instruments of production or instruments for consumption: rising unemployment, increasing impairment of the work environment through health hazards, work tension and accidents, deterioration of the living environment especially for poorer people through pollution and poisoning of air and water, pressurised sales promotion and wasteful consumption. He concluded by emphasising the absolute necessity of starting from human needs in reformulating guidelines for public action and applying resources to meeting these needs instead of our current slavery to the dictates of the market:

"Market economies have continued to define their objectives and to gauge their performance in terms of questionable economic indicators which fail to take adequate, if any, account of social and environmental costs of productive processes. As long as these national income indicators, expressed in market values, continue to serve as a basis for the formulation of our goals, we shall continue to misuse our productive capacities and to develop technologies which threaten the quality of life, including the working and living conditions of millions of people and ultimately the process of socio-economic reproduction.

20. *Ibid.* pp.29-31.

"Is there a way out of this threat to human life, human health and human survival? Are there alternative ways of guiding the process of production and, if so, of what nature would the criteria of decision making have to be? An alternative model is at least conceivable, even though its feasibility depends upon far-reaching institutional changes. New criteria and guide-lines of economic and technical development, which must be directly related to individual and social needs, seem to be essential. This means that goals, objectives and criteria of performance must be based upon a concept of human needs. The identification of such needs can not be left to arbitrary judgments and decision makers. Their formulation is not possible without a theory of individual and social needs, their dynamic structure, and the consequences of their neglect or nonsatisfaction.

"Such a theory is in the process of being developed, and it is possible to identify some general principles: there exist basic individual and social needs which cannot be sacrificed with impunity. While these needs can be identified factually, tested empirically and expressed in terms of social and environmental indicators, such indicators, as their name implies, do no more than indicate a state of affairs. They are not norms of action. However, they can be transformed into social norms with the aid of a fundamental value premise and the demonstration of the inevitable effects of continued neglect of such basic or minimum needs as useful and rewarding work, human health and socio-economic reproduction.

"Stated simply, the fundamental value premise is as follows: the value of fundamental minimum requirements of individual and social reproduction must be accepted unless we are prepared to deny the value of our own lives and survival, or that of society. Once this premise is accepted, we are able to establish a link between social and environmental indicators and norms of action. Of course, there may remain a lack of consensus as to priorities, distribution of costs, and the extent to which we maintain and improve minimum requirements for all. But this is a problem of socio-political choice, preference and conflict which can and must find its solution within the framework of representative government, with a maximum of participation of all members of society. By formulating policies of output, technology, location and employment in accordance with individual and social minimum requirements, and not in accordance with maximum output regardless of social costs, genuine full employment and the improvement of the quality of life can become a fundamental objective of economic policies. These goals are bound to remain

a continuous challenge both for industrialized and underdeveloped countries."²¹

Kapp died before he had fully developed the implications of such a radical revision of economic policy in the light of a "new science of political economy". But we can see from the hints he offers in the last chapter of his original text, from the end of the article on China both of which are printed after the main text, where his thought was leading him. His insistence on social action and social choice to offset social cost, contrast with the economist's concentration on individual satisfactions set against individual costs. This pushes him into defining forms of collective decision making; and this in its turn implies not only a challenge to the market as the allocator of resources but to the whole distinction between so-called 'productive' and 'unproductive' labour. 'Productive' work means that the products can be sold and profit made from increases in 'productivity'. 'Non-productive' work produces only social benefits most of which have no value in the market. Is there then any way in which we can measure their value? Kapp's general answer emerges from the detail of all the specific social costs he has studied in the book. The answer is a clear affirmative. With the help of the engineers and doctors and scientists we can establish objective minimum standards to which all 'economic' activity must conform. Here are some of the examples he lists:

"Maximum permissible limits of concentration of pollutants in the air and water, rates of utilization short of the point of irreversible exhaustion of flow resources, minimum standards of sanitation, education and medical care, standards of land utilization which incorporate our technical knowledge concerning the proper use of land which maintains soil fertility without setting the stage for erosion, water-logging salinization and a higher incidence of malaria . . . the location and size of large multipurpose projects. . . guided by availability of raw materials, nearness to markets, access to transport facilities and the presence of energy resources. The principle of social economy demands, moreover, that investment be made in such a fashion as to overcome the cumulative tendencies towards inequality and regional backwardness."²²

21. K.Wm. Kapp, "The Socio-Economic Effects of Low and High Employment", *Annals of the American Academy of Political and Social Science*, Vol. 418 March 1975, pp. 70-71.
22. K.Wm. Kapp, *The Social Costs of Business Enterprise*, pp.294-5.

Kapp is well aware that all this involves new methods of "discovering individual preferences with respect to social ends and of bringing them into harmony with public needs and requirements",²³ new ways of voting besides the restricted choice that the market offers and the infrequent choice of political party election programmes. Kapp did not explore the implications of his conclusion for decentralised social decision making, the possibilities of using the new systems of information communication created by the computer, the opening of the books of business enterprise for all to study and understand, the extension of trade union bargaining into the area of control over business managements' prerogatives. But others have begun to do this,²⁴ and as one of these I commend this book to all those whose concerns are the same as William Kapp's. They will find in his writings not only fresh inspiration and new insights into the problems of environmental disruption that we all now face, but the most detailed analysis of the essential elements of the solution to these apparently insoluble problems.

Michael Barratt Brown
University of Sheffield, June 1977

23. *Ibid.*, p.299.

24. e.g. M.Barratt Brown, T.Emerson and C.Stoneman, *Resources and the Environment - A Socialist Perspective*, Spokesman Books, 1976.

PREFACE TO THE SECOND EDITION

SINCE the publication of the first edition of *The Social Costs of Private Enterprise* in 1950 considerable progress has been made in the empirical study of social costs. Increasingly national and international agencies have investigated the consequences of such phenomena as air and water pollution, the avoidable exhaustion of renewable resources, the premature destruction of non-renewable resources, the impairment of the human factor by occupational diseases and industrial accidents and the effect of automation and technical change in general. Even the negative effects of the duplication and partial utilization of capital equipment, the "retardation" of sciences and technology and the unplanned concentration of industrial activities in a few already congested areas and the social and economic problems raised by sales promotion and "planned obsolescence" have attracted the attention of economists and social scientists. Research conducted under the auspices of such agencies as the U.S. Department of Health, Education and Welfare and the Air Pollution Control Association in Pittsburgh, USA., the U.S. Department of Agriculture, Resources for the Future, Washington, D.C., has aimed at the elaboration of criteria for the formulation of public policies designed to prevent or at least to remedy some of the most immediate damages arising as a result of private (and public) economic activities. This continued reliance on scientific research and on exact quantitative data as a prerequisite for the formulation of public policies provides the greatest, if not the only, hope that mankind will be able to control rather than succumb to the effects of the most explosive force in recent history: modern technology.

Confronted with the findings of empirical studies economic theory likewise has paid attention to social costs. In Europe in particular, problems of social costs seem to have caught the

imagination of a number of economists. Unfortunately, few of the results of these studies had reached the author at the time of the completion of the manuscript of the second edition (June 1, 1961). Nobody regrets the neglect of these discussions more than the author. This applies particularly to the papers dealing with social costs, which were presented at the Annual Meeting of the *Gesellschaft für Wirtschafts—und Sozialwissenschaften* in Homburg, Germany, in 1962.

As far as economic theory is concerned there has been a tendency to assimilate social costs (and social benefits) to the earlier concepts of "external diseconomies" (and "external economies") and to the type of welfare economics which makes use of Pareto's concept of indifference and the compensation principle. Another related and perhaps more promising trend of analysis has been to consider social costs (and social benefits) as a form of non-market interdependencies as a result of which negative and positive effects tend to be internalized in the cost and return structure of the various sectors of the economy. This is, of course, correct. The output of a firm is not independent of its ability to shift part of its costs to other sectors of the economy or to the individual. True social costs are then only net and avoidable damages which exceed the benefits accruing either to the sector that can be shown to be responsible for specific damages or to the economy as a whole. Such benefits have been identified as "internalized" economies said to be reflected in a more rapid technological progress or a higher rate of growth than would be possible if social costs could not be shifted. All these attempts may lead to a refinement of the concept of social costs and eliminate fallacious reasoning. However, there are limits beyond which further refinements of concepts do not necessarily improve them as tools of analysis. Indeed, a point may be reached when refined tools of analysis begin to conceal the issues instead of illuminating them. The fact remains that while economic progress may have been more rapid, society as a whole has to pay today in the form of higher taxes the social costs of air and water pollution, of slum clearance and urban redevelopment which an earlier adoption of a rational abatement and location policy could

have avoided. In other words, we share the uneasiness of those who feel that categories like "external diseconomies" and "external economies" have remained empty boxes. The formal apparatus of modern welfare economics is based upon presuppositions which are not free of contradictions—not to mention the fact that the compensation principle, if it could ever be made operational, would be difficult and costly to administer. This impasse of welfare economics is increasingly recognized by the growing number of its critics. In short, the solution of the theoretical and practical issues raised by the phenomena of social costs (and social benefits) seem to call for a new and different approach. The author has always felt that only continuous empirical research and the acceptance of a substantive and objectified concept of social welfare can lead to a better understanding of these economic problems. What we need is not a refinement of formal economic categories which carry over many of the utilitarian and individualistic behavioristic presuppositions of Bentham but the elaboration of tentative and pragmatically tested objective welfare criteria. Recent advances in our scientific knowledge make possible an objectification of economic welfare understood not in terms of positions of general equilibrium but as indispensable minimum requirements of civilized living, at least in a number of specific fields. No doubt, such tentative existential minima may change over time and will differ depending upon the state of economic development of different societies. The second edition has stressed some of these attempts to elaborate such existential minima.

Needless to add that the analysis of social costs (and social benefits) as, indeed, the economics of objective social welfare minima are concerned with the study and measurement of the substantive social efficiency of the system of production and distribution. Such an analysis of social efficiency is not confined to the system of business enterprise as it is known in the West. There is every reason to believe that a study of the social costs connected with different forms of economic planning would yield significant results which could provide the basis for far reaching improvements of the planning procedures in less developed as well as advanced economies.

The change of title to *Social Costs of Business Enterprise* is intended to express more explicitly the affinity of our analysis to the intellectual tradition of that branch of institutional economic theory which has stressed not only the cumulative character of social causation and the need for objective criteria of social welfare for the appraisal of the social efficiency of economic systems, but also the importance of raising the question of the quality of human life and behavior under different institutional arrangements. It was Veblen who, as early as 1921, called for an investigation by economists in consultation with the technical expert, "of the various kinds and lines of waste that are necessarily involved in the present businesslike control of industry."¹

In the course of the revision several chapters had to be rewritten almost completely, particularly where new findings and new data were available. In other instances a reorganization of the materials was found advisable. As far as possible problems of developing economies have been considered although not to the extent that would have been desirable. A systematic inquiry into the implications of social costs for the elaboration of investment criteria in developing countries is still to be made. Similarly, a study of the social costs of underdevelopment on the one hand and of the development process on the other seems to be a worthwhile subject of investigation. If the present study encourages economists to undertake such an analysis the author would welcome it as a further sign of the fruitfulness of the concept.

I am grateful to Professor P. C. Mahalanobis and the Indian Statistical Institute for their encouragement in connection with the decision to publish in India the second edition of my study. If this edition contains fewer statistical tables and estimates of social costs than the first edition this is due to my growing conviction that the available data are incomplete and inadequate. However, the quantitative measurement of specific types of social costs arising in the process of production is long

¹ Thorstein Veblen, *The Engineers and the Price System*, New York, The Viking Press, 1933, p. 152

overdue. In so far as the present study makes use of estimates and data collected by other authors full acknowledgement has been made in the text.

I want to thank my friend, Mr. Mulford Martin for his help in editing the manuscript. He has contributed greatly to the improvement of the form and substance of the text. As on previous occasions Lore L. Kapp has cooperated in every phase of the preparation of the second edition.

ROCKFALL, RFD 415 CONN.
November 1962.

K. WILLIAM KAPP

PREFACE

THE MAIN purpose of this book is to present a detailed study of the manner in which private enterprise under conditions of unregulated competition tends to give rise to social costs which are not accounted for in entrepreneurial outlays but instead are shifted to and borne by third persons and the community as a whole. Thus, the present study deals at the same time with a specific technical economic question and with broad issues of social philosophy and economic knowledge. The technical question involved is whether our concept of costs is not incomplete and apparently in need of correction. The broader issues of social philosophy and economic knowledge which the analysis of the social costs of production raise become clear only if we view the phenomenon of social costs within the framework of the basic premises of classical political economy and of the proposition still found in neoclassical economic thought that perfect competition tends to maximize output and the want-satisfying power of available scarce resources. To present a brief outline of this framework is the purpose of the first chapter. The second and third chapters are designed to provide a general introduction to the detailed analysis of social costs by describing the general meaning of social costs and examining the contributions of those economists who have questioned the validity of the main trend of neoclassical economic thought, and in this context have dealt with the phenomena of social losses and social waste. The threads of these theoretical arguments are then brought together in the concluding chapters, which are designed to summarize the results of the detailed analysis of social costs contained in the main part of the book and to draw a number of theoretical and methodological inferences from them.

The basic idea of the present study was first advanced in a highly tentative manner in the author's attempt to deal with

the problem of economic calculation in connection with his analysis of the economic relations between a foreign trade monopoly and private exporters and importers.¹ His interest in the problem of social costs was further stimulated by J. M. Clark's contributions to "Social Economics" as well as by the results of the unique and still largely neglected research carried out under the auspices of the National Resources Planning Board. Professors J. M. Clark and Robert Lynd read an earlier draft of the introductory and concluding chapters and have offered critical comments, which are gratefully acknowledged.

The contribution which my wife has made to this book is too comprehensive to be explained fully. She rendered indispensable aid in connection with the research work; she has prepared preliminary drafts for certain sections; and she has borne many of the numerous burdens involved in the final completion of the study. I also wish to mention with warmest thanks that Dr. Joseph Finnegan has helped with the editorial work on parts of the manuscript.

The untiring cooperation of Mr. Mulford Martin, Librarian of the School of Commerce, Accounts and Finance of New York University, and his staff greatly facilitated the collection of material. I am further indebted for information and material dealing with specific phases of the study to the following agencies and institutions: The Bureau of Labor Statistics of the U.S. Department of Labor, the Bureau of Mines of the U.S. Department of the Interior and the United Mine Workers of America for various data on work injuries; the Mellon Institute of Industrial Research at the University of Pittsburgh, the Air Hygiene Foundation of America in Pittsburgh, the Office of the Mayor of the City of Saint Louis, the New York Chamber of Commerce, the Smoke Prevention Association in Chicago, the U.S. Public Service and the Advisory Committee on Atmospheric Pollution at Birmingham University (Great Britain) for material related to the chapter on air pollution;

¹ *Planwirtschaft und Aussenhandel* (Geneva: Georg et Cie, S. A., Librairie de l'Université, 1936).

the Bureau of Mines for data on the disposal of oil-field brines in connection with the chapter on water pollution; the library of the League of Nations in Geneva (Switzerland) for information on the question of pollution of the sea by oil; the Fish and Wildlife Service of the U.S. Department of the Interior for data on the depletion of animal resources; the National Resources Planning Board, the Atlantic Refining Company, the Independent Petroleum Association of America and the Bureau of Mines for data dealing with the depletion of energy resources; the Soil Conservation Service of the U.S. Department of Agricultural Extension Service of Ohio State University, the Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma, the Illinois Farmers Institute, Springfield, Illinois, and the Forest Service of the U.S. Department of Agriculture for material on soil depletion, erosion and deforestation; the Tennessee Valley Authority and the Interstate Commerce Commission for information concerning diseconomies in transportation; the U.S. Department of State and the Office of Scientific Research and Development for material dealing with scientific research and atomic energy.

I wish to thank the following publishers for premission to quote from their publications: A & C. Black, Ltd., London; The Brookings Institution, Washington, D. C.; Columbia University Press, New York; The Commonwealth Fund, New York; Comstock Publishing Company, Ithaca, New York; E. P. Dutton & Co., Inc., New York; Harper & Brothers, New York; D. C. Heath and Company, Boston; International Publishers, New York; Richard B. Irwin, Inc., Chicago; Little, Brown & Company, Boston; Longmans, Green & Co., Inc., New York; Macmillan & Co., Ltd., London; The Macmillan Company, New York; McGraw-Hill Book Company, Inc., New York; W. W. Norton & Company, Inc., New York; Oxford University Press, London; Oxford University Press, Inc., New York; Pitman Publishing Corporation, New York; Rinehart & Company, Inc., New York; The Ronald Press Company, New York; Routledge and Kegan Paul Ltd., London; Charles Scribner's Sons, New York; Staples Press Limited, London; The Twentieth Century Fund, New York; The

University of Chicago Press, Chicago; The University of Minnesota Press, Minneapolis; The Viking Press, Inc., New York; John Wiley & Sons, Inc., New York. Detailed references to publisher, author, title, and year of publication appear in the text.

I also wish to acknowledge gratefully a grant-in-aid which I received from the Institute of Social Research at Columbia University from November 1943 to May 1944. In this connection I wish to record my gratitude to Dr. F. Pollock, Associate Director of the Institute of Social Research, who read the entire manuscript and made many valuable suggestions related to specific phases of the study. The technical completion of the final draft of the manuscript was greatly facilitated by a grant from the Research Committee of Wesleyan University. I am indebted to the Harvard University Press for many valuable suggestions concerning both the substance and the form of the manuscript.

I have made a deliberate attempt to keep the discussion as free as possible from all technical terminology in order to make the book readable for a wider circle than the limited group of professional economists.

K. Wm. Kapp

ROCKFALL, CONNECTICUT

October 1948.

CHAPTER ONE

ECONOMIC ANALYSIS AND SOCIAL COSTS

ALL SOCIAL scientists have to cope with two basic difficulties: common-sense distortions and their own misconceptions of the social process. Hidden valuations and normative judgments which parade as analytical (positive) statements, the tendency to put one's conclusions into definitions and assumptions, reasoning by analogy and by past experience, wishful thinking and self-deception, deliberate suppression and manipulation of information by interested groups, preconceptions including distorted time-perspectives and, last but not least, elements in the personality structure of the investigator—these are some of the obstacles which tend to defeat social inquiry by subverting the required critical and dispassionate attitude of the social scientist. Instead of testing our solutions by trying to disprove them we tend to defend them against evidence to the contrary. Instead of formulating our problems and our solutions as clearly and as definitely as possible so that they may be critically discussed and revised, social scientists have often tended to save untenable propositions by refining their definitions or by introducing auxiliary hypotheses—thereby rendering more difficult their disproof. Indeed, when new data come to light which contradict earlier conclusions strenuous efforts are sometimes made to play down their significance and to evade their impact.

This is not to say that there has been no progress in social inquiry. On the contrary, new data and new "facts" have repeatedly collided with the conclusions of an earlier age and have led to reformulations and new conceptual systems of a broader and more general scope than those of the past. What we wish to emphasize here is rather the fact that theoretical systems are not easily abandoned in the social sciences; indeed they seem to respond with considerable vigor to new data before

they finally fade into the background. Social analysis and economic theory are no exceptions in this respect.

In fact, it ought to be clear that the social sciences encounter special difficulties when it comes to the necessary weeding out of untenable propositions. This is due to the abundance and the complexity of social evidence and the extreme difficulty of disproving "experimentally" and once and for all any particular social theory. That these difficulties account for the distressingly high survival rate of social theories has often been stated and requires no elaboration. In the social sciences entire systems of analysis have succeeded in surviving by a restatement of assumptions and by redefining concepts or by narrowing the scope of their investigations. This has made it possible to attribute empirical facts which seemed to contradict the conclusions either to minor disturbances and exceptions or to factors which were said to fall outside the "proper" subject matter of the discipline. In still other cases new empirical data merely led to a preoccupation with purely factual research. And yet it will be readily admitted, that in order to be fruitful factual research must be guided by theory, and that if the older theoretical formulations can no longer provide such guidance intellectual reconstruction becomes necessary. Such reconstruction is overdue in the case of economic analysis. Economic theory and particularly the dominant school of neoclassical thought have continued to be shaped by certain classical *a priori* notions concerning the beneficial character of business enterprise which were characteristic of the social philosophy of economic liberalism. A brief outline of some of these preconceptions will enable us to set forth the broader issues raised by the study of social costs.

The unique theoretical contributions of classical political economy to social thought can be fully understood only within the context of the general intellectual atmosphere of the eighteenth century. The philosophical outlook of Quesnay and Adam Smith and their predecessors was shaped by the revolution in the natural sciences which had swept away the pre-Copernican world view and which had led to impressive results in physics, chemistry and biology. To be more precise, the social and political sciences which developed were inspired by

a peculiar mixture of the new scientific conceptions concerning the nature of the universe and a political creed which opposed many though not all forms of governmental regulations. The scientists, philosophers and political thinkers of that period were convinced of the existence of a natural order of the universe. In fact, they believed that not only inorganic matter and living organisms but human society as well were subject to basic natural laws. It was the task of the political economist to discover these laws as far as the production and distribution of material goods and the nature and causes of the progress of the wealth of nations were concerned. Just as the natural sciences had succeeded earlier in formulating the laws of celestial mechanics and some of the principles of physiology, the philosophers and political economists of the eighteenth century hoped to formulate the natural laws of economic and social affairs. Neither William Petty¹ nor Richard Cantillon² nor the Physiocrats³ nor Adam Smith⁴ had any fundamental doubts concerning the existence of a natural orderliness in economic affairs. In harmony with the prevailing anti-mercantilistic aspirations of the rising bourgeoisie the founders of the new system of political economy visualized the economic order *a priori* as a "system of natural liberty" not requiring conscious regulation by government authorities.

¹ Petty criticized the limitation of usury by referring to "the vanity and fruitlessness of making Civil Positive Laws against the Laws of Nature." See "A Treatise of Taxes and Contributions" in C. H. Hull, (ed.) *The Economic Writings of Sir William Petty* (Cambridge, 1899), p. 48.

² Cantillon was one of the first who conceived and analyzed various phases of the market mechanism, the automatic operation of which he described in detail. See H. Higgs, (ed.) *Essai sur la Nature du Commerce en Général*, (London, Macmillan and Co., 1931) esp. pp. 23 ff., and p. 53.

³ The close connection of the Physiocrats and the concept of natural law and particularly the "mechanics" of the circulation of the blood has often been commented upon and is made explicit by both Quesnay and Mercier. See Mercier de la Rivière, *L'Ordre Naturel et Essentiel des Sociétés Politiques* (Paris, 1767) and F. Quesnay, *Le Droit Naturel* (Paris, 1765). (For a translation of relevant extracts from these writings of Adam Smith's predecessors see K. Wm. Kapp and L. L. Kapp, (eds.) *History of Economic Thought* (New York, Barnes and Noble, 1956).)

⁴ The philosophical preconceptions of Adam Smith need no further elaboration. See W. Hasbach, *Untersuchungen über Adam Smith und die Entwicklung der Politischen Oekonomie* (Leipzig, 1891), and *Die Allgemeinen Philosophischen Grundlagen der von François Quesnay und Adam Smith Begründeten Politischen Oekonomie* (Leipzig, 1890). Cf. also J. Bonar, *Philosophy and Political Economy* (London, 1893). For more recent comments see G. Myrdal, *The Political Element in the Development of Economic Theory* (Cambridge, Harvard University Press, 1954).

Like all previous conceptions of natural law (in the sense of natural order) the system of natural liberty was conceived, from the very outset, as an essentially beneficial order which, if not interfered with, tended to maximize the welfare of society as a whole. It was the task of political economy to correlate such specific features of the economic process as prices, costs, profits, wages, rent, and "accumulation" with one another within a coherent system as an exemplification of the natural and beneficial order of economic life. This objective which has guided the scientific approach of one generation of economists after the other, found its culmination in the work of Alfred Marshall, who like Böhm-Bawerk succeeded in synthesizing the multitude of detailed economic phenomena within "a whole Copernican system, by which all the elements of the economic universe are kept in their places by mutual counterpoise and interaction."¹

The classical approach to the study of economic life has had farreaching consequences for the subsequent development of economic theory. In the first place, economic analysis has been preoccupied, from the very beginning, with the demonstration of the assumed orderliness in economic life or, as J. M. Clark puts it, with "a search for levels of equilibrium."² Secondly, it was inevitable that economists, in their search for natural order in production and distribution began to see both reality as a whole and specific phenomena in a light which tended to confirm their speculative hypotheses. Indeed, "the details of economic life (were) construed for purposes of general theory in terms of their subservience to the aims imputed to the collective life process."³ Basic concepts such as wealth, production, utility, costs, returns, etc. were formulated in such a manner as to make them integral parts of the general scheme of thought. In addition, economists preferred to focus their attention on processes which seemed to be self-regulatory and

¹ J. M. Keynes, *Essays in Biography* (London, Macmillan and Co., 1933), p. 223.

² J. M. Clark, "Economics and Modern Psychology", *Preface to Social Economics* (New York, Rinehart and Company, Inc., 1936), p. 93.

³ T. Veblen, "Industrial and Pecuniary Employments," *The Place of Science in Modern Civilization and Other Essays* (New York, The Viking Press, Inc., 1919), p. 282.

thus tended to confirm the order imputed originally to the economic process. In fact, "those features of detail which will bear construction as links in the process whereby the collective welfare is furthered, were magnified and brought into the foreground."¹ In contrast, other phenomena which upset rather than furthered the assumed tendency toward balance and harmony were seen as atypical exceptions or minor disturbances. In short, the *a priori* presuppositions of classical economics determined the selection of the phenomena to be studied and hence the scope of economic science; indeed, the latter was more and more adapted to the original (normative) aim of demonstrating not only the existence but the superiority of the "system of natural liberty" over alternative forms of economic organization.

Thus, under the influence of the natural sciences, economic analysis confined itself more and more to the study of market phenomena. Political economy became "pure economics" which recognized only those ends (and means) which could be expressed and measured in terms of exchange values. That is to say, those social ends and means (costs) which could not be expressed in terms of market prices increasingly came to be regarded as "noneconomic" and as such outside the proper scope of economic analysis. Similarly, only rational behavior was finally considered as relevant for purposes of economic analysis. Nonrational behavior was assumed to be, if not nonexistent, at least of no importance in connection with the analysis of economic activities.

Even more significant was the fact that pure economic theory began to concern itself more and more with the analysis of an essentially stationary image or model of the market economy. The theoretical task was to define the conditions of partial and general equilibrium under competitive conditions and to describe the adjustments which would be necessary in order to attain the imaginary conditions of balance and optimum in the allocation of given means to competing ends. Problems of dynamic growth and cumulative expansion and contraction under the impact of self-reinforcing tendencies both within

¹ *Ibid.*, p. 282.

and outside the economy which might tend to push the social system away from any position of balance and social optimum were either relegated to special chapters on business fluctuations or ignored or branded as noneconomic and sociological in character. Good illustrations of this procedure which tended to eliminate the dynamic and less congenial factors of reality from economic analysis can be found in nearly every branch of economic investigation. But nowhere is this tendency more marked than in the very core of economic analysis: namely, the theory of value and price. Here the concentration on private costs and private wants has been almost complete. In fact, for all practical purposes value theory considers it as axiomatic that entrepreneurial outlays and private returns constitute a theoretically adequate measure of the costs and benefits of productive activities.

Neoclassical analysis has continued to follow a trend which originated in the eighteenth century and which sought to reason by analogy from the natural sciences.¹ Its outspoken subjectivism permitted the most systematic application of utilitarian conceptions of human behavior to economic analysis. More specifically, the new classicism which viewed the market situation as the outcome of the "mechanics of self-interest" as W. Stanley Jevons called it, was dominated from the very outset by the desire to demonstrate that "free competition procures the maximum of utility"² and that under static conditions labor receives what it produces. Its theory of distribution may have served serious analytical purposes but its original intent was most certainly to show that social justice was possible without major social reform.³

¹ For evidence of the continued role of natural law concepts in neoclassical thought, see E. Böhm-Bawerk, *The Positive Theory of Capital*, (New York, G. E. Stechert and Co., 1930), p. 78; J. B. Clark, *Theory of Distribution*, (New York, The Macmillan Company, 1938), pp. 175 and 180.

² M. E. L. Walras, *Etudes d'économie politique appliquée*, Leduc, (ed.) (1936), p. 466, quoted from W. Stark, *The History of Economics*, (New York, Oxford University Press, 1944), p. 56.

³ J. B. Clark, *Theory of Distribution*, *op. cit.*, p. 180 cf. also the significant title and content of one of J. B. Clark's addresses: "Social Justice without Socialism" (Boston, 1914). On the whole subject with particular reference to the role which religious conceptions of social justice played in the development of neoclassical economic thought in America, see J. R. Everett, *Religion in Economics*, (New York, King's Crown Press, 1946).

Some neoclassical economists, it is true, have warned against any normative identification of the position of competitive equilibrium with one of maximum aggregate satisfaction. Thus, Alfred Marshall took exception to the doctrine for several reasons: first, because it assumes that equal sums of money measure equal utilities to all concerned, which clearly they do not under conditions of inequalities in the distribution of income and wealth. In the second place, Marshall pointed out that the doctrine of maximum satisfaction ignores conditions of increasing returns which make it possible to increase production beyond the equilibrium point without injuring the producer, since decreasing costs would make it possible for prices to fall and thereby to increase the consumers' surplus. In this case, Marshall held that the free play of demand and supply could not produce a maximum of aggregate satisfaction and suggested the payment of a subsidy since "the direct expense of a bounty sufficient to call forth a greatly increased supply at a much lower price would be much less than the consequent increase of consumers' surplus."¹ His concept of external economies likewise qualifies the doctrine of maximum aggregate satisfaction.

Similarly, Knut Wicksell was careful to point out that the doctrine of maximum gain under free exchange cannot in strict theory be defended, partly because of individual differences in the capacity of enjoying "the good things of life" as well as social differences and unequal distribution of income. "Thus, for example, the fixing by society, or by a union of workers, of a maximum working day would, within certain limits (which may sometimes be very narrow), be of distinct advantage to the workers and consequently to the most numerous class of society."²

By far the most general qualification of the doctrine of maximum satisfaction and indeed of the entire system of neoclassical equilibrium analysis is that of P. H. Wicksteed. After insisting that the differential (marginal) method makes it more important than ever not to lose sight of the wider ethical and social implications of economic life, Wicksteed points out that the economic

¹ Alfred Marshall, *Principles of Economics* (London, Macmillan and Co., 8th ed., 1920), p. 472. Used with the permission of the Macmillan Company.

² Knut Wicksell, *Lectures on Political Economy* (New York, The Macmillan Co., 1934), p. 77.

"machine" is constructed and moved by individuals for individual ends; that its social effects are incidental; that the collective wealth of the community has ceased to be of much direct significance to us; that the market does not tell us in any fruitful sense what are the "national," "social," or "collective" wants, or means of satisfaction of a community; that the categories under which we usually discuss these things conceal rather than reveal their meaning; that production is a means only, and derives its whole significance from its relation to "consumption"; that the recognition of this fact will humanize economics and that "the more we analyse the life of society the less we can rest upon the economic harmonies; and the better we understand the true function of the 'market' in its widest sense, the more fully shall we realise that it never has been left to itself, and the more deeply shall we feel that it never must be. Economics must be the handmaid of sociology."¹

Despite these qualifications and strictures of neoclassical thought, very little if indeed anything has been done since to "humanize" economics and to broaden the scope of its investigations. Neoclassical economists may point to the emergence of a body of "welfare economics" as evidence of the fact that value theory has moved beyond the stage reached at the time of Wicksell and Wicksteed and that many of the social costs to be analyzed in the present study have already found recognition. In a sense, this is correct and there can be no doubt that Pigou's *Economics of Welfare* represents, as will be shown later, an attempt to assimilate the phenomena of social costs to neoclassical economic analysis.²

¹P. H. Wicksteed, "The Scope and Method of Political Economy in the Light of the 'Marginal' Theory of Value and Distribution", *Economic Journal*, Vol. XXIV, (1914), pp. 11-12.

²Since the first edition of the present work appeared, the importance of social costs (and social benefits) has found increasing recognition in the discussion of external economies and external diseconomies. These "externalities," as Samuelson calls them in the 1961 edition of his *Economics*, (New York, McGraw-Hill Book Company), are now clearly admitted "to create a divergence between private pecuniary marginal cost as seen by a firm and true social marginal cost," p. 476 n. See also E. T. Weiler and W. H. Martin, *The American Economic System* (New York, The Macmillan Company, 1957), pp. 534-539. What is, however, not recognized is the fact that these so-called external diseconomies and social benefits are not isolated cases but are widespread and inevitable phenomena under conditions of business enterprise.

Certainly, as far as the basic philosophy of neoclassical theory is concerned, there is as yet little evidence that social costs (and social returns) have found the recognition which they deserve. The implicit identification of entrepreneurial costs and returns with total costs and total benefits continues to govern the methodology of theoretical economics. Perhaps this is inevitable. After all, most economic theory reflects the historically given social conditions and patterns of thought at any given time. It endeavors to give more or less systematic expression to a particular way of solving the economic problems of the time; in this sense economic theory may be said to "describe" what is happening in the economy. Neither social costs nor social returns enter into the cost-price calculations of the private firm unless special provisions to this effect are made by law and by the systematic application of the principles of social insurance as in the case of workmen's compensation acts. Fundamentally, therefore, the treatment of social costs as a minor and exceptional disturbance rather than as a characteristic phenomenon of the market economy reflects the still very imperfect way in which these costs are taken into consideration in the economic calculus of the system of business enterprise.

In the light of these facts it is not even surprising that the doctrine of maximum satisfaction and particularly the traditional identification of competitive equilibrium with the optimum solution of the economic problem, far from having been abandoned, still plays an important role in contemporary writings.¹ Marshall's and later Wicksell's and Wicksteed's qualifications which were directed against some of the more optimistic formulations of the doctrine advanced by mathematical economists, have led to a refinement of the original proposition that competitive equilibrium is a position of maximum satisfaction. In its contemporary form the doctrine is more carefully related to the traditional assumptions of static equilibrium analysis. However, if in its present version the doctrine is formally more defensible, it is also more meaningless and irrelevant for any realistic

¹ Whoever is inclined to doubt the validity of this statement needs only to consult a number of representative treatments of price theory, particularly those parts dealing with the comparison of price and output adjustments under conditions of (static) competition, with those of monopoly.

appraisal of the performance of the system of business enterprise. For if the existing distribution of resources and income is taken for granted, if entrepreneurial (money) costs and returns (measured in terms of exchange values) are assumed to be not only accurate measures of outlays and benefits but are regarded in fact as the only relevant cost and return elements, and if the volume of commodities to be exchanged is assumed to be fixed—that is to say, if the whole process of competitive price adjustment is viewed as essentially stationary and free of any cumulative changes of supply and demand and price—then competition and rational behavior on the part of both consumers and producers, guided by a constant comparison and final equalization of marginal costs and marginal gain, may indeed be said to tend toward a state of economic equilibrium which is both theoretically determinate and superior to any other conceivable state of affairs (conceivable, that is, under those conditions). However, the formal correctness of the deductions does not make them more relevant for an interpretation of the reality of business enterprise. Indeed, as Schumpeter points out, “in appraising the performance of competitive enterprise, the question whether it would or would not tend to maximize production in a perfectly equilibrated stationary condition of the economic process is . . . almost, though not quite, irrelevant . . . (and) the theorem (of maximum satisfaction of wants) is readily seen to boil down to the triviality that, whatever the data and in particular the institutional arrangements of a society may be, human action, as far as it is rational, will always try to make the best of any given situation. In fact, it boils down to a definition of rational action and can hence be paralleled by analogous theorems for, say, a socialist society.”¹

¹ J. A. Schumpeter, *Capitalism, Socialism and Democracy* (New York, Harper and Bros., 1942), pp. 77n. In fact, as Sidgwick pointed out earlier, practically the whole system of theoretical conclusions of modern economic science could be deduced from the assumption of rational economic conduct. “Thus, it may be argued first that from the universality of the desire for wealth, from the superior opportunities that each individual has, as compared with any other person, of learning what conduces best to the satisfaction of his wants, and from the keener concern he has for such satisfaction, any sane adult may be expected to discover and aim at his own economic interests better than government will do this for him. Then, this being granted; it may be argued, secondly, that consumers in general . . . seeking each his own interest intelligently, will cause an effectual demand for different kinds of products

In the light of this brief survey of the evolution of classical economic analysis the phenomenon of social costs assumes a much broader significance than that of a specific technical question related to private cost accounting. Indeed, a detailed analysis of social costs opens the way for the demonstration that the social performance of the free market economy would still fall short of the economic optimum even if it were possible to stem the cumulative and self-sustaining tendencies toward oligopoly in market economies. For the fact that private entrepreneurs are able to shift part of the total costs of production to other persons or to the community as a whole, points to one of the most important limitations of the scope of neoclassical value theory. As long as it continues to confine itself to market value neoclassical economics will fail to assimilate to its reasoning and to its conceptual system many of the costs (and returns) which cannot be expressed in dollars and cents.

However, the demonstration that business enterprise tends to shift part of the costs of production to third persons and to the community as a whole is only one of the reasons why the presumption against governmental regulation and the still prevailing bias against planning must be abandoned. Indeed there are two further reasons why the system of business enterprise fails to achieve the maximization of the want-satisfying power of scarce resources: namely, serious obstacles to rational behaviour of consumers and entrepreneurs in modern market economies, and the existence of important social returns which diffuse themselves throughout society and, since they cannot be sold in markets and cannot be appraised in terms of dollars and cents, are largely neglected by private enterprise.¹

The present investigation must thus be understood as part of a larger inquiry the purpose of which is twofold: to measure the

and services, in proportion to their utility to society; while producers, generally seeking each his own interest intelligently, will be led to supply this demand in the most economic way, each one training himself or being trained by his parents for the best rewarded, and therefore, most useful services for which he is adapted." H. Sidgwick, *The Principles of Political Economy* (London, 1901), p. 29.

¹ The first of these factors has been analyzed by the author in some detail in "Rational Human Conduct and Modern Industrial Society," *The Southern Economic Journal*, 1943, vol. X, pp. 136-150. For an analysis of problems of

performance of the system of business enterprise by yardsticks which transcend those of the market and to lay the foundation for a reformulation of economic analysis so as to include those omitted aspects of reality which many economists have been inclined to dismiss or neglect as "noneconomic." Such a new science of economics will have to recognize that a partial view of the economy can never lead to a rational (i.e. critical and scientific) view of the economic process—a view which will always call for a comprehensive interpretation of all relevant factors. Only by overcoming the present compartmentalization of our knowledge in the social sciences, or more specifically by accepting the fact that the "economic" and the so-called "noneconomic" are intrinsically interrelated and must be studied together, will we be able to construct a new science of economics, which will be "political economy" in an even more comprehensive sense than the term was ever understood by the classical economists and their predecessors. But this raises issues which transcend the scope of the present study. Our main purpose is to demonstrate that entrepreneurial outlays fail to reflect important social costs of production and that they cannot be accepted as measures of total costs. As a first step in this demonstration it is important to turn our attention to the meaning and the general nature of social costs.

social returns and the related subject of public investment see K, William Kapp, *Hindu Culture, Economic Development and Economic Planning*. (Bombay, Asia Publishing House, 1962)

See also for a devastating critique of the doctrine of consumers' sovereignty under conditions of modern sales promotion and advertising, J. K. Galbraith, *The Affluent Society* (Boston, Houghton, Mifflin and Co., 1958), esp. chs. 10 and 11.

CHAPTER TWO

THE NATURE AND SIGNIFICANCE OF SOCIAL COSTS

FOR the purposes of this investigation the term "social costs" covers all direct and indirect losses sustained by third persons or the general public as a result of unrestrained economic activities. These social losses may take the form of damages to human health; they may find their expression in the destruction or deterioration of property values and the premature depletion of natural wealth; they may also be evidenced in an impairment of less tangible values.

Social losses arise in various ways. Some clearly have their origin in specific industries and can be traced to particular productive processes and business practices. Others are the result of the interaction of a great number of factors which make the process of causation a complex and frequently a cumulative one. In some cases, the social costs of production are felt immediately; in other instances, the negative effects of private production remain hidden for considerable periods of time so that the injured persons do not become immediately aware of their losses. Furthermore, whereas certain social losses affect only a limited group of individuals, others may be felt by all members of society. Indeed, the actual damages may be so widely dispersed and affect so many people that, while the total losses are substantial, each individual sustains only a relatively small loss or injury. Although aware of his losses, the individual may not even consider it worthwhile to take defensive action against the particular industry responsible for his losses. In many instances it may not be clear who is actually responsible for the damages. In short, the term "social costs" refers to all those harmful consequences and damages which other persons or the community sustain as a result of productive processes, and for which private entrepreneurs are not held

accountable. This definition of the concept is comprehensive enough to include even certain "social opportunity costs," which take the form of avoidable wastes and social inefficiencies of various kinds.

In order to be recognized as social costs, harmful effects and inefficiencies must have two characteristics. It must be possible to avoid them and they must be part of the course of productive activities and be shifted to third persons or the community at large. The consequences of an earthquake are not social costs in the sense in which the term is to be used here. An earthquake is neither a productive activity nor can it be avoided. At best, some of its destructive effects may be prevented by appropriate measures of precaution. What matters for our discussion is the fact that certain productive activities set the stage for considerable social losses, that the causal relationships between these activities and the social losses can be critically explored and that the losses can be minimized or avoided by appropriate measures. For instance, pollution of the environment by various types of contaminants can be traced to productive activities and can be shown to be man-made and avoidable.

The basic causes of social costs are to be found in the fact that the pursuit of private gain places a premium on the minimization of the private costs of current production. Therefore, the greater the reliance on private incentives, the greater the probability of social costs. The more reliance an economic system places on private incentives and the pursuit of private gain the greater the danger that it will give rise to external "unpaid" social costs unless appropriate measures are taken to avoid or at least minimize these costs. From this it would follow that a decentralized planned economy which makes extensive use of private incentives such as bonuses to its managers in order to assure the attainment of its targets and objectives, will hardly be immune to social costs. Evidence of certain inefficiencies in the Soviet economy support this conclusion.¹

¹ For an account of some of the social costs which can be traced back to the incentive system in Soviet economic planning, see J. S. Berliner, "Managerial Incentives and Decision Making: A Comparison of the United States and Soviet Union" in *Comparisons of the United States and Soviet Economies*, Joint Economic Committee, 86 Congress, Part I, (Washington, D. C., U. S. Government Printing Office, 1959), pp. 349-376.

In so far as social costs are the result of the minimization of the internal costs of the firm it is possible to regard the whole process as evidence of a redistribution of income. By shifting part of the costs of production to third persons or to the community at large producers are able to appropriate a larger share of the national product than they would otherwise be able to do. Alternatively, it may be claimed that consumers who purchase the products will get them at lower prices than they would have been able to do had producers been forced to pay the total costs of production. And similarly, the enforcement of preventive legislation has a redistributive effect. There is thus a problem of the incidence of social costs and of the costs and benefits of measures designed to prevent the social losses caused by private productive activities.¹ How large a share of the national income is thus redistributed is a problem which cannot concern us here. It is needless to add that the fact that problems of social costs raise issues of income redistribution makes them matters of political controversy and political power.

It is no exaggeration to say that the occurrence of social costs has found recognition in a variety of practical policies. Indeed, a large part of governmental activities in modern society is devoted to the repair and prevention of a number of social losses caused by modern industrial activities. These policies must be considered as strong evidence of the existence of social costs. No doubt, this increasing recognition reflects to a considerable extent a shift in the balance of power in favor of those classes and groups in society which have borne the brunt of social losses in the past and who now are using their political and economic power in an effort to protect themselves against the negative consequences of progress. The political history of the last 150 years can be interpreted as a revolt of large masses of people (including small business) against social costs. It is doubtless true that the steady increase of protective social legislation, the enforcement of minimum standards of health and

¹ The point has been made recently in a somewhat different context by K. Fox, *Pollution: The Problem of Evaluation*, National Conference on Water Pollution, December 1960, United States Department of Health, Education and Welfare, U.S. Public Health Service, Washington D.C, (mimeographed), p. 5.

efficiency, the prohibition of destructive practices in many fields of production, the concern with air and water pollution, or even the efforts of farmers, businessmen and labor to peg the prices of their products and services, reflect, at least in part, an attempt to restrain destructive methods of production and exploitation of resources.

Viewed in this fashion the struggle for the prevention of social costs or for their more equal distribution is nothing but an integral part of the gradual access to political power by groups formerly excluded from such power. No doubt, pressure groups and vested interests have been able to distort and abuse the legitimate struggle for a more equal distribution of social costs, to the detriment of society. Most certainly, not every counter-vailing restraint of trade is justified as a measure designed to remedy the wastes of unregulated competition. In many instances, these restraints are themselves techniques of taking advantage of the consumer and have become the sources of important social costs. And yet, after all has been said about the misuse of power by vested interests, the fact remains that, on the whole, the increased emphasis on the elimination of, and protection against, social losses and the shift in the balance of power reflect an expansion of popular control over economic institutions and policies.

Despite this shift in the balance of power, the main body of neoclassical value theory has continued to regard social losses as accidental and exceptional cases or as minor disturbances. To dismiss the entire problem of social costs in this manner begs the question. For whether or not these costs are isolated cases and minor disturbances can be decided only after their significance and their probable magnitude have been explored. Similarly, to dismiss the problem of social costs on the ground that in some instances remedial measures have been taken by governments and private organizations misses the important question as to whether such measures are adequate and effective. This question too can be answered only after an attempt has been made to comprehend the nature and possible magnitude of the social costs of production. Close analysis of existing preventive regulations reveals that present restraints are still

highly ineffective in minimizing social losses and that in many instances social costs have found either no or only the most rudimentary recognition.

Social Costs and Social Change

It has been argued that social costs are merely the by-product of any process of rapid economic change and growth. Thus, social costs are sometimes considered as the short-run price paid for high level productivity and social performance of the economic system in the long-run. There would be no basic quarrel with this position if it did not imply that social costs are unavoidable and economically justified and that nothing is to be gained by their investigation. However, whether growth and development are worth their price can be determined only after an attempt is made to ascertain the *total* costs involved. Whether one prefers to look upon social costs as the price to be paid for economic growth or—what is essentially the same thing—as the short-run inefficiency of an alleged long-run efficiency in no way affects the importance of knowing the full price paid for either. In fact, to trace and identify the social costs of growth and long-run efficiency is not only a necessary undertaking but is clearly called for by the canons of economic rationality. Nothing is more irrational than an incomplete system of cost accounting. An economic calculus that neglects one part of the costs of production can hardly claim to promote social efficiency.

In its most uncompromising form the thesis that social costs are merely the inevitable and unavoidable price of economic change goes even further. It asserts that the endeavor to eliminate or at least to redistribute the social costs of production and to insist upon a more orderly and deliberate change is nothing but an attempt to end all change and growth.¹ Thus it is argued that unlike previous forms of social organization in which vested interests were able to block new methods of

¹ "However unconsciously, the present movement to plan change and growth is in many of its forms really a movement to end change and growth." Cf. D.M. Wright, *The Economics of Disturbance* (New York, The Macmillan Co., 1947), pp. 91-92.

production and economic change through regulations of all sorts, the system of business enterprise has been marked by a maximum of opportunities for innovations which freely invaded and destroyed established patterns of production and organization. This, together with the spirit of economic rationality, is said to enable the market economy to promote and assimilate technical progress in the most rapid fashion, and it is, therefore, no accident that its history has been associated with the most pronounced scientific progress and economic growth on record. The argument concedes, it is true, that this rapid expansion with its characteristic discontinuities in the production of durable capital and the periodic overexpansion of productive facilities has made the capitalist market economy a highly unstable form of economic organization. A further consequence has been a growing hostility to competition and the emergence of an "anti-capitalist" mentality and an intense quest for greater security by large masses of people who have to bear the brunt of the social losses of rapid change. It is these groups, interested in preserving the *status quo*, who have gained in political influence. If this anti-capitalist mentality continues it is asserted all change and growth may come to an end. The same prospect is in store for planned economies because, there too, groups with a vested interest in the maintenance of the *status quo* would be able to use their influence in an effort to perpetuate the existing methods of production and cost accounting to the detriment of society as a whole. So much for the thesis.

What bearing has this line of reasoning on the problem of social costs? In so far as it maintains that the growing political influence of persons who have carried the burden of social costs and social change in the past may bring to a stop all innovation and progress, the choice seems to be one between democracy and progress. This would be merely another way of saying (still assuming that the main line of the above argument is correct) that rapid change depends upon the survival of undemocratic elements which make it possible for a small group of people interested in rapid change to impose upon the great majority of the population the burden of social costs, instability and personal insecurity. If it were really true that democracy

and rapid economic growth are alternatives the question obviously remains whether we consider the preservation of democracy or rapid change as the greater value. And it would be legitimate to raise the further question whether the lament about the imminent end of all change and growth does not reflect, however unconsciously, a willingness to reverse the movement toward social and political democracy.

But is the argument sound? Is it really correct that we have to choose between democracy and progress? Must we assume that any "protection" against the costs of competition has to end in a complete stoppage of all change? Several reasons may be advanced to support our more optimistic outlook.

First, it is reasonable to assume that any opposition to progress and growth would decline considerably if the total costs of such change were more equitably borne than in the past and fuller compensation were made for the social losses suffered. In fact, the opposition to change and long-run growth is, at least in part, also based upon the general economic instability to which the competitive process, for reasons other than progress and change, gives rise. Since this instability can be materially reduced by measures of anti-cyclical economic control it is reasonable to assume that the opposition to change would decline with the achievement of a higher degree of over-all economic stability. Furthermore, with a more complete system of social accounting and the decline of opposition to change, the cleavage between those who cling to the *status quo* and those who expect to gain from change will be amenable to the typical processes of democratic bargaining and compromise. Finally, and most important of all, the general world situation and the competitive co-existence of rival forms of economic and political organizations makes it impossible for either society to arrest the pace of technological progress and change. Whatever may be the hazards of living in the atomic age with the world divided into two rival blocs, technological stagnation is not likely to be one of them. Neither the Soviet economy nor the American economy show any slackening in the application of new technological innovations.¹

¹ See, however, chapter 10.

The concept of social costs may be criticized on the ground that it covers a great variety of social losses and, therefore, lacks definiteness and precision. To some extent this may be correct. However, let us restate our intentions and consider the alternatives that were open to us. It is the purpose of our analysis to trace what we consider to be typical social phenomena as they organize themselves into a pattern. To this end a general concept is needed which defines the phenomena in terms of certain general characteristics. Our concept identifies these characteristics in terms of the empirical consequences of productive activities which the entrepreneur does not bear but is able to shift to other persons or to the community at large. In this sense our concept is both concrete and operational. That the consequences vary in scope and character is true. But this can hardly justify the rejection of the concept on the ground of ambiguity. The alternative would have been to develop a separate concept for each of the various kinds of social losses and to abandon any attempt at a general definition. This might have been satisfactory if we had wanted to write the economic history of social costs in modern industrial societies. But such is not the case. We are concerned with the problem of social costs as a typically neglected phenomenon of economic analysis and we hope to show that this neglect accounts for many of the failures of economics and its lack of relevance for the comprehension and solution of practical problems of modern economies. Until recently economic analysis has neglected the social and human costs of production. This neglect is in contradiction to the tenets of our professed humanistic ideals and the respect for the value and dignity of the individual. As we shall see, social costs threaten the life and health not only of the individual but of all humanity and play havoc with a rational use of our resources. If we permit professional inertia and academic interest in traditional neoclassical analysis to stand in the way of a major reconstruction of economic science we may preserve the tradition but miss our chance to permit human intelligence and human knowledge to contribute to the solution of one of the most urgent problems of modern industrial societies.

Quantification and Measurement

There are, however, several problems which confront us when applying the concept of social costs. One of these problems is the fact that third persons and the community at large who sustain the losses as a result of private productive activities may also benefit to a certain extent from the current lower prices at which they are able to purchase commodities just as the producers who contribute to air pollution may actually find their own health and property impaired by the very process that permits them to shift part of the costs of production to the community at large. Here we are faced with the specific interdependency which connects all phases of social reality.

In addition, some social costs belong to those social phenomena for which it is as yet difficult to arrive at statistical measurements and agreed estimates. Generally speaking there is a substantial lack of information on the magnitude of social costs of production and only the most preliminary studies of them have so far been made. While we study the commercial and business aspects of productive processes, their social consequences—although recognized in general terms—attract little attention. We may spend substantial amounts of money on market research and sales promotion, and billions of dollars are available for research on moon rockets and similar adventures into outer space, but a study of the causes and effects of social costs which would aid in their assessment attracts at best only limited and completely inadequate funds.

However, while it is necessary to realize that quantification will always remain an important question in the analysis of social costs it is essential not to exaggerate its significance. Quantification and measurement doubtless have their place not only in scientific analysis but also in the formulation of practical policies. And yet in many instances the effort to quantify may be in vain. We may create the appearance of quantitative measurement when in effect we have nothing of the sort. Such an illusion of quantification is characteristic of many discussions in economics particularly in value theory. We speak of "opportunity costs" or the "demonstration effect." Are these "quantitative" concepts actually subject

to measurement? Can we really determine the opportunity costs of any public or private decision or expenditure? However, these concepts have never been seriously questioned on the ground that their quantitative character is neither self-evident nor clearly established in practice. If it is argued that these are auxiliary theoretical concepts and that their usefulness does not depend upon precise measurements anyway, the same could be said of the concept of social costs. The usefulness of the concept of social costs as a tool of analysis does not depend upon the precise measurability of the latter. The social consequences of productive activities to which the term social costs refers are at least as operational and concrete and subject to quantification as the subjective realities to which the concept of opportunity costs and individual preference scales refer. Social analysis must resist the temptation to apply the standards of precision of micro- and macro-physics or for that matter of the differential calculus. We defeat the purpose of scientific inquiry if we make a fetish of precision and measurement by imitating standards and procedures which may be applicable to the measurement of temperature but which are difficult or impossible to achieve in the social realm. Actually the statistical (substantive) measurement of some of the social costs may in the end be easier than the quantification of such intensive psychic magnitudes as utilities, pleasure and preferences which play such an important role in neoclassical value theory. After all, social losses have certain objective effects on mortality, morbidity, general human efficiency and property values which can be quantified—even though the operation and standards of measurements are not always those of adding dollars and cents.¹

It has to be admitted that some social costs are highly complex and composite in character and can be evaluated only in terms of the importance which organized society attributes to both the tangible and the intangible values involved. Such social evaluations do not, however, pose an entirely *new* problem. The formulation of public policy nearly always requires an evaluation of “means” and “ends” whose relative importance can only

¹ See “Social Costs and Social Benefits, their Relevance for Public Policy and Economic Planning”, in K. William Kapp, *Hindu Culture, Economic Development and Economic Planning* *op. cit.*

be estimated due to the fact that a substantial proportion of all "costs" and "returns" of economic policies are "political" and intangible in character. Of course, this is not to say that policy formulation on the basis of general estimates of possible costs and returns has been fully explored and offers no further theoretical difficulties. Quite on the contrary, the issues raised by the concept of "social value" and "social evaluation" belong to the most important unsolved problems of economic science.

The concluding part of the present study suggests the general direction in which a solution of these problems might be found. It will suffice to state here only briefly that the social scientist must resist the temptation either to ignore social costs because they require an evaluation by society or to introduce his own standards and preferences into the discussion of their evaluation. For, to do the former and to leave social losses out of account because they are "external" and "noneconomic" in character, would be equivalent to attributing no or "zero" value to all social damages which is no less arbitrary and subjective a judgment than any positive or negative evaluation of social costs. For the social scientist to evaluate social costs in terms of his own standards and preferences would mean the introduction of highly subjective value judgments into economic analysis and would make the generalization derived therefrom equally subjective, arbitrary and problematical. Here, as in all matters of social evaluation, we would be on safer grounds if we could rely on objective standards of social minima and measure social costs in terms of shortfalls or deficiencies from such minima.

Cumulative Causation and Social Costs

One of the central tasks of the theory of social costs and indeed the key objective of the present study is to trace the causal relationships between various productive activities and business practices on the one hand and of significant social losses and damages on the other. This undertaking will be rendered easier in the light of a brief discussion of social causation. In contrast to neoclassical analysis we accept the principle of cumulative causation as the main hypothesis for the study of social relations and economic processes in particular. It is

essential, therefore, to provide an explicit statement of the main characteristics of this hypothesis.

Cumulative causation in social affairs is not a recent discovery. The study of economic fluctuations has developed several "models" of cumulative causation which should, at least, be mentioned even if they are still highly mechanistic in conception and narrowly confined to economic variables. Cases in point are the so-called cobweb principle, the "acceleration" of the demand for, and production of producers' goods resulting from a relatively small change in the rate of increase or decrease of the demand for consumers' goods and finally the backward sloping supply curve of labor, reflecting the possibility that a fall in wages may be accompanied by a greater supply of labor hours, as well as the tendency of prices to rise or fall in accordance with speculative expectations and behavior. Even the multiplier may be cited as a model of the cumulative character of economic processes.

Let us illustrate the potentially disequilibrating tendencies of these models of cumulative causation with reference to the backward sloping supply curve.

During the Industrial Revolution which opened the way for unskilled women and child labor the displacement of workers by machinery tended to depress wages and forced women and children into factories to supplement the family income. Thus, far from resulting in a decrease of the amount of labor offered the drop in wages increased the supply thereby contributing further to the tendency of wages to fall. It was this tendency of wages to fall which, together with a general scarcity of capital gave relative validity to Ricardo's iron law of wages as well as to Marx's conception that wages tend to fluctuate around the minimum subsistence level. Doubtless, the general principle which is expressed by the backward slope of the supply curve of labor holds true not merely in times of rapid economic growth but also under normal conditions in traditional societies.

That even the whole system could move increasingly and cumulatively away from equilibrium was pointed out by Schumpeter who stated that "once equilibrium has been destroyed by some disturbance, the process of establishing a

new one is not so sure and prompt and economical as the old theory of perfect competition made it out to be; and there exists the possibility that the very struggle for adjustment might lead such a system farther away from instead of nearer to a new equilibrium. This will happen in most cases unless disturbance is small. In many cases, lagged adjustment is sufficient to produce this result."¹

However, the principle of cumulative causation owes less to the aforementioned models of business cycle research than to the earlier views of Veblen. For Veblen it was always axiomatic that the process of cultural evolution and economic processes could be understood only in terms of the principle of a cumulative sequence of cause and effect. This sequence must be viewed as unending, unteleological, and unconcerned with human wishes and moved by a kind of institutional inertia rather than any tendency toward either partial or general equilibrium.² The principle of cumulative or circular causation stresses the fact that social processes are marked by the interaction of several variables both "economic" and "noneconomic" which in their combined effects move the system away from a position of balance or equilibrium. In fact instead of calling forth a tendency toward automatic self-stabilization social processes may be said to obey some principle of social inertia which tends to move the system in the same direction as the initial impulse. "The system is by itself not moving toward any sort of balance between forces but is constantly on the move away from such a situation. In the normal case a change does not call forth countervailing changes but, instead, supporting changes, which move the system in the same direction as the first change but much further."³ This

¹ J. A. Schumpeter, *Capitalism, Socialism and Democracy*, (New York, Harper and Brothers, 1942), p. 103.

² M. W. Watkins, "Veblen's View of Cultural Evolution" in D. F. Dowd, (ed.), *Thorstein Veblen: A Critical Reappraisal*, (Ithaca, N.Y., Cornell University Press, 1958), pp. 249-264. See also W. C. Mitchell's theory of causation in *Business Cycles, The Problem and its Setting* (New York, National Bureau of Economic Research, 1927).

³ G. Myrdal, *Rich Lands and Poor*, (New York, Harper and Brothers, 1957) p. 13. That many of these movements in the same direction may spend themselves and under certain conditions be arrested by neutralizing tendencies does not refute their cumulative and self-reinforcing character. See *Ibid.* pp. 33-37.

principle of cumulative causation, by stressing the interaction of several factors that move the social system in the same direction as the initial impulse only faster, constitutes the main causal hypothesis and the general conceptual framework for the study of social costs.

One final word is in order. Most of the factual evidence of social costs presented in the following chapters pertains to economic life in the United States. This emphasis on social costs in the American economy may give rise to the impression that they are a typical American phenomenon. However, such is not the case. Social costs are a common phenomenon in competitive economies; what should be emphasized is the fact that American business enterprise provides a particularly clear illustration of the operation of the capitalist process because it had remained relatively free of governmental control throughout the nineteenth century and up to the Great Depression of the nineteen thirties.

We wish to make it clear that we are not comparing unregulated private enterprise with a system of economic planning. We do not imply that a system of economic planning would necessarily eliminate the phenomenon of social costs. Whether or not a planned economy will avoid the social costs of production depends upon the planners, i.e. whether they wish to avoid them or neglect them. In the last analysis this is a matter of the political structure of the planned economy, and whether or not the plan as an essentially political act of decision-making is subject to review at the polls. The fact that we do not compare unregulated competition and economic planning and that we do not argue that social costs will be automatically avoided under a system of economic planning (whether centralized, decentralized or local) makes it unnecessary, we feel, to examine the political and economic problems of specific alternative forms of social organization. Nor shall we discuss techniques and policies which might lead to the elimination of social costs. To do so would transcend the scope of the present study, which is confined to the tracing of a number of significant cases of social costs in the system of business enterprise.

Before turning to our main problem it will be worthwhile to review briefly the contributions of those economists who have questioned the validity of the main trend of reasoning of classical and neoclassical economics and who have in this context dealt with the phenomenon of social costs.

CHAPTER THREE

EARLIER DISCUSSIONS OF SOCIAL COSTS

EVER since the classical economists took over from the natural sciences the concept of equilibrium and used it to demonstrate that production and distribution were self-regulating processes capable of achieving an optimum solution of the economic problem without positive direction by public authority, individual economists have questioned the general validity of such an optimistic interpretation. In dissenting from the tenets of the classical school many critics referred to various social costs in the sense in which the term will be used here. In fact, in surveying this critical literature one is impressed by the fact that social costs have never disappeared completely from the literature. Confronted with the mass of factual evidence unearthed by the critics one wonders why the classical preconceptions of equilibrium and self-regulation were not abandoned long ago and replaced by premises postulating, for instance, inertia in social affairs or indeed cumulative movement into the same direction. Certainly there was enough evidence to support such a thesis which could have served as a basis for a far-reaching critique of classical economics and its social philosophy.

There seem to be three reasons why the critics did not carry their discussion to this conclusion. First, most critics shared the basic presuppositions of their time which prevented them from rejecting the rationalistic and optimistic notion of a "natural" order in social and economic affairs. Second, old preconceptions die slowly, especially if they reflect deep-seated political creeds and ideologies. And third, it is much easier to build a system of theoretical generalizations upon the notion of natural law and rational economic conduct than it is to build a system of economic thought upon the conception

of a tendency toward social inefficiency. It is thus not surprising that the factual evidence collected by the critics did not lead to the elaboration of a new and equally systematic body of doctrine in support of economic control and planning.

The Classical Economists

It may seem paradoxical to start this discussion with the classical economists and it would obviously be an extension of the argument to assert that the founders of political economy were champions of the doctrine of social costs. And yet some of the classical economists advanced important qualifications of the doctrine of the invisible hand, in which we find elements of what may be defined as social costs. Even and particularly Adam Smith was fully aware of the fact that the market mechanism could secure the optimum solution of the economic problem only if at least three conditions were fulfilled; first, that there would be free competition; second, that the competitors were restrained in their action by "sympathy" and "moral sentiments"; and third, that in addition to defense and the administration of justice, the government erects and maintains certain "public institutions" and "public works" which "though they may be in the highest degree advantageous to a great society, are, however, of such a nature, that the profit could never repay the expense to any individual or small number of individuals, and which it, therefore, cannot be expected that any individual or small number of individuals, should erect or maintain."¹ It is true, Adam Smith took it for granted that the prerequisites of free competition would be fulfilled and it is not difficult to understand why, at his time, he felt it unnecessary to inquire further whether this assumption would always be fulfilled in the future. In 1776, i.e. prior to the series of technological advances usually referred to as the first Industrial Revolution and the concentration of capital in joint stock companies, it would have been impossible to foresee that the time might come when production and distribution would no longer be carried on by a multitude of small-scale businessmen actively

¹ Adam Smith, *The Wealth of Nations* (New York, The Modern Library 1937), p. 681.

competing with each other. It is well known that despite this "innature" state of the economy at his time, Adam Smith made some very shrewd observations concerning the natural propensity of "masters" to combine with each other to the disadvantage of the working-man and the consumer in general.

Smith's reliance on moral sentiments as a prerequisite of any workable system of competition has often been overlooked and has even been denied by later generations of economists who preferred to stress Smith's reference to the invisible hand as evidence of his glorification of selfishness. However, nothing could be further from the truth. It is unthinkable that a moral philosopher of the stature of Adam Smith, who published *The Theory of Moral Sentiments* in 1759, would have abandoned his conceptions of the moral laws governing human behavior in 1776 when he published *The Wealth of Nations*, without making such a change of view explicit. It is, therefore, imperative that *The Wealth of Nations* be read in conjunction with the earlier *Theory of Moral Sentiments* in order not to lose sight of Smith's presupposition of the existence of a natural moral law which would induce the prudent man to improve himself only in fair ways, i.e. without doing injustice to others. We cannot criticize Adam Smith for not having had a more modern understanding of human nature and the fact that in the struggle for commercial survival it is often the most unscrupulous who sets the standard for moral restraint.

There were other members of the classical school whose writings reveal an awareness of some of the disequilibrating tendencies of unregulated free enterprise and of specific aspects of social costs. For example, T. R. Malthus' analysis of the rapid accumulation of capital as a possibly disturbing element in the progress of wealth may well be regarded as an early example of an approach to economic analysis which questions the self-equilibrating tendency of the market economy and points to the social losses caused by prolonged unemployment. It is well known that there is a direct connection between Malthus' views, which were shared and in part even anticipated by Sismondi, and those of J. A. Hobson and J. M. Keynes.

Even David Ricardo finally revised his earlier optimism

concerning the impossibility of a lasting displacement of labor by the introduction of machinery; he admitted that the advantages of technological progress, if introduced suddenly and to a considerable extent, are paid for by losses borne by the working population.

The Historicists

It was the Historicists among the economists of the nineteenth century who delivered the first systematic blow against the basic preconceptions of classical political economy. From Auguste Comte to Gustav Schmoller, the members of this school were united in their denial of the thesis that the principle of self-interest is able to promote social welfare and that there was no need for government planning and regulation of the economic process. In their insistence upon the need to consider social and economic reality as a whole, and to make economic analysis more concrete and more operational by means of detailed case studies, the Historical School traced in detail many of the negative social consequences of the competitive market economy such as extreme inequalities in the distribution of wealth and income, social insecurity and destitution of old and sick people, depressed areas and industries. Being aware of these negative effects, they demanded far-reaching social and economic reforms by means of social legislation very much along the lines of the American New Deal. In fact, the Historical School anticipated many of the ideas which are now more or less generally accepted at least as far as practical social policy is concerned.

The Socialists

What distinguishes the socialists and especially Marxian socialists from the classical school is not a difference in method and preconception, but the fact that they arrive at diametrically opposed conclusions on the basis of the same central doctrine—the labor theory of value. Instead of harmony of interest, Marx demonstrates the existence of exploitation and inevitable conflict between labor and capital. Instead of automatic equilibrium between consumption and production, Marx deduces

crises and ultimate breakdown of the capitalist order. Basically, the socialist theory of surplus value according to which the price of labor (wages) tends to fall typically short of the laborer's contribution (in terms of value) to the total product, implies a concept of social costs. This was clearly seen and stated by one of the earliest proponents of the theory of surplus value, namely, Simonde de Sismondi. Without even formally accepting the labor theory of value, in fact in a chapter which bears the general title "How the Returns of the Entrepreneur are derived from Capital," Sismondi points out that their dependence and their general state of poverty often forces workers to accept any kind of work even under the most unsatisfactory conditions and at the lowest possible wages. "The returns of the entrepreneur sometimes represent nothing but the spoliation of the worker; the former makes his money not because his business yields returns far in excess of the costs of production but because he does not pay the total cost of his enterprise; he fails to give an adequate compensation to the worker. Such an industry is a social evil."¹

Sismondi also seems to have been the first economist to have set forth in a more systematic way other aspects of social costs, especially those arising in connection with technological improvements.² Without denying the existence of equilibrating tendencies of the market, Sismondi makes it clear that the attainment of a new equilibrium, for instance after the introduction of technological innovations, is usually achieved only at the price of great human costs and capital losses. "Let us beware of this dangerous theory of equilibrium which is supposed to re-establish itself automatically. . . . It is true a certain equilibrium is re-established in the long run but only after a frightful amount of suffering. It is a fact that capital is withdrawn from a particular industry only as a result of bankruptcy of the owner, and workers give up their occupations only when they die; indeed, laborers who find it easy to shift to other occupations

¹ Translated from J. C. L. Simonde De Sismondi, *Nouveaux Principes D'Economie Politique* (second edition, Paris, 1827), vol. 1, p. 92.

² Concerning the question of Sismondi's priority over, and relation to, Ricardo and Malthus, see G. Sotiroff, *Ricardo und Sismondi* (Zürich, Europa Verlag, 1945), pp. 41-47.

and move to other places must be regarded as exceptions and not the rule."¹

As a result of this immobility of fixed capital and labor, technological changes have, according to Sismondi, the effect of destroying the value of old investments—a fact which exposes manufacturing industries to violent shocks. As far as the losses of labor are concerned, Sismondi points out that "the immediate effect of machinery is to throw some of the workers out of employment, to increase the competition of others and so to lower the wages of all. This results in diminished consumption and a slackening of demand. Far from being always beneficial, machinery produces useful results only when its introduction is preceded by an increased revenue, and consequently by the possibility of giving new work to those displaced."² Countless official and private investigations into the conditions of the working class during the Industrial Revolution, especially in England, have confirmed Sismondi's thesis. These studies provide a detailed picture of the social costs caused during the period of transition following the introduction of the machine method of production; they have remained to the present day classic examples of a discussion of social costs resulting from the impairment of the health and efficiency of the working population.

In fact, these social costs of technological change may be regarded as a special case of the social costs of transition which remain largely unaccounted for in entrepreneurial cost calculations. Marx dealt with costs of transition in his discussion of the effects of the abolition of the corn laws in England in his *Address on Free Trade* in 1848. Quoting with approval Ricardo's statement that the importation of cheaper corn will lead to lower wages³, Marx continues: "And do not believe, gentlemen,

¹ Translated from J. C. L. Simonde de Sismondi, *op. cit.*, Vol. II, p. 220.

² Quoted from C. Gide and C. Rist, *A History of Economic Doctrines from the Time of the Physiocrats to the Present Day* (New York, D. C. Heath and Company, 1915), p. 180.

³ "If, instead of growing our own corn . . . we discover a new market from which we can supply ourselves with these commodities at a cheaper price, wages will fall and profits rise." D. Ricardo, *The Principles of Political Economy and Taxation* (New York, E. P. Dutton and Co., Inc., Everyman's Library, 1937), p. 80.

that it is a matter of indifference to the worker whether he receives only four francs on account of corn being cheaper, when he had been receiving five francs before."¹ To those economists who argue that the decline of wages and the keener competition among workers are temporary sufferings during the transition period, Marx replies that "these temporary evils have implied for the majority the transition from life to death, and for the rest a transition from a better to a worse condition."² In fact, "under this free trade the whole severity of the economic laws will fall upon the workers"³ and "all the destructive phenomena which unlimited competition gives rise to within one country are reproduced in more gigantic proportions in the world market."⁴ In short, according to Marx "the free trade system hastens the social revolution. It is in this revolutionary sense alone, gentlemen, that I vote in favour of free trade."⁵

Similarly, other socialists have spoken of social costs implicit in the competitive structure of society. Thus, Robert Owen, in a critical appraisal of the effects of the new methods of production, writes in 1821: "The steam engine and spinning machines, with the endless mechanical inventions to which they have given rise, have, however, inflicted evils on society, which now greatly overbalance the benefits which are derived from them."⁶ Similarly, Charles Kingsley, an early Christian Socialist with a conservative outlook, has a notion of social costs of free enterprise when he complains about "the slavery, starvation, waste of life, year-long imprisonment in dungeons narrower and fouler than those of the Inquisition, which goes on among thousands of free English clothes-makers at this day."⁷

Friedrich Engels conducted an early investigation of the Industrial Revolution in England and its effects on the worker.

¹ K. Marx, Address on the Question of Free Trade, reprinted in *The Poverty of Philosophy* (New York, International Publishers), n.d. p. 199.

² *Ibid.*, p. 204.

³ *Ibid.*, p. 206.

⁴ *Ibid.*, p. 207.

⁵ *Ibid.*, p. 208.

⁶ R. Owen, *Report to the County of Lanark* (Glasgow, 1821) reprinted in *Introduction to Contemporary Civilization in the West* (New York, Columbia University Press, 1946), Vol. II, pp. 407-8.

⁷ C. Kingsley, *Cheap Clothes and Nasty*, reprinted in *Alton Locke* (London, Macmillan, 1911), p. XLVII.

He called attention to another type of social costs, the full magnitude of which was brought to light only in the twentieth century: namely, the damage caused by air pollution. In London, Engels points out, "two hundred fifty thousand fires crowded upon an area three to four miles square, consume an enormous amount of oxygen which is replaced with difficulty because the method of building cities in itself impedes ventilation. The carbonic acid gas, engendered by respiration and fire, remains in the streets by reason of its specific gravity and the chief air current passes over the roofs of the city. The lungs of the inhabitants fail to receive the due supply of oxygen and the consequence is mental and physical lassitude and low vitality."¹

Charles Fourier discussed certain social costs of agricultural production without, however, analyzing them systematically. Comparing the effects of modern forestry with conditions prevailing in more primitive times, Fourier is led to the conclusion that "we fall far below the savages. . . . For we do not like them confine ourselves to leaving them (the forests) uncultivated and in their primitive state; we bring the axe and destruction, and the result is landslides, the denuding of mountainsides, and the deterioration of the climate. This evil, by destroying the springs and multiplying storms, is in two ways the cause of disorder in the water system. Our rivers, constantly alternating from one extreme to the other, from sudden swellings to protracted droughts, are able to support only a very small quantity of fish, which people take care to destroy at their birth, reducing their number to a tenth of that which they ought to produce. Thus, we are complete savages in the management of water and forests."²

An early systematic treatment of social costs in agriculture is contained in Justus von Liebig's treatise entitled "*Die Chemie in ihrer Anwendung auf Agricultur und Physiologie*," which influenced to some extent Marx's analysis of capitalist agriculture. In an introductory section Liebig discusses the history and effects of soil depletion from the earliest days of recorded history and

¹ F. Engels, *The Condition of the Working Class in England in 1844* (New York, 1887), p. 64.

² *Selections from the Works of Fourier* (London, 1901), p. 109.

ends his historical survey with the following warning: 'If we do not succeed in making the farmer better aware of the conditions under which he produces and in giving him the means necessary for the increase of his output, wars, emigration, famines and epidemics will of necessity create the conditions of a new equilibrium which will undermine the welfare of everyone and finally lead to the ruin of agriculture.'¹ It remained for Karl Marx to formulate, obviously on the basis of Liebig's inductive researches, the statement that "... all progress in capitalistic agriculture is a progress in the art, not only of robbing the laborer, but of robbing the soil; all progress in increasing the fertility of the soil for a given time is a progress toward ruining the lasting sources of that fertility. The more a country starts its development on the foundation of modern industry, like the United States, for example, the more rapid is this process of destruction. Capitalist production, therefore, develops technology, and the combining together of various processes into a social whole, only by sapping the original sources of all wealth—the soil and the laborer."²

These earlier treatments of social costs by socialist writers lead directly to the analysis of social losses by later social reformers and particularly to the Fabian Socialists in Great Britain. The works of J. A. Hobson and the Webbs were devoted in large measure to the tracing of social costs in the industrial sphere. Because these contributions are well known and will be referred to later and have, moreover, influenced contemporary thought and practice far beyond the narrower circle of Fabian Socialists it will be sufficient to list merely some of the more representative works.³

¹ Translated from the 7th edition of Justus von Liebig, *Die Chemie in ihrer Anwendung auf Agricultur und Physiologie* Erster Teil, Der Chemische Prozess der Ernährung der Vegetalien (Braunschweig, 1862), p. 155.

² Karl Marx, *Capital* (Chicago, Charles H. Kerr, 1906), vol. I, pp. 555-6. For a further elaboration of Marx's views on the exploitation of natural resources ("Naturelemente") and the fact that the latter enter into the productive process without entering into private cost calculations, see *Ibid.*, Vol. III, pp. 938, 944-46.

³ For J. A. Hobson, see *Work and Wealth—A Human Valuation* (New York, The Macmillan Company, 1916). For the Fabian Socialists, see Sidney and Beatrice Webb, *The Decay of Capitalist Civilization* (London, The Fabian Society and George Allen and Unwin, Ltd., 1923), ch. V; and H. D. Dickinson, "The Failure of Economic Individualism," in *Studies in Capital and Investment* (London, Victor Gollancz, Ltd., 1935).

Among contemporary socialist writers, Oskar Lange has paid attention to social costs. Indeed he makes the possibility of taking into account all the costs of production one of the distinguishing features of a socialist economy. "The . . . feature which distinguishes a socialist economy from one based on private enterprise is the *comprehensiveness* of the items entering into the price system. . . . Into the cost account of the private entrepreneur only those items enter for which he has to pay a price while such items as the maintenance of the unemployed created when he discharges workers, the provision for the victims of occupational diseases and industrial accidents, etc., do not enter, or, as Professor J. M. Clark has shown, are diverted into social overhead costs."¹

Welfare Economics

The concept of social costs has played a major role in the development of what has come to be called the economics of welfare. Wicksel and Wicksteed had shown that the economic machine operated for private gain could by no stretch of the imagination be said to bring about a social optimum. Even earlier Cournot had set forth a number of "economic antinomies" and had stressed the fact that social interests did not coincide with the outcome of the interplay of particular interests, and that governmental action was called for to bring the two together. As cases in point Cournot mentioned not only the monopolist but the owner of a forest whose private interest precluded the adoption of lumbering practices which would be most advantageous to society.² In a similar vein Otto Effertz³ and André Landry have traced the conflicts between social optimum and private optimum. Effertz referred to economic antagonisms or conflicts between the present and the future and viewed all social organization and legislation as a reaction against social losses. For Effertz there was no doubt that actual output fell far short of potential output and that the latter was

¹ Oskar Lange (and F. M. Taylor), *On the Economic Theory of Socialism* (Minneapolis, The University of Minnesota Press, 1938), pp. 103-4.

² A. A. Cournot, see A. Landry, *L'utilité Sociale de la Propriété Individuelle* (Paris, 1901), p. 36ff.

³ O. Effertz, *Les Antagonismes Economiques*, (Paris: 1906).

far greater than was actually imagined. Similarly Landry, following Rodbertus and Cournot, focussed attention on the conflict between the private and the general interest. What was needed, according to Landry, was a study of social utility and a distinction between profitability and productivity (*rentabilité* and *productivité*) in order to show that private enterprise often disregarded social costs and overestimated its contribution to the social products.¹

On the basis of these earlier French attempts, A. C. Pigou undertook to integrate the phenomenon of social costs into the conceptual system of neoclassical equilibrium economics.² Pigou has since broadened his approach and now speaks of general disharmonies and wastes arising in production and distribution, and those connected with industrial fluctuations. He deals with such matters as losses sustained by outsiders as a result of private production, the inability of private entrepreneurs to estimate future demand, the misallocation of resources by monopolies, the social costs of technical improvements, the costs of advertising, the tendency to discount future needs in favour of present wants, the social losses entailed by extreme inequalities of income especially those resulting from unequal wage bargains between employers and unorganized labor and the neglect of social returns. In all these instances, Pigou speculates that we may be confronted with evidences of "the bankruptcy of capitalism" and "... a *prima facie* case for extending the range of public ownership and public operation to industries in which they have not yet been invoked."³ At the same time, Pigou rejects the socialist thesis that public ownership and central planning offer the only safe guarantee for the elimination of social costs and the optimum allocation of scarce resources. He feels that the main reason which argues against the socialist thesis is the difficulty of obtaining the necessary data required for the calculation and measurement of

¹ A. Landry, *Manuel D'Economie*, (Paris, 1908). See especially Appendix I.

² A. C. Pigou, *The Economics of Welfare*, (London, Macmillan and Co., ed. 4, 1932).

³ A. C. Pigou, *Socialism versus Capitalism* (London, Macmillan and Co., 1947), pp. 43 and 45. See also *Economics in Practice* (London: Macmillan and Co., 1935), Lecture 5.

relative costs and benefits of alternative methods of adjustment.

Pigou's systematic approach to the problem of social costs will be understood best in the light of a summary of his central thesis concerning the divergence of social and private costs. His analysis is based upon a comparison of the "marginal social product" with the "marginal private net product." The marginal social product includes the "total net product of physical things or objective services due to the marginal increment of resources in any given use or place, no matter to whom any part of this product may accrue."¹ Since the investment of additional resources may throw costs "upon people not directly concerned through, say, uncompensated damage done to surrounding woods by sparks from railway engines,"² the marginal net social product of a given unit of investment may diverge and, indeed, be considerably smaller than the marginal private net product. The latter is defined as "that part of the total net product of physical things or objective services due to the marginal increment of resources in any given use or place which accrues in the first instance—i.e., prior to sale—to the person responsible for investing resources there."³

The distinction between private net product and social net product enables Pigou to trace a number of cases in which the private product is greater than the social product, that is to say where private productive activities tend to give rise to social losses of various kinds. He lists as examples of such a divergence the overrunning of a neighbor's land by rabbits originating from game preserves; the destruction of the amenities of neighboring sites by the construction of a factory in residential districts; the wearing out of the surface of roads by motor cars, increased expenditures for police and prisons made necessary by the production and sale of intoxicants; the costs of diplomatic manœuvres, military preparedness and actual war caused by foreign investments; the negative effects of woman labor in factories; the costs of competitive advertis-

¹ A. C. Pigou, *The Economics of Welfare*, *op. cit.*, p. 134.

² *Ibid.*, p. 134.

³ *Ibid.*, pp. 134-35.

ing; the costs of bargaining including deception as to the physical nature of commodities offered for sale and the future yield of securities, and various negative effects of monopolistic practices. Pigou speaks even of the money value of the marginal social net product in the sense of what the social product, and hence the social losses, are worth in the market, although he makes it clear later that many of the social losses caused by private productive activities cannot "be readily brought into relation with the measuring rod of money."¹

This attempt to discuss the phenomena of social costs within the terminological and conceptual system of traditional equilibrium economics is characteristic of Pigou's approach to social costs. Fundamentally, it reflects a belief that the "disservices" caused by private productive activities are exceptions and can be remedied within the framework of private enterprise. And it is consistent with this premise that the greater part of Pigou's work is devoted to a discussion of governmental measures (taxes, prohibitions, social legislation) designed to bring about the closest possible identity between the (marginal) social and private product of individual economic activities in order to maximize the "national dividend" and through it total welfare.

More recent formulations of the theory of welfare economics have considerably restricted its scope, with the result that the phenomena of social costs and social benefits no longer play the role which they did in Pigou's thought. This is due primarily to the fact that the "new" welfare economics conceives of the welfare of the community in terms of the sum total of the utilities of individuals, and tries not only to dispense with all quantitative comparisons of utilities but also with any social evaluation of the utilities of individuals. Thus, the new standard definition of welfare has been formulated as follows: "Instead of attempting to give 'content' to the idea of welfare directly, we define a welfare indicator which increases and decreases with welfare—welfare is that which varies with this indicator. The indicator is defined as follows: *welfare increases (decreases) whenever one or more individuals become more (less) satisfied*

¹ *Ibid.*, p. 183.

without any other individuals becoming less (more) satisfied."¹ If one individual or group of individuals is injured by a particular measure, its effect on the welfare of the community ("total welfare") is said to be ascertainable by the "compensation principle," under which injured groups are compensated by "bounties" paid out of taxes levied upon persons benefited by the change. Hence "*welfare will be increased, decreased or left unchanged by a given economic reorganization depending upon whether the algebraic sum of all compensating taxes and bounties is positive, negative or zero.*"²

It is impossible within the context of this study to attempt an exhaustive appraisal of these new departures in neoclassical welfare economics.³ Suffice it to question briefly the capacity of the so-called compensation principle to encompass the phenomena of social costs (and social returns). Above all, there seems to be no indication that the envisaged system of bounties and taxes can be made to yield theoretically defensible estimates of social costs and social gains. For example, how can it be ascertained whether individuals find themselves equally (or more or less) satisfied after they have paid the tax and are freed, for instance, from the effects of air and water pollution, as compared with the state of affairs before they paid the tax and suffered from the consequences of polluted air and water? In fact if the compensation principle lacks practical applicability, the whole concept of "welfare" as the sum total of the utilities of individuals once more becomes ambiguous and we are compelled to conceive of the welfare of the community in terms of interpersonal comparisons of utility and to include social evaluation of social costs and social benefits within the realm of scientific discussion. Indeed, the fact that the new welfare economics defines the welfare concept as the sum total of the utilities of individuals, and that difficulties in the way of accurate and quantitative interpersonal comparisons of utilities are believed to make the latter so completely incommen-

¹ M. W. Reder, *Studies in the Theory of Welfare Economics* (New York, Columbia University Press, 1947), pp. 14-15.

² *Ibid.*, p. 17.

³ For a critical evaluation, see G. J. Stigler, "The New Welfare Economics," *American Economic Review*, Vol. 33 (June 1943), pp. 355-59.

surable that no social action can be based upon such comparisons, seems to indicate that the new welfare economics despairs of any possibility of including social costs (and social returns) within the realm of economic analysis. It is not surprising, therefore, that it has been described recently as a dreary desert, "a system of ideas based on a mechanistic psychology of a completely individualistic pursuit of pleasure and avoidance of pain, which no one believes to be a correct account of human nature, dished up in algebraical formulae which do not even pretend to be applicable to actual data. As he, the student, goes deeper into the matter, he reads some brilliant and subtle authors who debunk the whole subject and show conclusively its methodology was inadmissible."¹

Veblen on Social Costs

Veblen developed his analysis of the price system under conditions of absentee ownership outside and indeed in opposition to the dominant doctrine of equilibrium analysis. He aimed at a theoretical framework of "evolutionary" economics which combined a concrete theory of economic dynamics and cyclical movements under the institutional framework of absentee ownership with the study of long-run economic and socio-cultural development. In this analysis, Veblen and his followers were able to take account of social causes and repercussions which traditional economic analysis considered to be outside the realm of economics. Indeed, Veblen took it for granted that economic processes could be understood only in terms of a principle of cumulative causation in social affairs, which, in opposition to the concept of equilibrium, emphasizes the self-sustaining and reinforcing character of "institutional inertia." He may thus be credited with having laid the foundation for an alternative conceptual framework and principle of explanation which has its fruitfulness wherever it has been systematically applied in social analysis.

Veblen's *Theory of Business Enterprise*, and particularly his later writings on absentee ownership and the price system,

¹ Joan Robinson, "Teaching Economics," *The Economic Weekly* (Bombay), January, 1960, p. 173.

provide a still highly neglected framework of analysis in which the concept, although not the term, of social costs figures predominantly. What Veblen has to say on "sabotage" and the delay and obstruction of industry and output ("the conscientious withdrawal of efficiency") or the retardation, restriction or withdrawal of plant and workmen; on waste and duplication in industry, transportation and distribution; the "fabrication of customers" and the production of saleable appearances; the rising sales costs (per unit and as a percentage of total shop or production costs); the cumulative growth of salesmanship (and publicity) and their play on human credulity and the sensibilities of fear and shame; or on pecuniary waste and personal futility and the retardation and repression of civilization by the price system and its commercial standards of 'truth—these will always remain important suggestions concerning those phenomena which we define as "social costs."¹

Indeed, it was Veblen who, in 1917, called for an investigation of the social costs of business enterprise in these terms:

"It will be necessary to investigate and to set out in a convincing way what are the various kinds and lines of waste that are necessarily involved in the present business-like control of industry; what are the abiding causes of these wasteful and obstructive practices; and what economies of management and production will become practicable on the elimination of the present business like control. This will call for diligent teamwork on the part of a suitable group of economists and engineers, who will have to be drawn together by self-selection on the basis of a common interest in productive efficiency, economical use of resources and an equitable distribution of the consumable output."²

¹ Th. Veblen, *The Vested Interest and the Common Man*, (1919). Among the other writings of Veblen which deal with social costs, see *The Engineers and the Price System* (1921), *Absentee Ownership and Business Enterprise in Recent Times* (1923) as well as *An Inquiry into the Nature of Peace and the Terms of its Perpetuation* (1917).

² Th. Veblen, "The Technicians and the Revolution", in *The Portable Veblen* (New York, The Viking Press, 1948), p. 543.

Instead of such cooperation and teamwork, the engineers and the economists have continued to go their own way.

In the course of the elaboration of a theory of economic dynamics outside the realm of marginal utility economics, Veblen, and notably some of his followers, such as J. M. Clark and W. C. Mitchell, have analyzed a wide variety of social costs which arise primarily in connection with technical progress, depressions and monopolistic practices. A detailed survey of these contributions to the theory of social costs is neither practical at this point nor necessary, in view of the fact they will be discussed in the individual chapters concerned with the social costs of technical progress, unemployment and monopoly.

Recent Developments

The realization of a general discrepancy between competitive equilibrium and social optimum went a step further with the emergence of the theory of imperfect and monopolistic (oligopolistic) competition. This theory, which incorporated the substance of Veblen's analysis of salesmanship and his notion of "the production of saleable appearances", had demonstrated the ubiquity of monopolistic elements in virtually all modern market situations in which firms sell non-homogeneous commodities and succeed in making the demand for their product less (than infinitely) elastic. While the theory has continued in the traditional search for (or, shall we say, the definition of) formal positions of equilibrium there can be no doubt that, despite its essentially static character, it has contributed to a more realistic appraisal of the alleged benefits of competition. For, if "an essential part of free enterprise is the attempt of every businessman to build up his own monopoly"¹ and if "the typical outcome of private enterprise is not pure competition but monopolistic competition"² which eventually tends to degenerate into economic warfare and cut-throat competition, "pure competition may no longer be regarded as in any sense an 'ideal' for purposes of welfare economics."³

¹ E. H. Chamberlin, *The Theory of Monopolistic Competition* (Cambridge: Harvard University Press, 1946), p. 213.

² *Ibid.*, p. 213.

³ *Ibid.*, p. 214.

More recently, social costs have attracted attention in connection with the emergence of a general theory of economic policy and normative economics. Thus, in a general analysis of Minimum Wage Legislation, F. H. Blum distinguishes between social costs which have already been "internalized" into cost accounting because society has assumed responsibility for these costs (social overhead costs) and such elements of social costs which society permits to be shifted to third persons.¹ This distinction which relates the system of cost-accounting operating in a given social system to the distribution of power stresses by implication the income redistribution effect of social costs and of the various economic policies designed to "internalize" these costs into entrepreneurial outlays.

The practical implications of social costs can be restated in general terms. Social costs are a common phenomenon within the system of business enterprise. Their neglect seriously interferes with maximum efficiency in the use of resources. For this reason society must be prepared to translate social costs into private costs by political action. As a matter of fact the history of economic and social legislation as well as economic history could well be written as the history of the success or failure to make sure that private interests are not pursued at the cost of collective interests.² We may go one step further and say that economic history and economic legislation have been shaped by precisely those aspects of the economic process which equilibrium economics either denied or ignored.³

No attempt will be made to survey the work of a number of writers who have analyzed the cultural and human consequences of business enterprise. These investigations which independently have carried forward Veblen's concern with "personal futility" and "the retardation of civilization" point to a wealth

¹ F. H. Blum, "The Social and Economic Implications of the Fair Labor Standards Act: An Interpretation in Terms of Social Costs." *Proceedings*, 9th Meeting of the Industrial Relations Research Association (Cleveland, 1956), p. 167-83.

² K. Paul Hensel, *Ueber Wirtschaftliche und Wirtschaftspolitische Willensbildung* (Berlin; Verlag Duncker und Humblot, 1959), p. 21.

³ As an illustration of what can be done in rewriting history if the phenomena of social costs are kept in view see Karl Polyani, *The Great Transformation* (New York, Rinehart and Company, 1944).

of evidence of a less tangible kind of social costs which economic analysis will have to consider sooner or later.¹

¹ See, for instance, E. Fromm's, *Escape from Freedom*, (1941), *Man for Himself* (1947), and *The Sane Society* (1958); K. Horney, *Neurosis and Human Growth*, (1950); H. S. Sullivan, *The Interpersonal Theory of Psychiatry* (1953).

CHAPTER FOUR

THE SOCIAL COSTS OF AIR POLLUTION

AIR pollution is rapidly becoming one of the major sources of social losses in the industrial world. For this reason we have chosen to examine first the social costs of air pollution. Contrary to the model of equilibrium analysis which views economic processes as subject to essentially self-balancing forces, the factors which have given rise to air pollution in modern industrial centers tend to interact in a cumulative manner. That is to say the process, if not promptly and deliberately interfered with, will move on in the same direction and damages may reach serious proportions. This is evidently what happened in a number of areas where the effects of air pollution led to dramatic episodes with catastrophic effects on human health and property values as well as on plant and animal life.

That air pollution is not equally damaging and uniform in its effects in all industrial centers and major metropolitan communities does not refute the general thesis of its cumulative character. For air pollution, while caused by human activities¹ is aggravated by specific environmental factors of which climate and topography are the most important ones. Air pollution research carried out during the last two decades leaves no longer any doubt that the concentration of pollutants in the air depends upon the interaction of (a) the quantity and kind of pollutants emitted; (b) the rate of dispersion of the pollutants, and (c) the chemical and physical reactions which alter the pollutants in the air.¹ While it is not possible to say that this interplay of factors is as yet fully explored and that all pollutants and their effects have been completely identified sufficient

¹*National Goals in Air Pollution Research*, Report of the Surgeon General's Ad Hoc Task Group on Air Pollution Research Goals, (U. S. Department of Health, Education and Welfare, Washington D.C., 1960), p. 1.

knowledge is available to draw important conclusions with regard to the social costs caused by air pollution.

The quantity and kind of pollutants emitted into the atmosphere is clearly related to the unrestrained concentration of industries in a few centers, the growth and coalescence of metropolitan areas and the steady increase of population. Human activities in these centers of industrial production and habitation give rise to the discharge into the atmosphere of a great variety of substances which are either pollutants themselves or which become pollutants after chemical reactions have taken place in the atmosphere. The manner in which industrial production leads to air pollution need not occupy us to any great extent. Suffice it to point out that the pollutants are either solids, liquids or gases. The formation of these pollutants is almost invariably a sign of improper and incomplete combustion of fuels; in other words, their existence in the atmosphere is indicative of technical inefficiencies in the use of coal or oil.

Thus, the combustion of raw bituminous coals remains incomplete if the construction and operation of the furnace or the method of firing and the supply of draft, interfere with the development of proper heat. Under these conditions, the volatile content—i.e. the gaseous portion of bituminous coals—the distillation of which takes place already at temperatures below the ignition point—burns with an improper mixture of air, or may strike cooling surfaces that will reduce its temperature below the ignition point. In both cases, the unconsumed parts of the coal will be entrained by the upward rush of hot air and form, in association with carbon and tarry matter condensed by premature chilling of flame together with dust and ash, the visible smoke. According to the kind of fuel and the manner in which it is burned, this coal smoke will consist of greater or smaller amounts of gases, such as carbon dioxide, carbon monoxide, oxygen, nitrogen, ammonia, sulphur dioxide and other sulphur compounds, unburned or partly burned fuel in the form of coke, mineral matter or ash, tar, and very fine particles of free carbon. Though not all these smoke elements are necessarily air pollutants, they may, nevertheless, become harmful under certain conditions. It is

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also noteworthy in this connection that the better grade solid fuels, such as anthracite and coke, contain no or less volatile matter and can be burned almost completely and without smoke emission. The combustion of liquid fuel, such as oil, is generally better controlled because it takes place in specially designed burners "which atomizes the oil, and feeds it in a uniform stream and which also provides for the introduction and mixing of air in, or close to, the burner where the mixture is ignited." Nevertheless, under certain conditions the combustion of oil too, may remain incomplete, with the result that smoke production takes place. "Such smoke is a tarry, greasy pollutant which coats whatever it touches, and which can also carry along with it any sulphuric or sulphurous acid with which it comes in contact whether these resulted from the sulphur which was in the oil or came from outside sources."¹

Temperature, precipitation, air movement, wind direction, cloudiness, relationship between upper and lower strata of air and their relative temperature and moisture contents, as well as topographical obstacles to the movement of air—these are factors which influence the intensity of air pollution. Depending upon their presence and their possible combination at any particular time the discharge of a given quantity and kind of pollutants may have entirely different effects. Meteorological conditions may be such as to prevent vertical or horizontal movements of air masses for hours and even for days. The normal dispersion of pollutants and the natural dilution of air will thereby be arrested and a saturation of the air with pollutants may ensue. In some areas, particularly in river and mountain valleys and in temperate zones a so-called thermal inversion may arise. That is to say the "temperature of the upper air may become warmer than the temperature on the surface of the ground. . . . Depending on the temperature differential, the height of the warm air and the density of the warm layer, it acts as a lid preventing airborne waste from being dissipated in the usual manner. Waste then begins to

¹ H. B. Meller and L. B. Sisson, *The Municipal Smoke Problem* (Pittsburgh, 1935), pp. 8-16. esp. p. 14.

accumulate. The smog banks one sees over nearly any great city, flying into it at dawn or dusk, are concentrations of air-borne waste plus droplets of water held down in the city by a thermal inversion."¹ In other words, air pollution is always a manifestation of the fact that man-made contaminants have accumulated at a rate faster than the rate of their dispersion by natural forces. Indeed,

air pollution may be "defined as the presence in the ambient atmosphere of substances put there by the activities of man in concentrations sufficient to interfere directly or indirectly with his health, safety, or comfort, or with the full use and enjoyment of his property. . . . Whenever man's activities discharge to the air noxious or troublesome substances at rates faster than those forces operating to disperse or destroy them, a build-up in pollution concentration occurs and persists until natural forces can again cope with the situation."²

Thus wind, speed, wind direction, turbulence, temperature, frequency of thermal inversions, topographical barriers to horizontal air movements, rainfall and moisture content are all factors which will determine the severity and frequency of air pollution associated with any given amount and kind of pollutants that are emitted into the air as a result of human activities.

The third factor in the cumulative process¹ which gives rise to air pollution is the chemical interaction of primary pollutants in the atmosphere and the influence of sunlight. This is a relatively new and unexplored field of research and so far little seems to be known either about the photochemical reactions or the ultimate fate of primary pollutants. What has been

¹ W. F. Ashe, "Exposure to High Concentrations of Air Pollution (1) Health Effects of Acute Episodes", National Conference on Air Pollution, *Proceedings*, (U.S. Department of Health, Education and Welfare, Public Health Service, Washington D.C., 1958), pp. 189-90. Quoted hereafter as *Proceedings*.

² National Goals in Air Pollution Research, *op. cit.*, p. 7.

established is the fact that while in isolation, some primary pollutants may have no noxious effects on human health, prolonged interaction of such pollutants in the atmosphere may produce, especially at times of thermal inversion and under the influence of sunlight, "both stable and transient products which have corrosive, toxic or irritating properties. . . . For example, the formation of ozone and other oxidants characteristic of Los Angeles atmosphere is known to result from a series of free radical reactions among relatively innocuous gases at concentration of a very, very low order."¹

In the light of the foregoing analysis the complexity of the problem of pollution of the air becomes evident. Indeed, the same pollutants may have entirely different effects depending upon environmental factors. In some instances large quantities of pollutants may be easily dispersed depending upon the weather while again they may rise to lethal concentrations in others. Each situation may be said to be specific and as such requires special study both as far as causal analysis and preventive measures are concerned. As industrial production continues to concentrate, as new products and new industrial processes give rise to new pollutants, as urban communities coalesce in areas with a given rate of aerial dispersion, our cities face an increasing potential of air pollution unless an effective system of control and abatement succeeds in keeping the emanations of pollutants within safe limits.

Air Pollution and Human Health

Air pollution may affect human health in several ways. The pollutants of the air may irritate the mucous membranes of the eyes and the entire respiratory tract, they may create acute and chronic disorders of the respiratory organs (such as chronic bronchitis) and the gastro-intestinal tract; they may set the stage for allergic reactions; they are strongly suspected of being the source of certain types of cancer (especially lung cancer) they give rise to or aggravate cardiac impairments; they may contribute to increased fatigue, disability and

¹ *Ibid.*, p. 28.

debility. A Russian investigation indicates that they may have deleterious effects even on the central nervous system. They may lead to chronic diseases and symptoms as yet not fully understood and they have, in specific cases, caused sudden illness and death. Having listed these health hazards it is important to point out that serious research into causal relationships between air pollution and human illness and death has just begun and our knowledge is still fragmentary. Indeed despite definite links between various diseases and certain pollutants the exact causal relationship is not always clearly understood. But no one who has given serious thought to the phenomenon of cumulative causation will expect a simple cause and effect relationship between pollutants and human diseases. For pollutants are not the only factors which affect human health. Furthermore, they are not always combined with one another and with other factors in the same quantitative relationships. Hence, their cumulative interaction and their effects are likely to differ widely. Furthermore, the effect of any particular kind and quantity of irritants or toxic substances must obviously differ depending upon the time of exposure and prevalence of prior impairment. In other words, in all instances of cumulative causation in which research has to focus on joint interaction of more than one factor, it is necessary to take into account not only a time or exposure factor but also the general state of health of the exposed population. Under these circumstances it is to be expected that statistical studies cannot yield simple and unambiguous correlations. We are dealing with processes and chains of causation that are not necessarily linear and hence infinitely more difficult to study and to ascertain than the relatively simple relationships with which either Newtonian physics or traditional biology had

¹ E. Z. Andreeva- Galanina, *et. al.* The State of the Central Nervous System in Persons Exposed to the Prolonged Influence of Carbon Disulfide. (Lenin-grad, 1958). Summary in English, see Air Pollution Control Association, *Abstracts*, Vol. 5, No. 2, July 1959, (No. 2522). For an exhaustive survey of the Russian literature on air pollution including studies of limits of allowable concentration of atmospheric pollutants, see B. S. Levine, *U.S.S.R. Literature on Air Pollution and Related Occupational Diseases*, Vols. 1-V, U. S. Department of Commerce, Office of Technical Services, Washington D.C. 25, 1961, and the related series entitled "Limits of Allowable Concentration of Atmospheric Pollutants, Books 1-4.

to deal. Thus, "the quantitative relationship between dose and effect from exposure to low or threshold levels to high and damaging exposure, is practically never a simple linear one."¹ Air pollution like radiation has a cumulative effect in the sense that what counts is the total dose or exposure from all sources operating jointly (e.g. air pollution and cigarette smoke). In other words, neither statistical nor causal studies concentrating on one or another source can take into account the several factors acting in combination and hence cannot be expected to throw light on the non-linear, cumulative inter-relationship and interaction.²

We seem to be only at the beginning of establishing these non-linear interdependencies. Progress in our understanding of the relationship between air pollution and disease promises to provide important links in the identification of many chronic diseases as environmental diseases. It has already been suggested that

"The old idea that chronic diseases are "degenerative", or inevitable concomitants of aging, is giving way to the modern idea that the origins of chronic disease lie in specific external causes which can be discovered and thus controlled.

The other thing we are learning is that many environmental conditions which man repeatedly experiences, only gradually reveal themselves as dangerous to health. Chronic diseases are so insidious in their onset, and causative mechanisms so subtle that decades may elapse before cause and effect are put together."³

¹ N. Nelson, "How Air Pollution has its Effects on Health, (1) The Irritant Action of Air Pollutants." *Proceedings, Op. cit.*, p. 214.

² This is not to say that there might not be promising techniques to assess the possible role which different factors may play in the final outcome. Thus "one can speculate that if the cancer rate in rural populations represents a basic minimal rate for the human being, the doubled rate noted in urbanized areas represents, in large part, the contribution of air pollution..." However, other factors may well operate to produce lung cancer; cigarettes and air pollution may interact to enhance each others' effects and the effects of irritation, aerosol deposition, and the host's susceptibility must be taken into account. R. A. Prindle, *The Disaster Potential of Air Pollution*, (Chief, Air Pollution Medical Program, U. S. Public Health Service, Washington, D. C.; mimeographed, 1960), pp. 7-8.

³ L. Breslow, "Exposure to Low Concentrations of Air Pollutions, (1) Health Effects from Repeated Exposure." *Proceedings, op. cit.*, pp. 197-98.

There is abundant evidence which correlates air pollution and bronchitis both in its acute and its chronic variety. Bronchitis seems to be significantly correlated with certain types of air pollution in urban areas especially in Great Britain. Surveys show considerable differences in bronchitis mortality between country and town dwellers. High correlations have also been observed with respect to asthma, emphysems (a reduction of lung function due to chronic obstruction in the oxygen exchange between blood and air) and lung cancer. As we shall show later not only has the death rate attributed to these diseases increased in recent years but in the United States their morbidity and mortality rates in cities are substantially higher than in rural areas. Needless to add that air pollution is an aggravating factor not only for respiratory diseases but also for combined diseases of heart and lungs. Periods of increased air pollution in specific areas are associated with a worsening of symptoms, higher morbidity and excess death rates as compared with periods of light and "normal" air pollution.

Experimental investigations have identified some of the specific substances which may be responsible for the higher incidence of certain diseases in areas of concentration of air pollution.

Among these substances are "such materials as sulfur dioxide, sulfuric acid, and acid sulfates, the oxidant, ozone, such materials as the nitro-olefins, recently identified and shown to be strong eye and pulmonary irritants, and a number of unidentified organic free radicals, aldehydes, and higher oxidation products of hydrocarbons."¹

It is not our purpose to discuss the physical and chemical properties of these substances and the biological response of the human body after a prolonged period of exposure.² Suffice it to add merely that recent chemical analyses have established the presence of a cancer producing substance (benzpyrene)

¹ N. Nelson, *Proceedings, op. cit.*, p. 211.

² See *Ibid.*, pp. 210-14 and J. R. Goldsmith, "How Air Pollution has its Effects on Health, (2) Air Pollution and Lung Function Changes, *Proceedings, op. cit.*, pp. 214-27.

among the pollutants in contaminated air in cities. Benzpyrene which causes cancer in animals and is strongly suspected of producing cancer in man, has been found in the atmosphere of 103 American cities where systematic air sampling is taking place. Concentrations vary widely from season to season with higher concentrations in winter than during summer months. While the substance is only one of the suspected cancer producers in polluted air and in cigarette smoke, it is significant that the average city dwellers' exposure to benzpyrene is said to be 100 times greater than that of a resident in rural areas. If benzpyrene accumulated in the body and if there is no tolerable dose for cancer generating substances, "the question arises as to whether many cancers are not derived from constant exposure to an unsafe atmospheric level of carcinogens."¹ Air pollution in urban areas may thus constitute a major contributing factor to the increase of mortality rates from lung cancer. In this context, it is significant that "metropolitan areas with the highest indirect air pollution measures . . . show consistently higher mortality ratios for cancer of the esophagus and stomach—higher in each case by a margin of at least 15 percent—than do the standard metropolitan areas with the lowest measures."² Even higher percentages were computed for cancer of the trachea, bronchus and lung.³ A margin of at least 10 percent between mortality ratios in metropolitan areas with high and

¹ E. Sawicki in an address before the American Industrial Hygiene Association, Rochester, N.Y., quoted in *Excerpts from Congressional Record*, Senate, May 3, 1960, p. 8550. See also E. Sawicki et al., *Benzo (A) Pyrene Content of the Air of American Communities*, U.S. Department of Health, Education and Welfare, Cincinnati 26, Ohio, 1960 (mimeographed). The higher concentration of benzpyrene in city atmospheres had first been reported by a Russian investigator who studied the air pollution in certain towns in the USSR over a period of 8 years and found the main sources of atmospheric air pollution by carcinogenic hydrocarbons to be smoke, vehicular exhaust gases and tar-road dust. He pointed out that 50 cigarettes would have to be smoked in order to expose the smoker to as much benzpyrene as are inhaled in some industrial cities. See L. M. Shabad, *Current Problems of the Aetiology and Pathogenesis of Lung Cancer*, (Kharkov, 1957); English summary in *Air Pollution Control Association, Abstract*, Vol. 4, No. 6, Nov. 1958 (No. 2017). See also V. S. Serebrenikov, "Incidence of Lung Cancer in Sverdlovsk and Sverdlovsk Oblast" (Kharkov, 1957); English Summary in *Abstract op. cit.*, Vol. 4, No. 7, Dec. 1958 (No. 2091).

² R. Schiffman and E. Landau, *Use of Indexes of Air Pollution Potential in Mortality Studies*, U. S. Public Health Service, Washington D.C., 1960 (?) mimeographed, p. 5.

³ *Ibid.*, p. 6.

low air pollution potential was established for chronic rheumatic heart disease, arteriosclerotic heart disease including coronary, and nonrheumatic chronic endocarditis.¹

These newer findings lend dramatic support to the older and qualitative conclusions of the Smoke Investigation of the University of Pittsburgh. Thus, as far back as 1913 it was found that the poisonous compounds and soot particles contained in smoke-polluted air may serve "as carriers of the obnoxious products of human fatigue which irritate the sensitive membranes of the eyes, nose, throat, lungs, and gastro-intestinal tract, increase the susceptibility of gastro-intestinal pulmonary and nasopharyngeal disorders, diminish the potential reserve, working capacity, and well-being of the individual, increase fatigue, irritability and malcontent and may tend to hasten premature decay."² It is difficult to escape the conclusion that, even where no acute disabilities are evident, the exposure to air pollution may give rise to insidious effects which, while difficult to measure, are reflected in chronic diseases and a general depletion of vitality and resistance to all illnesses. Let us single out for special comment one of the chronic diseases which is most clearly associated with and aggravated by air pollution. In England chronic bronchitis accounts for the loss of nearly 27 million working man-hours and is given as the cause of death in 30,000 certificates every year in a total population of some 45 million; it outranks all other respiratory diseases as acrippler and killer.³ In a survey in Newcastle it was found that 36 percent of all males and 17 percent of all women over the age of 30 were affected by chronic bronchitis; in other words, roughly every third man and every sixth woman in the city suffered from the disease.⁴

However, the problem of air pollution and its social and

¹ *Ibid.*, p. 4.

² Smoke Investigation, University of Pittsburgh, Department of Industrial Research Bulletin, No. 3, *Psychological Aspects of the Problem of Atmospheric Smoke Pollution* (Pittsburgh, 1913), p. 41.

³ A. Roberts, Air Pollution and Bronchitis, *American Review of Respirational Diseases*, Vol. 80, Oct. 1959, pp. 582-84.

⁴ A. G. Ogilvie, Chronic Bronchitis in Newcastle upon Tyne, Symposium on Atmospheric Pollution, Newcastle upon Tyne, *Royal Society Promotion Health Journal*, London, Vol. 79, Jan. Feb., 1959, pp. 80-87.

human implications is above all a qualitative problem; morbidity data and the loss of potential working-time provide only an incomplete measure of what air pollution means in terms of human health. What actually happens when air pollution envelops a town and reaches high levels of concentration for a prolonged period of time may be seen from the following account by a physician of the disaster in Donora, Pennsylvania, in 1948. Donora is an industrial community which lies in a U-shaped river bend; it is surrounded by high stone hills on four sides. There are a variety of industries such as blast furnaces, zinc mills, and slag processing mills in Donora. Usually the dense, fog-smoke mixture that lies over the city in the morning clears up by noon. During the last week of October 1948, the smog did not lift.

"The fog closed over Donora on the morning of Tuesday, October 26th. The weather was raw, cloudy, and dead calm, and it stayed that way as the fog piled up all that day and the next. By Thursday, it had stiffened adhesively into a motionless clot of smoke. That afternoon, it was just possible to see across the street, and, except for the stacks, the mills had vanished. The air began to have a sickening smell, almost a taste. It was the bitter sweet reek of sulfur dioxide. Everyone who was out that day remarked on it, but no one was much concerned. The smell of sulfur dioxide, a scratchy gas given off by burning coal and melting ore, is a normal concomitant of any durable fog in Donora. This time it merely seemed more penetrating than usual."

"I knew that whatever it was that we were up against was serious. I had seen some very pitiful cases and they weren't all asthmatics or chronics of any kind. Some were people who had never been bothered by fog before. I was worried, but wasn't bewildered. It was no mystery—it was obvious—all the symptoms pointed to it—that the fog and smoke were to blame. I didn't think any further than that. As a matter of fact, I didn't have time to think or wonder. . . . My biggest problem was just getting around. It was almost impossible to drive. I even had trouble finding the office.

McKean Avenue was solid coal smoke. I could taste the soot when I got out of the car, and my chest felt tight. On the way up the stairs, I started coughing and I couldn't stop. I kept coughing and choking until my stomach turned over. . . . After a while, I dragged myself into the office and gave myself an injection of adrenalin and lay back in a chair. Then I heard the phone ringing. . . I thought about answering it, but I didn't have the strength to move. I just lay there in my chair and let it ring.¹

When it rained on Sunday and the smog lifted 20 people had died and a total of 5,910 persons or 42.7 percent of the population were ill. Three more persons died shortly after. Autopsies of three persons who died during the smog showed acute changes in the lungs. Studies of incidence and severity of disease revealed a direct relationship with increasing age. More than 60 percent of persons over 65 years of age reported some affection from the smog and almost one half of these were in the severely affected group.²

Similar episodes are recorded in metropolitan London. Careful evaluations of extended periods of severe fog with temperature inversions have shown that the concentration of smoke and sulfur dioxide in the air of London tends to exceed normal concentrations by about three times and that large numbers of people suffer from respiratory symptoms. Retrospective analysis of death registration disclosed excess mortality during these periods up to 4,000 (Dec. 5-9, 1952), 1,000 (Jan. 4-6, 1956) and 760-1,000 (winter, 1957).³

Damages to Agriculture: Effects on Plant and Animal Life

According to studies conducted under the auspices of the International Institute of Agriculture in Rome the sulphur and

¹ B. Roueche, "The Fog," in *Eleven Blue Men* (New York, Beckley Publishing Corporation, 1953), p. 189.

² R. A. Prindle, *op. cit.*, pp. 1-2. See also *Air Pollution in Donora*, Pennsylvania, U. S. Public Health Service, Washington D.C., 1949 Bulletin No. 306.

³ R. A. Prindle, *op. cit.*, pp. 2-3. For an account of other episodes in the United States, Belgium, Japan and Mexico, see W. F. Ashe, *Proceedings, op. cit.*, pp. 190-95.

sulphur dioxide¹ in coal smoke affects the fertility of the soils and attacks the metabolic system of plants. By washing out of the soil such important elements as potash, calcium and magnesium, the pollution of the atmosphere tends to affect practically all vegetation in gardens and fields in and around industrial districts. Animals are affected by air pollution not so much as a result of inhalation but by ingestion of forage exposed to gaseous emanations. For "plants attacked by toxic emanations . . . themselves become toxic, and their consumption, continued for a certain time, may cause fatal chronic toxic conditions in animals."²

Evidence of the harmful effects of smoke on the fertility of the soil is found in the fact that the soil in districts exposed to air pollution tends to become poor in potash, calcium, and magnesium—"a fact particularly noticeable in the mining districts of Czechoslovakia."³ Careful observations in the mining and factory districts of Czechoslovakia showed that "the soil is gradually losing all its fertility and yearly produces smaller crops."⁴ Similar evidence of the harmful effects of smoke on soil fertility is found in the United States. In Pennsylvania, for instance, severe erosion is reported to have resulted from factory fumes which "caused such high acidity in the soil as to retard and later prevent the growth of vegetation".⁵

The injurious effects of even small amounts of sulphuric acid in the air can lead to the complete destruction of plant life if the acid content of the air increases. According to Dr. Stoklasa, "it can safely be said that the presence of 0.002

¹ These substances are encountered primarily "in the manufacture of sulphuric acid from pyrites, also in foundries, chemical works, ultramarine, soda sulphite cellulose and glass factories, tile works, lime kilns, coke ovens, slag heaps and in coal and all other mines." See H. Cristiani and J. Stoklasa, *The Loss to Agriculture Caused by Factory Fumes*, (International Institute of Agriculture, Rome, 1927), p. 10.

² *Ibid.*, p. 14.

³ *Ibid.*, p. 25.

⁴ *Ibid.*, p. 25. See also J. Stoklasa, *Die Beschädigungen der Vegetation durch Rauchgase und Fabrikexhalationen*. (Berlin, Urban und Schwarzenberg, 1923).

⁵ A. F. Gustafson, H. Ries, C. H. Guise, W. J. Hamilton, Jr., *Conservation in the United States*, (Ithaca, N.Y., Comstock Publishing Company, Inc., 1940), p. 85.

per cent sulphuric acid may cause chronic mischief to all useful cultivated plants in the widest sense of the word, such as wheat, rye, barley, oats, maize, buckwheat, peas, lentils, vetch, horse beans, beans, tares, rape for seed and for oil, poppies, mustard, hops, tobacco, flax, hemp, potatoes, sugar beets, lucerne, red clover, meadow grasses."¹ More delicate plants are seriously damaged by the presence of even a smaller amount of sulphuric acid in the atmosphere.

Interesting illustrations of the injurious effects of air pollution on animal life were brought to light by a series of observations and experiments made in the environment of a large factory producing aluminum, nitric acid and its own electrodes for the electrolysis of the ore containing aluminum. Emanations from this plant (smoke as well as gases) poisoned the grass which farmers in the vicinity of the factory used either for cattle feeding or as litter. Animals which eat these damaged forage plants (even in small quantities) all die. "It is not even necessary to feed these animals with the damaged forage; it suffices to use it as litter. In these cases, the animals consume small quantities when the litter is renewed and also ingest fragments of hay. . . ."²

More recent biochemical and physiological studies at Riverside in California have shown that smog tends to increase respiration of plants by two to three times and that photosynthesis is decreased.

"This means that on smoggy days plants may use up more food in growing than they make. Research has also shown that air contaminants alter the permeability of cell membranes to such an extent that foodstuffs become congested in cells and are not transported as normally because water movement is impaired."³

¹ H. Cristiani and J. Stocklasa, *op. cit.*, p. 20.

² *Ibid.*, p. 10.

³ J. T. Middleton, *Impact of Air Pollution upon California Agriculture*. Paper presented to the Board of Regents, University of California, February 20, 1959, reprinted in *Congressional Record*, Appendix, May 5, 1959, p. A3716-7.

Translated into concrete terms, with special reference to California, air pollution is said to reduce

"yields in alfalfa, forage grasses, sugar beet and tomato. Air pollution reduces the growth of oranges as much as one third, increases leaf drop in lemons to seven times normal, and reduces fruit quality in apricots and grape because of excessive leaf drop. The protein content of alfalfa hay produced in polluted air is lower than that produced in clean air. Many flower crops continue to produce in polluted air but are of poor quality, the flowers small and the leaves yellow. Cut flowers do not last as long when grown in dirty air as when grown in clean. Some fruits stored in polluted air ripen faster than they should thereby reducing storability and consumer demand."¹

Estimates of the rate of reduction of plant growth in areas affected by air pollution vary from 30 percent to 90 percent in Czechoslovakia,² 50 percent in Britain³ and 50 percent in laboratory tests on tomatoes exposed to synthetic and natural smog.⁴

Corrosion and Deterioration of Materials

Air pollution attacks a variety of materials and leads to their premature deterioration thus causing serious economic losses. Again the adverse effects of air pollution are not necessarily associated with any single pollutant but are often the result of chemical reactions of pollutants to atmospheric conditions. Thus the various sulphur compounds contained in smoke exert a corrosive action on stone and metals, corroding or disintegrating "practically all kinds of building materials (slate and granite possibly excepted); marble tends first to turn green and

¹ *Ibid.*, p. 3716.

² H. Cristiani and J. Stocklasa, *op. cit.*, p. 19.

³ Statement of Dr. C. R. Metcalfe, Meeting of the British Association for the Advancement of Science, published in *The New York Times*, 9 October 1953.

⁴ O. C. Taylor, "Air Pollution with Relation to Agronomic Crops: IV. Plant Growth Suppressed by Exposure to Airborne Oxidants." (*Smog*) *Agronomical Journal*, Vol. 50, No. 9, September 1958, pp. 556-58.

then black, limestone deteriorates very rapidly, turning to gypsum owing to its great affinity for sulphur. The absorption of sulphur causes the stone to expand, thus rendering it soluble and powdery so that particles are constantly washed or blown away."¹ Materials such as stone, mortar, concrete, etc., are "soiled by soot, and the necessary cleaning by wire brush and detergent chemicals, a sandblast or other drastic methods, is not only costly, but injures the stone itself."² Metals, if exposed to smoke-polluted air, suffer not only from soot and tar but also from the presence of obnoxious gases and acid vapours. While "the destruction of iron is most noticeable, for it is the metal in most common use and it is more readily corroded than the majority of metals," there is hardly any metal which is not susceptible to the corrosive action of smoke. In fact "the sulphuretted hydrogen in smoke blackens, disfigures or tarnishes nearly all metals."³ Copper and bronze rapidly darken . . . aluminium is affected by vapours and acids, many metals become pitted from electro-chemical action and even gold and gilded articles become dull."⁴

Protective paint coatings applied to metallic surfaces and other materials are subject to contamination by atmospheric carbon and dust which tends to reduce their protective efficiency and makes necessary frequent washing of paint coatings.

Experiments made in England have shown "the corrosion of unprotected iron work to be six times as rapid in town air as in the pure country air."⁵ Evidence of the destructive effect of smoke on materials can be seen in the fact that metals had to be renewed and metallic surfaces had to be repainted twice as often in Pittsburgh than in a smoke-free environment.

Furthermore, air pollution affects the interior of buildings and apartments. Air conditioning and ventilating equipment in particular are subject to corrosion and have been seen to fail within a period of three months owing to atmospheric

¹ Smoke Investigation, Bulletin Nos 3, *op. cit.*, p. 36.

² H. B. Meller, "Air Pollution from the Engineer's Standpoint," *Heating, Piping and Air Conditioning*, Journal Section, January, 1931, p. 2.

³ *Ibid.*, p. 3.

⁴ Smoke Investigation, Bulletin No. 3, *op. cit.*, p. 37.

⁵ Smoke Investigation, Bulletin No. 6, (*Papers on the Effect of Smoke on Building Materials*, *op. cit.*, p. 46.

pollution.¹ Similarly, factory smoke and other pollutants are responsible for the deterioration of the quality and value of all kinds of merchandise, causing substantial losses to wholesale and retail businesses. In addition, air pollution causes social losses as a result of the necessity of more frequent household cleaning and washing.²

The progressive destruction and premature deterioration of building materials, metals, paint coatings and merchandise swells the expenditures for cleaning, washing, redecorating and repainting.³ These increased costs of "keeping clean" together with the serious effects of air pollution on health have caused many city dwellers to desert the cities and crowd into suburbs, with the consequent shrinking of real estate values of city property.

A polluted atmosphere also reduces the number of hours of daylight in a given locality and makes necessary increased expenditures for artificial lighting. Reduced visibility due to the increased intensity and duration of city smogs makes for costly delays in transportation, especially air transportation and shipping, and produces higher accident rates.

Some Quantitative Estimates of the Social Costs Caused by Air Pollution

As soon as we raise the question of the total costs of air pollution to society we encounter considerable uncertainties. This is to some extent due to lack of information. After all, as we have pointed out, statistics are rarely collected with a view to

¹ H. B. Meller and L. B. Sisson, "Effects of Smoke on Building Materials," *Industrial and Engineering Chemistry*, Vol. XXVII, November 1935, p. 1311.

² This was demonstrated by a comparison of costs of household washing in Manchester—a smoky town—and Harrogate—a clean town. The comparison made by the Manchester Air Pollution Advisory Board in 1918, showed "an extra cost in Manchester of 7½d. a week per household for fuel and washing material. The total loss for the whole city, taking the extra cost of fuel and washing materials alone, and disregarding the extra labour involved and assuming no greater loss for middle-class than for working class households (a considerable under-statement), works out at over £290,000 a year for a population of three-quarters of a million. See A. C. Pigou, *The Economics of Welfare*, *op. cit.*, p. 185 n⁴.

³ Repainting in a polluted atmosphere may be called for after one to three years whereas intervals of five to seven years are the rule in a soot-free atmosphere. The annual British air pollution damage bill for repainting buildings was estimated in 1954 as \$84,000,000 of which approximately \$20,000,000 was the value of paint. R. I. Larson, Air Pollution Damage to Paint, *American Paint Journal*, October 14, 1957, p. 104.

ascertaining the social costs of production. But the lack and uncertainty of information is due also to more basic difficulties. First, the process of causation is a cumulative one. Secondly, costs may be shifted from one group to another in a circular chain and the assessment of the incidence is difficult if not impossible. In addition, costs may be counted twice or even more times. Furthermore, should one include in the figure of total losses the costs of repairing the damage caused by air pollution, and if so, what should be done with those damages which are not subject to repair? Adverse effects on health and premature or "excess" death are qualitative losses; to translate them into quantitative monetary terms appears to be highly problematical. In the last analysis, we have to be satisfied with general estimates of social costs which could be avoided if more rigorous measures of control—or, for theoretical purposes, a complete abatement of air pollution were in force. Such measures may have farreaching effects on production and on the location of industries; in fact, they may retard the process of economic growth and development with subsequent undesirable consequences. Some one may raise the question of the costs of preventing social costs. These are serious problems which call for careful assessment. But such stocktaking is not possible without accumulation of pertinent data and this in turn can be done only with the aid of more research. Economists have so far shown little interest in this important socio-economic problem. As we have seen in this chapter we are still at the beginning of a serious appraisal of the social consequences of the industrial revolution.

As might be expected, estimates of the total costs of air pollution vary greatly from one locality to the next. The earliest and most detailed of these estimates of the social costs of air pollution were made in 1913. According to the Smoke Investigation of the Mellon Institute of Industrial Research at the University of Pittsburgh the smoke nuisance cost the people of Pittsburgh approximately \$9,944,740 per annum (in 1913).¹ More recent estimates place the losses caused by smoke in

¹ Smoke Investigation, Bulletin No. 4., *op. cit.*, p. 44.

Pittsburgh at \$9.36 per person per year.¹ Later investigations in Pittsburgh convinced the Institute "that we were safe in estimating the cost to each man, woman and child in the city at about \$15 each year."² Studies made in other places, among them New York, Chicago, Cincinnati, Salt Lake City, Boston and Baltimore, have revealed losses amounting to "from ten to thirty dollars per capita."³ Estimates for Cleveland range as high as eighty dollars for each family.⁴ The total costs of the smoke nuisance in New York City were placed at about \$100,000,000 in 1932.⁵

These are earlier estimates of the social costs of air pollution. However, it would be a mistake to believe that the problem has diminished in severity. It is true that industry has been induced to some extent to assume responsibility for the abatement of air pollution, and it is estimated that the national expenditure by industry for this purpose exceeds \$300,000,000. But voluntary acceptance varies and local legislation is rarely capable of enforcing the introduction of costly control equipment. It is not surprising, therefore, that the over-all extent of air pollution has not decreased. On the contrary, all available evidence points to the conclusion that the extent of air pollution continues to increase and so do the estimates of the total losses caused by its negative effects. Indeed, it is to be expected that air pollution will pose an ever increasing threat to human health due to the fact that new industrial processes and a great number of new products are coming into existence every year. Industrial expansion gives rise to a continuous coalescence of residential and industrial areas which, in the case of the Eastern Seaboard of the United States, already extends over several hundred miles.

Current estimates of the costs of air pollution vary all the

¹J. E. Ives and R. R. Sayers, *City Smoke and its Effects*, U. S. Public Health Report January 1936, Vol. 51, p. 16.

²According to estimates by H. Meller, quoted by W. B. Courtney, "Our Soiled Cities," *Collier's Weekly*, January, 27, 1934.

³J. E. Ives and R. R. Sayers, *op. cit.*, pp. 16-17

⁴Smoke Investigation, Outline of the Smoke Investigation, Bulletin No. 1, *op. cit.*, p. 8.

⁵H. Obermeyer, *Stop that Smoke* (New York, Harper and Brothers, 1933), pp. 48-9.

way from 2 to 7.5 billion dollars per year in the United States (with \$500,000,000 spent every year for pollution abatement). Average costs per capita which 10 years ago were still about 10 dollars per person are now estimated to be nearer to \$65.¹

Air Pollution and the Future

The foregoing analysis has attempted to show that air pollution is the outcome of a process of unrestrained and unregulated social growth and economic development. A new technology, the use of coal and oil as major sources of energy, increasing populations, large-scale methods of production, the concentration of large numbers of people in vast metropolitan areas, the rapid increase in the number of trucks and automobiles as a means of transportation—these are the factors which, in conjunction with meteorological conditions, have given rise to a concentration of pollutants in the atmosphere in many centers of industrial production. From time to time, and depending upon circumstances, the contamination by industrial and other pollutants may become heavy enough to lead to loss of life which have characterized the catastrophic episodes in Donora and other highly industrialized areas. While these dramatic incidents serve to highlight the potential effects of air pollution, they convey only a partial picture of what are doubtless the most important effects of any long-run exposure to the contamination of the atmosphere: the slow undermining of the health and vitality of human beings which has found expression in the higher morbidity and mortality rates from a variety of chronic diseases including cancer in cities as compared to rural areas. Other losses caused by air pollution are damage to vegetation and livestock, earlier deterioration and corrosion of many materials, the need for more frequent coatings and paintings of surfaces, increased expenses for cleaning, reduction of visibility and the attendant costly delays in air and road transport.

There is every reason to believe that future needs for energy in an expanding economy, the emergence of new products

¹R. G. Gustavson, "What are the Costs to Society?" *Proceedings, op. cit.*, p. 43.

and new industrial processes, increasing population and the further coalescence of urban areas will increase the hazards of air pollution. Chemical interaction may produce new hazards and aggravate old ones which are not yet fully understood. The possibility cannot be ruled out, therefore, that air pollution will increase rather than decrease in magnitude and severity. With it the incidence of certain diseases is likely to increase. While acute and dramatic episodes may not occur more often the slow and silent effects of long-run exposure to low or moderate concentration of pollutants will make itself felt in an increasing incidence of various chronic diseases in the still growing industrial and metropolitan centers in the industrial countries. We are thus faced with a paradoxical situation. While we have succeeded—at least in most of the “advanced” industrial countries—in eradicating a host of contagious diseases, the unrestrained and cumulative concentration of industrial production in a few large centers of manufacturing has increased the incidence of chronic diseases and exposes man in industrial civilizations to new hazards. Considering the difficulties faced by the underdeveloped world in the elimination of the causes of recurrent epidemics of cholera and typhoid, we may marvel at the practical absence of these earlier scourges of mankind in the industrial world. But, at the same time, the underdeveloped world might point to the fact that the problem of air pollution and its health hazards continues to cause excessive social losses in the industrialized countries.

In what sense then are these health effects and social losses of air pollution examples of social costs of business enterprise? Needless to say, private industrial activities are no longer the only sources of air pollution in modern industrial societies. In addition to major industrial sources of air pollution, there are now the smokestacks of public utilities, the incinerators of apartment houses, the chimneys of residential buildings and above all, the exhausts of trucks and automobiles which emit solid liquids and gases in apparently ever increasing quantities. In view of the fact that private consumers and automobiles play a role in the causation of air pollution it may be argued that the social costs of air pollution are only

in part due to private industry. It may be further argued that some of the costs of air pollution are borne by private enterprise in as much as the higher costs resulting from increased illness, the outlays caused by more frequent protective coatings of surfaces, the deterioration of merchandise, damage to crops and livestock, delays in air and road transportation are all adding to the costs of the private entrepreneur as well. Such arguments overlook the basic character of the nature of cumulative causation. In a cumulative chain of causation there is necessarily interaction between many factors; this together with the fact that the final outcome of a cumulative social process always depends upon the concurrence of circumstances makes it possible to shift part of the causal "responsibility" to one or the other factor. While this will always be possible and while it may serve a purpose in a debate, it defeats the search for truth. The truth of the matter is that it is the whole cumulative process of unrestrained concentration of industries and the subsequent growth of urban communities which gives rise to the contamination of the atmosphere beyond the levels of concentration of pollutants that might be said to be compatible with human health. It is this process of unrestrained concentration, regardless of climate and topography which gives rise to the social costs. Neither the private automobiles nor the chimneys of private dwellings in Donora nor, for that matter, the recurrent temperature inversion, nor the topography of the valley in which Donora is located, can reasonably be said to have given rise to air pollution and its harmful effects. What has given rise to air pollution is the unrestrained concentration of industries in this locality. What applies to Donora applies with equal force to Pittsburgh, to New York, London, Tokyo, the Meuse Valley, the cities of the Ruhr or the paper mills in Cornerbrook in Newfoundland, the mining towns of the Andes and may tomorrow apply to Calcutta¹ or the emerging industrial centers in Africa. Indeed, it will apply to the industrial centers of the Soviet Union and China if concentration of industrial production is permitted to proceed without con-

¹ The average monthly fall of soot in Calcutta is currently estimated at 25 tons per square mile. *The Economic Weekly* (Bombay, 1 February 1960.)

sideration of its harmful effects on human health and its social costs. That some of these social costs are shifted by one group of firms to other concerns (or for that matter cause additional outlays for the very firms which are contributing to the air pollution in the first place) in no way changes the social character of these costs. They are avoidable if organized society, that is, governments will take the necessary steps and enforce rules which the situation demands.

Before turning to these practical measures it may be worthwhile to point out how the principles of business enterprise favor the emergence of the social costs of air pollution. The initial concentration of industrial production in a few centers, as indeed the location of industries in general under conditions of unlimited competition, will take place in accordance with private cost-benefit calculations. Once established, the industry widens the market for a host of other industries; it offers employment and income opportunities to labor and capital; it provides a broader tax base for the emerging urban communities and the necessary public services. The locality becomes generally more attractive for additional investments, enterprise and labor and urban settlement. It is this expansionary momentum which serves to "polarize" industrial development in certain "nodal" centers, which soon gives rise to secondary and tertiary spread effects in the form of increasing outlets for agricultural products and consumers' industries in general. In the light of traditional economic theory the process seems to proceed in harmony with the principle of social efficiency. For, after all, internal economies combine with external economies (in the narrow Marshallian sense) to make it appear rational to concentrate production in centers which are already established and offer some guarantee that the necessary social overhead investments (in roads, schools, communication) can be shared by a larger community. What is overlooked is that the concentration of industrial production may give rise to social costs which may call for entirely new and disproportionate overhead outlays for which nobody may be prepared to pay. Thus by concentrating on the analysis of internal and external economies, and by stopping short of the

introduction of the concept of social costs of unrestrained industrial concentration, traditional theory lends tacit support to the over-all rationality of cumulative growth processes, no matter what their socially harmful effects may be. After all, what could be more "rational" than to exploit to the fullest extent the availability of internal and external economies. As long as social costs remain unrecognized and as long as we concentrate on costs that are internal to the firm or to the industry we shall fail to arrive at socially relevant criteria.

It may be argued that, while the neglect of social costs may contribute to the cumulative growth process it still would not explain the incomplete and inefficient process of combustion which gives rise to the emanation of pollutants into the atmosphere. For obviously, if air pollution is a sign of inefficient and incomplete combustion of coal or oil the question arises why would business enterprise permit such waste to continue? The answer is simply that what may be technologically wasteful might still be economical considering the fact that not only social costs can be shifted with impunity but, above all, that discounted private returns (or savings) obtainable from the prevention of the technological inefficiency and social costs may not be high enough to compensate for the private costs of the necessary abatement measures. The fact that the resulting pollution of the atmosphere may cause social costs far in excess of the costs of their abatement is not, and indeed cannot, be normally expected to be considered in the traditional cost-benefit calculations of private enterprise. According to one investigator the costs of enforcing existing air pollution ordinances (in Ontario) would involve expenditure of only 15 cents per capita while the annual economic losses which could be saved in this way would amount to between \$10 and \$20 per person.¹

It is therefore not surprising that the abatement of air pollution tends to fall behind the emergence of new hazards. Municipalities may pass new legislation and industries may

¹ D. A. Thomas, "Fifteen Cents Expenditure per Capita saves \$10 to \$20 per capita Economic Loss," *Municipal Utilities Magazine*, Toronto, Vol. 96, December 1958, pp. 21-22.

even be called upon to spend increasing amounts on abatement measures but the rate of industrialization and motorization may proceed at an even more rapid pace. Indeed, with the extension of metropolitan areas over several states it has already become evident that the problem of air pollution is not simply a municipal problem but is regional and interstate in scope and character. Ultimately only federal legislation and enforcement on a regional basis may offer some guarantee of effective control and abatement of the hazards and losses due to air pollution.

The real question is, however, not the form but the content or scope of the required control measures. This becomes clear as soon as it is realized that the control of air pollution cannot stop simply with laws setting forth rules on the construction of higher smoke stacks and the installation of filter devices designed to prevent the emission of dust and solid particles. Any effective prevention of air pollution in the major industrial centers of the world can no longer be confined to the abatement of smoke and the reduction of solid deposits in the atmosphere. Air pollution is now mainly a matter of minute solid and liquid particles and gases which remain suspended in the atmosphere for a long time and enter into chemical reactions with one another under the influence of sunlight.

In the last analysis "the key to control of air pollution in many cases is good equipment, well-designed, well-installed, well-maintained and well-operated."¹ This may call for the establishment of standards for new equipment, their maintenance and enforcement as well as control of old equipment and enforcement of more complete fuel combustion. What may be called for are such measures as strict regulation of stack emissions in relation to permissible concentration of pollutants in surrounding areas, the dispersion or treating of waste gases, the systematic modification of some industrial processes, the treatment of raw fuel to reduce emanation of smoke and hydrocarbon fumes, the use of superior synthetic-type fuel in auto-

¹ A. J. Benline, "The Local Government Official's Stake in Air Pollution Control," Conference of Mayors and other Municipal Officials, Rochester N.Y., June 20, 1960, reprinted in *Congressional Records*, Senate, June, 28, 1960, p. A5527-28.

mobiles, the relocation of some industries outside cities or even the planning of protective barriers such as shrubs and trees.¹

If the replacement of man and horsepower by coal and oil during the last 100 years has been accompanied by the pollution of the air in many of our industrial centers the technology of the 20th century which is now being developed on the basis of our increasing mastery of thermo-nuclear reactions is bound to change the character and magnitude of air pollution. From a relatively localized or at least regional problem, air pollution is likely to develop into a problem of world-wide dimensions. Radioactive waste materials may get into the atmosphere and aerial dispersion may make air pollution a more or less long-standing hazard which will not be restricted even to national boundaries.

Indeed, in the age of thermo-nuclear energy many problems including the social costs of air pollution are likely to assume world-wide proportions in as much as increased exposure to radiation from whatever source has cumulative deleterious effects not only on the health of the present generation but, by affecting the rate of mutation, may influence the health of future generations.

In the long run the dangers of air pollution and the social costs connected with it call for a radically new approach to the solution of all problems of industrial location. Clean air in industrial centers of the world is becoming a scarce resource. That is to say, the conservation of clean air may soon be a major preoccupation of governments in the more populated centers of the industrialized countries. The day may not be far off when man in the industrial world will assert his "unalienable right" to clean and uncontaminated air. The need to conserve air may make it necessary to contemplate the elaboration and utilization of objective standards in the formulation to location policies, i.e. standards of maximum acceptable concentration (M.A.C.) of pollutants in the atmosphere. Such M.A.C. will have to be worked out in accordance with general welfare

¹ See H. Voigt, *Cleaning the Flue Gases and Damage Caused by Flue Gases, Energie Technik*, Berlin, Vol. 8, November 1958, pp. 482-84.

considerations which take into account the biological requirements of human beings and reasonable human health. In other words, the determination of the location of industries in the future will have to go far beyond the assessment of internal and external economies and private, i.e. internal costs, (in market terms). Location of industries will have to become a matter of public policy not only for military and defense reasons but also because of its impact on air pollution and the necessity to conserve clean air. In short, what will be required is a comparison of alternative sites in terms of their respective air pollution potential. Areas with frequent temperature inversions and their duration can be determined. The direction and velocity of prevailing winds can be ascertained. If the prevailing wind is from the north it would follow that industrial areas should be located south of the residential districts. Location policies and the planning of cities will have to be based upon some notion of maximum urban concentration so as to guarantee conditions of existence which are compatible with human well-being and reasonable health. Only in this way will it be possible to maintain the necessary balance between man's activities, his technologies and the natural order of things to which, after all, man must make the necessary adjustments if he is not to destroy the basis of human survival.

CHAPTER FIVE

THE SOCIAL COSTS OF WATER POLLUTION

WHILE clean air is rapidly becoming a scarce resource in many industrial centers due to air pollution, the growing scarcity of clean water has long been recognized and has acted as a major restraint in many decisions concerning the location of industries and residential areas. Industries and agriculture use great amounts of water and the rapid expansion of productive activities over the last decades has brought many regions on the verge of a serious water shortage. "The volume of fresh water used daily in the United States has increased sevenfold since the turn of the century; more incredibly still, it has virtually doubled since 1945, the peak year of industrial effort in World War II . . . By 1980, according to reliable projections, our fresh water needs will have doubled again, reaching the astronomical figure of 600 billion gallons."¹ Indeed, clean water is for all practical purposes a scarce resource. During World War II plans for the construction of at least 300 industrial or military establishments in the United States had to be abandoned or modified because of inadequate water supplies. In some regions the amounts of water needed for industrial and municipal uses exceed available supplies and water has to be used several times, each time requiring costly treatment and purification. For the world as a whole and over the years the supply of water is, of course, constant. Nevertheless, if the demand for water increases at rates indicated above, the balance between supply and demand may soon become as unfavourable in industrial civilizations as it has long been in some arid parts of the world. Future generations may have to devote a substantial part of

¹ L. E. Burney, *Clean Water, National Conference on Water Pollution* (Public Health Service, U.S. Department of Health, Education, and Welfare; Washington, 1960), p. 2.

their total effort to the provision of additional sources of water in essentially the same manner in which irrigation civilizations in the past depended upon relatively heavy public investments in expensive schemes for storage and control of water. Current efforts to solve the problem of the desalinization of ocean water may well foreshadow the shape of things to come. Even if the costs of desalinization per gallon of water are reduced¹, as they undoubtedly will be, the volume of water required is such that the total costs involved will be a substantial first mortgage on the cost of living.

The problem of water pollution must be viewed within the context of the growing imbalance of the constant supply of, and the rising requirements for, water. Indeed, the pollution of water by industrial wastes and municipal sewage, which according to all indications, is being practiced at an increasing rate at a time when some areas are already experiencing acute shortages of water, makes it abundantly clear that this contamination reduces directly the limited supply of clean water. Water pollution is thus an integral part of the problem of the conservation, management and development of water resources. More than this, the contamination of water, like the pollution of the atmosphere, is additional evidence of the fact that industrial man is in the process of radically changing his natural environment.

The Causes of Water Pollution

In many respects the pollution of streams, rivers and lakes resembles air pollution. Like the latter the contamination of water has many of the characteristics of a circular process in which several factors interact and push in the same direction. Similarly, the pollution of water could be avoided or minimized if industries and municipalities were to take appropriate action in the form of adequate prior treatment of the waste products

¹ At present (1960) the lowest estimates of the costs of saline water conversion vary from 40 to 50 cents per 1000 gallons; these estimates apply, however, to the laboratory stage of experiments and not to pilot plants. See *Water Resources Developments in the United States*, Saline Water Conversion. 86th Congress, Committee Print No. 26 Washington D.C., 1960, U.S. Government Printing Office, p. v.

that are discharged into rivers and lakes. As in the case of air pollution those who are most directly responsible for the pollution of watercourses do not bear the adverse effects and monetary losses caused by their productive activities. As a result, they are frequently not interested in minimizing these negative consequences. As a matter of fact they tend to be interested rather in avoiding investments for the necessary treatment of their waste products. By minimizing their internal costs they tend to shift and actually maximize the social costs. Indeed, the costs of controlling water pollution either by prior treatment of the materials discharged or by otherwise disposing of them are likely to be much lower than the social costs arising from the neglect of these measures. The damages caused by water pollution are distributed over a great number of people who may be unable or uninterested in bringing legal action against the main offender because it is usually difficult and expensive to prove liability for damages in court. "Judicial precedent requires the demonstration of specific damage rather than general damage, and further requires quantitative estimates of the amounts of damage experienced by specified individuals. Variations in the natural quality of water and polluting substances make the process of marshalling such evidence lengthy and intricate."¹ Furthermore, even if liability and damages are proven it is also necessary to demonstrate that practicable means of abatement exist before an injunction may be obtained. This entails additional expense and further delay. Thus the dispersion of damages and the excessive expenses for court action act as a deterrent to the elimination of water pollution in modern industrial societies. However, the main social costs of water pollution are not those sustained by individuals in the form of injuries to health or property or recreational values but rather those which arise from the depletion of a major economic resource.

As in the case of air pollution the rising incidence of water pollution in many industrial societies can be understood only

¹ National Resources Committee, *Water Pollution in the United States* (Third Report of the Special Advisory Committee on Water Pollution), (Washington, D. C., U.S. Government Printing Office, 1939), pp. 67-68.

as the outcome of a vicious circle of interdependent variables such as the increasing concentration of large scale manufacturing in a few centers, the emergence of new technologies in the form of new products and processes and the expansion of population and settlement in large cities. The pollution of rivers takes place as a result of the discharge, often without adequate treatment, of industrial wastes and municipal sewage. From the perspective of the process of cumulative causation it is futile to attempt to distinguish between industrial wastes and municipal sewage. For not only is the municipal sewage problem the result of an unrestrained concentration of industries and populations in a few large centers, but the disposal of industrial waste actually takes place to a considerable extent through municipal sewage systems. In fact, the continuous incorporation of suburban industrial areas into urban communities leads to a steady increase of the "load factor" of municipal disposal systems. For instance, of the 280,000 manufacturing establishments in the United States more than 150,000 use significant amounts of water and may thus produce liquid waste materials which find their way into adjacent waterways. Eighty per cent (by number) of the industrial establishments in the United States are connected with municipal sewage systems and it is estimated that about one third of the organic wastes treated by municipalities are industrial in origin.¹ There remain 25,000 "independent" plants which discharge their liquid wastes directly into various water-courses, and the important point is that this direct discharge is felt to be "far more important both in terms of total volume and strength than are the wastes from those industries discharging through municipal systems."² Of course, these are only rough estimates but they serve to set the stage for a discussion of the general significance of the problem of water pollution in the United States.

Waste products, whether of industrial or municipal origin, can be classified for our purposes according to whether they are

¹ *Water Resources Activities in the United States*, Washington, D. C., Pollution Abatement, 86th Congress, Committee Print No. 9. (U. S. Government Printing Office, 1960), p. 2.

² *Ibid.*, p. 18.

persistent¹ chemical, mineral and radioactive substances which are largely unaffected by existing treatment or whether they can be reduced to stable compounds through the action of oxygen-requiring bacteria. In addition, there are polluting agents such as infectious disease-carrying organisms, mineral substances which serve as food (fertilizer) for obnoxious or over-abundant aquatic plant life, and heat which diminishes the amount of oxygen which water can hold in solution. Although industrial or municipal waste products discharged into rivers may contain one or several or indeed all of these polluting agents, it is still useful, for an analysis of the causal relationship, to draw distinctions between major pollutants and their effects.

Among the most important sources of water pollution appear to be those industrial processes which discharge persistent chemical or mineral substances. It is true that this type of pollutants and their effects are not yet completely understood; the method of study for their evaluation and removal is still in a relatively early stage. However these pollutants are continually increasing in amount. Not only will the output of industries discharging them grow severalfold over the next decades but technological developments and processes are expected to give rise to new and increasing numbers of these pollutants.² Among these pollutants are acids, iron salts, alkalines toxic acids, including a great variety of processing chemicals, brines and radioactive materials. Primarily responsible for the production and discharge of these wastes are pulp and paper, as well as iron and steel industries, petroleum refining and the still limited but increasing number of mills and refineries processing uranium and thorium bearing ores. For our purposes it will be sufficient if we illustrate the cumulative process of water pollution by one or two examples. Thus, let us examine coal mining and petroleum production. In many instances, "subsurface formations of sandstone and limestone

¹ Persistent in the sense that they remain relatively stable in water or are reduced so slowly that they must be regarded as persistent for all practical purposes.

² It is estimated that "about 400 new chemical substances are created each year by industrial research." *Water Resources Activities in the United States*, Print No. 9, *op. cit.*, p. 16.

are saturated with salt water or brine. When these strata are penetrated by wells drilled for oil and gas or other purposes, the brines are released and, unless proper precautions are taken, may be brought to the surface through the wells or may find their way into formations containing fresh water."¹ Older mines usually produce substantial quantities of brines and these may eventually pass into water supplies especially "in those fields where brines underlie the oil in the extraneous parts of the oil-bearing reservoirs. . . ."²

The relative amount of salt water produced varies considerably between different oil fields and wells. While some wells are reported to produce only one barrel of water to 27 barrels of oil, other wells may produce as much as 100 barrels of brines to every barrel of oil produced.³ According to estimates of the U.S. Bureau of Mines the mid-continent and Gulf coast oil fields produce approximately 10,000,000 barrels of brine daily—that is about 3 barrels of brine for every barrel of oil.⁴

In the absence of adequate precautionary measures (such as the use of button hole plugs, the cementing and repair of wells or the proper disposal of brines at the surface) these salt waters are likely to find their way into streams, rivers and lakes where they may give rise to a serious contamination of fresh water supplies.

In coal mining, certain washing processes yield a wash water "which carries fine particles of coal and refuse known as culm into the streams."⁵ Moreover, water pumped from operating mines and draining from abandoned mines often has a high acid content which may become an active source of water pollution. Although detailed estimates of the amounts of culm and

¹ L. Schmidt and C. J. Wilhelm, *Contamination of Domestic Water Supplies by Inadequate Plugging Methods or Faulty Casing*, (U.S. Bureau of Mines and the Kansas State Board of Health, n.d.), p. 1.

² H. C. Miller and G. B. Shea, *Recent Progress in Petroleum Development and Production*, (Washington, D. C., U. S. Bureau of Mines, 1940), pp. 374-75.

³ L. Schmidt and J. M. Devine, *The Disposal of Oil Field Brines*, U. S. Department of Mines, reprinted February 1937 (R.I. 2945), p. 1.

⁴ H. C. Miller and G. B. Shea, *op. cit.*, p. 375; see also L. Schmidt and J. M. Devine, *op. cit.*, pp. 1-2.

⁵ National Resources Committee, *Water Pollution in the United States*, *op. cit.*, p. 12.

acid pouring from coal mining regions into stream systems are not available, it is an established fact that such mining wastes have contributed to the filling of stream channels thereby decreasing their navigable depth and increasing the height of flood flow. "Sulfuric acid is formed at exposed surfaces in coal mines where sulfur-bearing minerals, water and air come in contact. Water flowing through mines or pumped to the surface carries acid to the receiving streams."¹ In the early thirties it was estimated that 2.7 million tons of sulfuric acid were produced annually by mines.

Hydraulic mining and dredging operations give rise to other kinds of mining debris which, if discharged into rivers and streams, contribute materially to the silting and pollution of stream channels. For example, debris from gold mining operations in California once constituted a source of serious silting of streams and threatened the use of channels downstream. While various control measures required under Federal regulation (such as the construction of storage dams, levees, barriers, etc.) have substantially reduced these harmful consequences of water pollution in the State of California, hydraulic mining and dredging operations in parts of Idaho and some western States are still reported to contribute materially to the silting of stream channels.

As in the case of radioactive fallout the disposal of radioactive waste materials in connection with the peaceful uses of atomic energy creates hazards of world-wide dimensions. Major sources of radioactive waste products are mills and refineries processing radioactive minerals such as uranium or thorium, and power reactors using refined radioactive substances for medical and other research purposes. While most of the radioactive substances remain tied to the spent ore the remaining fraction may wash or be discharged into watercourses and result in serious health hazards. The maximum permissible concentration (MPC) of radium in the domestic water supply is 4.0 micromicrograms per liter.² Any expansion of the capacity of the refining

¹ *Water Resources Activities in the United States*, Reprint No. 9, *op. cit.*, p. 10.

² For strontium 90 the M.P.C. is only 0.5 micromicrograms per liter as compared to as much as 50 million micromicrograms per liter for a poison like arsenic. *Ibid.*, p. 14.

and processing industries for fissionable materials will lead to an increase of the amounts of radioactive wastes that must be disposed of. This problem is further complicated by the long life of some of the radioactive waste materials and by the fact that many radioactive substances are concentrated by aquatic growth and by sediments to a level many times in excess of the concentration present in the surrounding water.¹ The magnitude of the problem and its cumulative character is accentuated by the fact that even the disposal of radioactive waste materials by dilution in the ocean opens the possibility of a concentration of specific fission products by aquatic life. Clays and some minerals are also capable of absorbing radioactivity. In addition there will be the physical and financial problem of finding storage for an estimated 35 million gallons of radioactive waste materials in 1980 and of roughly 300 million gallons by the year 2000.² We shall not consider the additional risks due to accidents and human failures as a result of which untreated radioactive materials might be released into watercourses. Hardly anything needs to be said about the cumulative health hazards of adding to the environmental sources of natural radioactivity those resulting from the disposal of radioactive waste.

Negative Effects of Water Pollution

In comparison to the effects of exposure to radioactive wastes the other "persistents" and chemicals may be said to be relatively less dangerous. Nevertheless, their continued discharge into watercourses can hardly be contemplated with equanimity. Thus, the discharge of brines, in addition to making water unusable for human beings and animals may affect negatively the quality and fertility of the soil. Indeed, it may destroy all vegetation. At the same time, the discharge of brines into watercourses damages the water supply for municipal and industrial uses. Purification becomes more difficult and expensive. Drainage of acid mine wastes into streams increases the acidity of the water which results in tangible damage through corrosion of concrete and steel structures such as boilers, bridge piers, piping, barrages and other metal structures.

¹ *Ibid.*, p. 14. ² *Ibid.*, pp. 14-15.

Other persistent substances which are not easily removed by the normal purification treatment are the synthetic chemicals which are increasingly used as germ killers, insecticides, herbicides and other solvents including detergents. The use of these persistent substances is steadily increasing. "Over 500 million pounds of synthetic organic pesticides and 1 million pounds of inorganic (arsenicals, copper and zinc sulfate, sodium chlorate, boron and sulfur) are produced in the nation annually. Farmers in the United States spent \$231 million in 1957 for agricultural chemicals other than fertilizers."¹

Some of these toxic materials drift into watercourses and pass unchanged through treatment plants into the domestic water supply. Long before they reach the human consumer they may severely damage if not wipe out certain plants and animals. Recent investigations have shown the presence of insecticides in major rivers in the United States. This aspect of water pollution is considered to be serious enough to call for a "reversal of the trend toward widespread general use of insecticides." Indeed the United States Public Health Service suggests that "the long-range goal may well have to be discovery or development of various benign insects and organisms as natural insect control agents, rather than use of these toxic chemicals for the purpose."² The increasing use of detergents which make their way into wells and city water systems seems to have no more serious effects in the short run than to make city waters foam when shaken. However, these are short run effects. The long run consequences of pollution of water supplies by these relatively new synthetic products are not yet known.

At the same time industrial and municipal wastes may contain mineral substances which serve as food or fertilizers for a great variety of aquatic vegetation which subsequently grows in greater profusion and abundance. As these plants die and decay, "secondary" pollution may affect the taste and odor of the water. In certain types of algae "blooms" a strychnine-like poison may be generated which has occasionally killed wild animals and cattle. "The effects of nutrient-laden waters will

¹ *Ibid.*, ² *Ibid.*, p. 10.

be the increased frequency of algae "blooms" accompanied by intensified taste and odor problems at water treatment plants, the unnatural green-soup appearance of streams and lakes, the death of fish, the strong odour of decaying windrows of accumulated dead aquatic plants on shorelines and interference with boating, water skiing, and swimming."¹

In addition, the utilization of water for cooling purposes by power plants, steel mills or petroleum refineries can have serious polluting effects. Not only does it change the physical environment of all aquatic life but such utilization also diminishes the amount of oxygen-demanding wastes which are reduced to stable compounds. In other words, once more we are faced with a typical vicious circle of cumulative causation: an increase of industrial production, and particularly the increased output of electric power, increases the heat pollution of our water courses. This pollution has the effect of depleting the oxygen carried by water which in turn diminishes its capacity to reduce the organic waste load which an increased industrial and municipal waste disposal places upon existing waterways. In short, water pollution from these sources does not merely increase proportionately but at a geometric rate if no action is taken to counteract the trend. In fact, current projections (1960) foresee an eightfold increase in thermal pollution by the year 2000 regardless of whether conventional fuel or nuclear energy will be used because cooling water is required for condensing steam in either case.²

The least frequent type of water pollution in advanced societies is most frequent and serious in the underdeveloped world. The contamination of streams and ground water by a variety of organisms which carry and spread epidemics such as typhoid fever, cholera and other enteric disorders, tuberculosis and apparently even virus infections. In societies with sewage systems and systematic disinfection of the water supply by means of chlorine and other substances this danger seems to be, if not completely eliminated, at least substantially reduced.

So far we have dealt with the effects of the major types of

¹ *Ibid.*, p. 8. ² *Ibid.*, p. 15.

persistent water pollutants and their industrial sources. Our next problem is the effect of wastes which reduce the oxygen in water. These effects are much better understood than the former. Moreover, they can be expressed in quantitative terms. Oxygen-demanding wastes are partly industrial in origin and partly a result of sewage discharged into waterways (with or without treatment). The fact that their oxygen requirements can be calculated, accounts for a type of data which permits a somewhat more quantitative evaluation of the magnitude of the pollution problems in the future.

These wastes are reduced to stable compounds through the action of bacteria which require oxygen. By measuring the average amount of oxygen needed for this purpose, it is possible to arrive at an estimate of the amount of oxygen remaining in the water after receiving a given discharge of these materials. This in turn enables us to estimate the maximum permissible load of different watercourses given the projected discharge of wastes under different assumptions of population growth in the watershed area. Furthermore, by measuring the oxygen needed to stabilize the daily sewage and related wastes of one person, it becomes possible to translate any estimated waste load in terms of "population equivalents". This unit serves to express any given totals of present or projected oxygen-demanding waste loads which industrial or municipal sources may place on water resources in terms of equivalent millions of population. To repeat, such population equivalents apply only to oxygen-demanding wastes; they do not measure the previously discussed pollution load resulting from persistent chemical, mineral and radioactive substances.

On the basis of a calculated average of a daily biochemical oxygen-demand of 0.17 pound of oxygen per person and assuming that all urban populations will be served by municipal sewer systems and that the effective reduction in oxygen-demanding substances by sewage treatment will have increased to 80 percent (as against an average of only 44 percent in 1960) the estimated stream load from city-located industries alone will be equivalent to the load which a population of 139.7 million people would place upon the existing watercourses.

Together with an estimated population served by sewage treatment systems in the year 2000 the total load would reach a population equivalent of 419.1 million.¹ These data do not take account of those oxygen-demanding industrial wastes which are discharged directly into streams by various industries, notably the food processing industries. As indicated earlier, only rough estimates are available on the relative magnitude of this load. However, the wastes discharged directly by 25,000 manufacturing plants are said to be far more important both in terms of volume and strength than are the wastes from industries discharging into municipal systems.² Considering that not all of these directly discharged wastes are necessarily oxygen-demanding and considering that the estimated industrial wastes discharged through municipal systems in the year 2000 are likely to be 35 percent of the aforementioned totals in population equivalents, it is probably safe to say that industrial components of oxygen-demanding wastes may well be around 50 percent of the total waste load discharged into streams.

A monograph published under the auspices of the American Chemical Society in 1953 concluded that assuming industries remove only half of the polluting material by prior treatment "it is evident that the industrial waste treatment problem is of greater magnitude than the domestic sewage treatment."³

The Social Costs of Water Pollution

We shall not discuss in detail the various adverse effects which the pollution of rivers, streams and lakes may have on human health, property values and recreation opportunities, because specific and reliable estimates are unavailable. However, it will hardly be denied that these adverse effects are both tangible and important. In addition, many of these effects are still unexplored as for instance the effects of water-borne radioactive materials, detergents, and viruses. In addition to these health hazards, there is the danger that the industrial utilization and pollution of water courses will hasten the time when more and

¹ *Ibid.*, p. 2. ² *Ibid.*, p. 18.

³ Quoted from *Ibid.*, p. 17.

more areas will have to set up costly water conservation and management schemes in order to maintain the quality of drinking water. Furthermore, there are the effects of water pollution on vegetation and livestock, on fish and on a wide variety of recreational values as well as on aesthetic values. Thus while there are no quantitative estimates as to the social costs of water pollution it is certain that the pollution of rivers, streams and lakes is a typically cumulative process with farreaching insidious effects extending over a great range of human activities. It is equally certain that both the number and volume of pollutants are increasing, and that technological advances and expanding populations and urban concentrations will make the problem of water pollution, like that of air pollution, one of the major social costs of modern industrial civilizations.

What would be a possible approach to the evaluation of the social costs of water pollution? The answer to this important question depends upon the conceptual framework we choose. If we want to look upon water pollution and social costs only in terms of the benefit-cost calculus of business enterprise we would have to try to arrive at a monetary value of the various losses and damages caused by the contamination of water-courses. While this is possible in some instances, it would be a fruitless undertaking in others. It is possible to calculate the market values of the increased costs of maintenance and repair of particular structures which are corroded prematurely by the chemicals discharged by an up-stream factory. Similarly, it would be possible to estimate the market value of the loss of livestock, the destruction of crops, the loss of soil fertility or even of certain recreational facilities. Data of this sort are available.¹ However, they are far from satisfactory because they are not only incomplete but misleading. They focus attention only on those values which can be estimated in dollars and cents. These data also tend to support the misconception that the problem of water pollution is essentially a "uniquely local blight" which can be corrected by general appeals to "the responsibility" of business concerns and local taxpayers. Actually, as we have

¹For earlier estimates see K. William Kapp, *The Social Costs of Private Enterprise* (Cambridge, Mass., Harvard University Press, 1950), pp. 85-91.

endeavored to show throughout the preceding analysis, the problem of water pollution can be understood only if it is seen in the framework of social ecology and the threatening imbalance between a given supply of, and a rapidly increasing demand for water in practically all parts of the world. Water and air pollution do much more than shift some of the costs of production to people living outside of a given area. They create a new physical environment for man. Indeed, instead of the natural environment in which man has lived for centuries, the permanent revolution of technology has created a man-made environment the full implications of which, for human health and human survival, are far from being fully understood. We are only at the threshold of the realization that this man-made environment may be exceedingly detrimental to all life on this planet. By far the greatest potential danger in this respect is to be found in the inadequate disposal of radioactive wastes and radioactive fallout. What gives these hazards their unique and dramatic character are the cumulative effects of exposure over the entire life span of the individual on his health and survival. It has been said that in public health, as in other fields of human understanding, "we stand at the microchemical and micro-physical frontier"¹ beyond which there may lie the solution of many of the problems of the presently still incurable and chronic diseases. The cumulative impact of a man-made environment on human health is the measure of major and significant social costs. As already pointed out, we are just at the beginning of systematic inquiries which may ultimately provide the basis for the elaboration of scientific standards and the evaluation of the human costs of water pollution.

The threatening imbalance between an essentially constant supply and a rapidly increasing demand for water opens up still another perspective of the social costs of water pollution. A dependable supply of clean water is essential to agricultural and industrial growth. Regions which are unable to conserve their water supply or which permit it to be polluted by human activities, destroy one of the productive forces upon which rest

¹ L. E. Burney, *op. cit.*, p. 4.

their present and future prosperity. The pollution of this resource, like the pollution of the atmosphere, is a **social** cost which needs to be fully assessed. Admittedly, these productive forces have social values which cannot be assessed in terms of either individual welfare criteria or market values. They are values-to-society for which the market calculus provides at best only a preliminary and certainly not an overruling yardstick. Social values of this sort call for an appraisal of over-all social and political consequences of action or non-action. In the specific case of water pollution they call for knowledge of the cause and effects of the pollution of specific watercourses so that the consequences and comparative costs of different policies (including the policy of non-action) can be stated and thus become the basis of rational political choice. Only systematic research conducted under impartial scientific auspices can provide the basis for estimating the social costs of water pollution with a reasonable degree of accuracy. Unless such a scientific assessment of the causes, extent and effects of water pollution is carried out and kept up to date in order to take account of the effects of new pollutants resulting from a changing technology it is futile to speak of over-all measurements of the social costs of water pollution and of environmental pollutants in general. Such a scientific assessment would ultimately lead to the elaboration of scientific standards of Maximum Permissible Concentrations of various types of environmental contaminants. These standards could serve not only as the basis of measurements of environmental pollution but also as objective criteria for the formulation of sanitary standards and policies for the maintenance of an environment that conforms to the biological requirements of health, life, and survival. Instead of passively adjusting to a detrimental environment the scientific man can shape his surroundings and adjust his man-made (artificial) environment to his purposes.

We cannot concern ourselves with the economic or administrative aspects of abatement policies. Suffice it to point out, however, that the need for more information is not equivalent to saying that we must remain inactive until all investigations have been completed. Enough information is available to

justify remedial action in specific cases. Delay will render not only future action more costly but will increase present social costs. Indeed, as pointed out before, the costs of early abatement may be amply justified if compared with the future social costs of neglecting early remedial action. While society has to bear the social costs of neglect, individual enterprises can shift the social costs to others and even to the future. The social costs of water pollution are borne to a considerable extent by people living downstream. This complicates the abatement problem; it transforms water pollution into a regional problem. Above all, it raises the question of the incidence of costs and benefits. Abatement policies cannot be made dependent upon the local ability to pay or the local tax base. They have to be financed on a regional scale and as part of the general attempt to preserve a national resource. Only a regional approach with Federal agencies assuming over-all responsibility for water management policies can guarantee the preservation of water resources. (The traditional formula of making federal grants dependent upon adherence to minimum standards and of withholding funds from communities which do not meet these standards or which have delayed action, could serve its purpose again.)¹

We may assess the social costs of water pollution indirectly by inquiring into the costs of keeping watercourses relatively clean. Estimates of abatement costs convey an approximation of the price at which it is possible to eliminate and avoid the contamination of surface waters and the resulting social losses. At the same time they show by how much private expenditures fail to cover their total costs. Recent estimates of the U.S. Public Health Service place the total costs required for the elimination of pollution at \$10.6 billion over the next decade. Slightly more than half of this amount would have to be spent by private industry for the construction of treatment facilities. No data are available to measure the probable deficiency between required and actual spending.²

¹An alternative approach recently suggested would be to charge high water rates to industries discharging waste products into public water courses.

²As far as municipal expenditures for sewage treatment are concerned the deficiency is estimated to be almost 2 billion dollars during 1950, i.e. the

More detailed estimates for 1935, while obviously out of date, are nevertheless significant for their methodological approach. These estimates compare the value of total output of major waste producing industries with the estimated costs of waste treatment.

TABLE 1. *Comparison of Estimated Value of Products Manufactured with Estimated Cost of Industrial Waste Treatment for Major Industries Contributing to the Pollution of Surface Water in the United States.*¹

I Product	II Total Value, 1935	III Estimated Costs of waste treatment ²
Food and Beverages ..	8,830,896,000	205,400,000
Textiles	2,516,157,000	54,000,000
Chemicals ..	1,366,311,000	28,300,000
Petroleum Refining ..	1,823,793,000	30,000,000
Ferrous Metals ..	1,902,909,000	20,000,000
Non-Ferrous Metals ..	382,526,000	21,600,000
Rubber	469,400,000	1,000,000
Paper	822,719,000	129,000,000
Gas	203,751,000	5,000,000
TOTAL	18,318,461,000	494,300,000
Miscellaneous waste treatment ..		100,000,000
Added for contingencies ..		100,000,000
TOTAL COSTS ..		694,300,000

Although this table conveys only a general picture of the total output value and estimated capital outlays required for the

difference between an estimated need of \$5.1 billion and actual expenditures of \$3.2 billion.

¹Compiled for the volume of production indicated by the 1935 Census of Manufacturers and based upon the judgment of engineers who have had wide experience in the treatment of industrial waste. See National Resources Committee, *Water Pollution in the United States*, *op. cit.*, pp. 53-54 and p. 31.

²These estimates do not cover the costs of industrial waste treatment for all manufacturing processes within each particular industry. In other words, the actual cost of an adequate waste treatment program exceed these estimates.

prevention of water pollution according to major industrial groups, it reveals nevertheless great differences in the financial burden which these costs would place upon individual industries. Thus, the estimated costs of waste treatment in the manufacture of paper amount to almost one seventh of the annual value of the total output in 1935. In the textile field costs would reach one fifth of the total output whereas the manufacturers of rubber goods would have to provide for the necessary waste treatment at a cost equal to $\frac{1}{468}$ of their total output.

Even more significant than these over-all comparisons are estimates of the costs of industrial waste treatment in individual plants and manufacturing processes in relation to total capital investment and annual costs of production. Such estimates not only disclose the relative financial burden which the required corrective measures would place upon individual manufacturers, but they also indicate whether, and which industries are likely to experience difficulties if they had to bear the costs of waste treatment. The great practical significance of such a distinction suggested the following preliminary and tentative classification of the chief waste producing industries according to whether the costs of adequate waste treatment be "not burdensome," "sizable" or "extremely high."

1. *Industries for which waste-treatment could be provided at a cost which would not be burdensome:* "Small isolated food establishments producing dairy products and canned goods; small laundries; certain chemical industries with small volumes of wastes; some textile industries in which separation of wastes may reduce the volume for which final treatment may be provided; petroleum refineries; metallurgical industries with small volumes of acid pickling wastes and large receiving bodies of water available. . . ; water-gas manufacturing plants near ample dilution water. . . ; and miscellaneous plants producing wastes which can be partially treated at point of origin and safely discharged into sewage treatment works."¹

¹ *Ibid.*, p. 49.

2. *Industries for which waste-treatment works would involve equipment of considerable magnitude and constitute a sizable item in the cost of production:* "Meat-packing plants; large canneries, beet-sugar plants; distilleries; breweries; certain cereal-processing industries, particularly corn-products plants; textile mills; tanneries; coke-ovens and other units producing phenolic wastes; paper mills not producing sulphite or sulphate pulp, and smelting and refining plants producing nonferrous metals."¹
3. *Industries for which the cost of corrective measures would be extremely high:* "Sulphite and sulphate paperpulp mills; certain distilled spirits industries; certain chemical process plants producing wastes high in concentration and complex in character; and steel mills producing large volumes of pickling liquors."² To these industries must also be added the petroleum industry, in as much as capital outlays required for the proper treatment of oil-field brine waste are estimated conservatively to amount to at least \$100,000,000 exclusive of the annual operating costs, which would likewise be excessively high (perhaps as much as 18 to 33 per cent of the capital investment).³

If more recent and detailed cost studies should confirm the relative accuracy of the above classification and establish the fact that the burden of constructing and maintaining the required waste treatment works would cause serious financial disruptions in certain well-established lines of manufacturing such evidence would offer an interesting illustration of the fact that entire industries might be able to occupy and to maintain their present economic position only because they do not bear the full costs of production but find it possible to shift a substantial part of these costs to other persons and to the community at large.

¹ *Ibid.*, p. 49. ² *Ibid.*, p. 50. ³ *Ibid.*, pp. 47-48.

CHAPTER SIX

SOCIAL COSTS AND RENEWABLE RESOURCES

In the preceding chapters on air and water pollution we have repeatedly touched upon the problem of conservation and depletion of resources. Thus, we have pointed out, that clean water and clean air are no longer free gifts of nature. Particularly in more heavily industrialized areas these essential prerequisites of human life are in the process of becoming true economic resources whose depletion and conservation has become a matter of public concern because their increasing contamination threatens the continuity of human activity.

Throughout our discussion we have made use of such concepts as natural balance, maximum permissible concentration, safe minimum standards and objective requirements of human health. The basic ideas expressed by these terms are relevant also for the study of social costs which may arise in the utilization of such renewable resources as wildlife, soil fertility and forestry. Thus, if the rate of utilization of any of these resources exceeds a safe minimum rate the consequences will be not only a rapid and cumulative exhaustion but an irreversible process which may have farreaching adverse effects for the prosperity of entire industries and communities. Just as the concept of a maximum permissible concentration of pollutants can be defined in objective terms, it is possible to formulate a "social limit" beyond which any utilization of renewable resources will cause a variety of social losses. Indeed, in extreme cases the depletion of one or the other resource may limit economic growth and threaten an entire region with stagnation and permanent structural depression. Thus communities may be left stranded and ghost towns may take the place of formerly thriving settlements.

Closely connected with this concept of a base or safe

minimum level is the concept of natural balance. Most natural resources exist in association with other elements such as plants and minerals and form a natural system of great complexity and sensitivity. If this ecological balance is upset the effects may be cumulative and farreaching and for all practical purposes irreversible even though restoration of the *status quo ante* may be technically possible—at least in the long run and perhaps at prohibitively high costs. Let us illustrate these two concepts—ecological balance and safe minimum standards—in greater detail.

The Ecological Balance

The term ecological balance refers to the delicate system of interrelationships between the land and its vegetative cover. The natural vegetation in any given area may be said to be determined by such factors as the quality of the soil, the amount and distribution of rainfall, and the topography of the land. Long periods of drought or extremely light rainfall preclude forest growth which requires a relatively high amount of moisture. At the same time the vegetative cover of any given area determines the capacity of the soil to absorb rainfall. It regulates the infiltration of water, keeps ground water stores at the proper level and equalizes run-off and stream flow. Natural geological erosion of the land is thus kept at a minimum, or at least reduced to a pace at which it does not seriously interfere with natural vegetative growth and the slow process of soil formation.

Anything that destroys this natural balance is likely to interfere with the protective function of the vegetative cover of the land. For example, the ecological balance may be disturbed by the process of bringing virgin land under cultivation, by draining ponds and other wet lands, by plowing under the natural sod, or by removing the forest cover. All of these operations may have harmful effects which often fail to be considered by those interested in increasing the area of tillable land. Indeed, if carried out on a large scale and without protective measures in response to a rapidly growing demand for farm products, the process of bringing virgin soil into use may endanger the very prosperity which it seeks to promote.

Similarly, improper land use and certain lumber operations, like improper selection and "repeated burning and improper degree or timing of grazing may upset this balance to such an extent that the valuable species are replaced entirely by other less valuable ones."¹ In other instances, the removal of the forest cover may cause a greater frequency of floods, the silting of streams and reservoirs, the diminution of ground water stores, the pollution of rivers, the destruction of irrigation schemes, the harmful effects of dust storms and the disappearance of wild-life. These far-reaching and often irreversible consequences of human activities are all due to the fact that they disturb the complex and highly sensitive ecological balance which exists between the land and its vegetative cover.

To define the ecological balance is not to suggest that its maintenance must become a norm. There is no need to point out that any general increase of population makes it more difficult to maintain intact the ecological balance. Even apart from the general increase of population there may be other overruling reasons why this balance cannot be maintained—as for instance in periods of natural disaster or national emergencies. However, any such disturbance has long-term cumulative consequences which man can anticipate to a large extent and which it is always imprudent to ignore not only in the interest of maximizing current returns or minimizing current costs but also with respect to its social costs.

The "Critical Zone" in the Utilization of Renewable Resources

Just as there are maximum permissible levels of concentration of pollutants in air and water beyond which any further contamination would be socially harmful, there are definite limits beyond which any further increase in the rate of utilization of renewable resources sets into motion a cumulative process of irreversible depletion and exhaustion. More precisely, there is a critical zone which may be defined as "a more or less clearly defined range of rates [of utilization] below which a decrease in flow cannot be reversed *economically* under presently foreseeable

¹S. V. Ciriacy-Wantrup, *Resource Conservation—Economics and Politics* (Berkeley, University of California Press, 1952), p. 257.

conditions."¹ That is to say, a state of economic irreversibility may be reached before the flow of the resource reaches zero. Furthermore, economic irreversibility does not necessarily mean technical irreversibility. Under different conditions of demand and costs it may become worth-while to reforest an area of of secondary growth and brush or restore a depleted or eroded soil to full productivity. Such reforestation and soil conversion will be a slow process and require considerable amounts of capital because the lost ecological balance will have to be restored.

Whenever the rate of utilization exceeds the critical limit or zone the resource flow tends to decrease and the resource may finally lose its capacity to renew itself altogether. It ceases to exist. In the case of wildlife the destruction of the breeding stock or its natural habitat terminates reproduction and makes the depletion irreversible. "Soil depletion may become economically irreversible if a protective plant cover is destroyed by cultivation, improper degree or timing of grazing, and repeated burning in areas where topography, climate or soil render precarious any existing balance between erosive forces (water, wind) and the stabilizing force of plant cover."² Certain types of gully erosion effectively terminate the possibility of utilizing the fertility of the soil for plant growth. In forestry, a rate of cutting and certain unselective lumber practices soon cause the ecological balance to be upset and may give rise to an economically irreversible degeneration of species or the complete disappearance of the forest and its protective functions.

Expressed differently it may be said that there is a minimum standard of resource use beyond which any intensification in the rate of utilization will cause an economically irreversible depletion which is associated with considerable social losses. Obviously the type and magnitude of these losses will vary depending upon the kind of resource under consideration. Admittedly, there are elements of uncertainty which affect both

¹ *Ibid.*, p. 39. The following discussion is based upon Ciriacy-Wantrup's development of the concept of the "critical zone" for flow resources.

² *Ibid.*, p. 256. For further details on the "critical zone" for specific renewable resources see *Ibid.*, pp. 256-59.

the outcome and the magnitude of the losses. Thus, for example, adaptation to the loss of a particular resource and changes in taste are possible. Furthermore, there is no absolute certainty whether the process of depletion cannot be reversed—except in the case of extinction of an animal species. Nevertheless, the social losses may be said to be substantial in terms of their potential social consequences and in relation to the cost of avoiding them. Thus invariably the consequences of an economically irreversible destruction of renewable resources narrow alternatives of activities open to a social group. An irreversible depletion limits and channels development toward specialization rather than diversification. It sets the stage for a process toward arrested economic growth and leads ultimately into a dead end. From the perspective of the group, enforced specialization and arrested growth must be regarded as serious limitations of the path of development of societies. For this reason it is true that any irreversible depletion of any resource constitutes a substantial social loss.¹

Compared with these potential social costs likely to be caused by an economically irreversible depletion, the actual costs involved in avoiding these adverse social consequences are relatively small. This conclusion is justified if we consider that what is needed, in many instances, is the adoption of more selective techniques and practices of resource use which are in harmony with the life and growth cycle of such resources as wildlife, fisheries, and forestry. In all these instances, the rate of use may have to be reduced not to zero but only to a safe distance from the critical zone. Furthermore, the consequences of a use rate which pushes the depletion beyond a safe minimum standard would stop the flow of the resources altogether. This exhaustion is frequently reached with surprising rapidity. Society would then have to forego the entire use of the resource.²

Again, it must be pointed out that the "critical zone" beyond which the depletion becomes practically irreversible is a defin-

¹ *Ibid.*, p. 252. See also the literature quoted by Ciriacy-Wantrup dealing with the dangers of limiting alternatives in biological growth and the development of civilization.

² *Ibid.*, p. 254.

able bench mark and not a norm which must inevitably determine the rate of utilization at any given time. There may be overruling reasons why some resources and their "habitats" may have to be sacrificed to the expansion of settlement and civilization. Furthermore, the maintenance of a safe minimum standard defined in physical terms (i.e. in terms of safe yields) is still subject to the economic requirement of minimizing the total costs involved. Thus if there are alternative conservation practices which would preserve the base level of utilization, that practice which involves the lowest total (private and social) costs is called for.¹ On the whole, the safe minimum standard for the utilization of renewable resources is a practical definable social optimum which can serve as an operational bench mark for the formulation and evaluation of policies and practices in terms of their effects on the rate of utilization either "toward" or "away" from the critical zone of irreversible destruction of the resource base. More than this, as an operational optimum the social minimum standard focuses attention on the effects of different institutional arrangements and practices which are among the factors determining the rate of resource use. It can serve as a tool for the social scientist in his investigation of the social costs which may arise in the utilization of resources.

Institutional Comparisons

What are the effects of different institutional arrangements on the rate of resource utilization? In raising this question it must, of course, be kept in mind that institutional factors are never the only factors which determine the rate of resource use. In addition, the demand factor and the state of technology have to be considered. For evidently a steady increase in population and improvements in the efficiency of capture or recovery have the effect of increasing the rate of utilization. As a matter of fact these are the truly dynamic factors which influence not only the rate of utilization but the question of whether particular elements in man's natural environment are really resources or "free gifts of nature."

¹ *Ibid.*, p. 258.

Traditional societies were essentially static, non-commercial societies which produced for a relatively self-sufficient group of people. Home consumption or local markets limited the rate of resource use. In so far as land and pasture were either free goods or held in common their utilization was closely regulated by habits and institutional restrictions enforced by custom. As the widespread acceptance of the three-field system indicates it would be erroneous to believe that these societies were unaware of the need for conservation practices. Where land and forest resources were owned by manorial estates as in feudal Europe, the interest and the system of unit operation of the owner served as a guarantee that depletion was kept to a minimum. If we consider further that the technology was primitive and pre-industrial and that the population-land ratio was on the whole favourable and stationary it is perhaps safe to conclude that traditional societies basically maintained a safe social minimum in the utilization of their renewable resources. Their institutional arrangements were such as to prevent any serious depletion of resources. Oriental irrigation civilizations must have been particularly aware of the need for conservation practices. In fact their survival depended upon their ability to maintain protective water controls (such as irrigation canals, ditches, flood control, terracing, etc.) and a rate of resource use which did not exceed the pragmatic optimum. The fact that this dependence upon major installations made them also vulnerable to foreign conquest supports the hypothesis that destruction by foreign conquests rather than internal disturbances or over-use played the major role in their ultimate decline and disappearance.

Tribal societies or village communities in which land has not yet become a true commodity are likely to be even more conservative in their land use practices. When land is not a commodity—that is, when it is used by individuals or families but cannot be sold or mortgaged—it is valued for the subsistence it provides to the members of the group. As their legal or religious fictions may have it, the land may belong to the tribe, the ancestors or simply to all past, present and future members of the family. Each family may have the right to cultivate

and pasture some land. Land may even be a medium of investment and a 'storehouse of value', in fact, pastures may be needed to support large cattle herds used as instruments of wealth. But the fact remains that land is valued and used not in response to the maximization of a cash income but for the subsistence of the individual and the group. For all practical purposes this must have the effect of a built-in restriction to use the land so as to preserve it intact for future use. Indeed all kinds of primitive conservation practices may be maintained in the interest of present and future generations.

For the study of the social costs arising in the competitive utilization of renewable resources (and indeed all resources) it is instructive to trace the effects which a commercial penetration by advanced market economies has upon the rate of resource utilization in traditional societies. Admittedly, this type of culture contact is taking place under special conditions which are particularly destructive due to the absence of political and institutional restraints. Nevertheless, a discussion of these destructive effects discloses the factors and forces at work with particular clarity. The establishment of colonial rule and administration changes radically the rate of the utilization of resource. Even if boundaries are not made static and where private property rights to land are not established the contact with the colonial power, its economy and the world market for primary commodities is bound to have the most farreaching effects on the intensity of land use. Land will now become valuable as a source of cash income. Cultivation will become more systematic and continuous. With land as an asset capable of yielding a cash income there will set in a tendency to establish exclusive ownership rights. Hand in hand with these rights goes the power to transfer land at will and transmit it to individual members of the family. As a result fragmentation and dispersion may set in. Increasing population pressure, low incomes, fluctuating prices, high rates of time preference, and other obstacles to the practice of soil conservation will act as inducements to maximize current incomes at minimum current costs. The results of this combination of circumstances will lead to an over-intensive utilization of farm

land in the course of which depletion of soil fertility, overgrazing, and erosion may become common characteristics of land utilization. The familiar vicious circle of poverty, low income, ignorance, and soil depletion will complete the process and be reflected in extremely low yields in agriculture which have become characteristic of agriculture in many underdeveloped countries.¹

In all these cases we are confronted with a cumulative process which led to a disregard of the critical zone and hence of the safe minimum standard. A similar outcome marked the earlier stages of transition from traditional to commercial agriculture in what are now the developed countries of Western Europe. Here too the operational pragmatic optimum tended to be ignored with considerable adverse social effects. Indeed it was a search for a pragmatic-technical optimum which induced several early agricultural chemists (like Liebig, Charles Comte, and Johnston) to question the possibility of rational agriculture under conditions of private property in land. It was left to Marx to emphasize that the transformation of tribal property, feudal land property and small peasant property held in common into a system of modern agriculture led to a *reductio ad absurdum* of the price system in agriculture and land use in general.² Indeed, what makes the price system problematical in agriculture, according to Marx, is the fact that natural resources enter the process of reproduction of values essentially as free gifts of nature. If land which is an indispensable condition of human existence

¹ For a more detailed account of the whole process see E. H. Jacobi, *Agrarian Unrest in South East Asia*, (New York, Columbia University Press, 1949). A. Gaitskell, "Internal Economic Development" in *New Fabian Essays* (A. C. Jones, ed.) (New York, Praeger, 1959), pp. 128-50; R. Dumont, *Types of Rural Economy* (New York, Praeger, 1957), pp. 74 ff, 114 ff. and *passim*. See also Ciriacy-Wantrup, *op. cit.*, p. 50.

² Unlike some of the earlier agricultural chemists who spoke of the antagonism between private property and a rational system of agriculture, and who argued in favor of "a sole and highly enlightened will" to assign to each piece of land its task, Marx singled out the dependence of the cultivation of particular crops upon the fluctuations of market prices and the continual changes of this cultivation with the fluctuation of price as the major reason why "the whole spirit of capitalist production, which is directed toward the immediate gain of money, contradicts agriculture, which has to minister to the entire range of permanent necessities of life required by a network of human generations." K. Marx, *Capital, A Critique of Political Economy*, (Chicago, Ch. H. Kerr & Co., 1909), Vol. III, p. 724 n.

and of the reproduction of successive generation of human beings, is destroyed, future generations will be burdened with additional investments such as fertilizers, irrigation systems, drainage works, etc. In short, future costs and future prices are raised as a result of the neglect of the requirements of maintaining the natural balance. Later generations cannot escape the consequences of what Marx called the exploitation of the power of the soil or the spoilage of the natural productivity of labor.

Nor did Marx have any confidence that the outcome would differ markedly between small-scale and large-scale agriculture. With high initial land values (representing the capitalized rent to be paid for the land), the small-scale cultivator cannot afford the investments in land called for by rational agriculture. In large-scale agriculture where tenancy plays a role the tenant's investments in improvements are likewise limited because of his justified fear that any increases in output will benefit not him but the landlord in the form of a higher rent or taxes. In both instances the dependence of the farmer upon market prices and tenancy causes land (or the "external social property" which is the basis of the free "natural" productivity of labor) to be "devastated" and there occurs "an incurable break in the interconnections of the social circulation of matter described by the natural laws of life."¹

This earlier analysis of the connection between the institutional price system and particularly between fluctuating farm prices and an economically irreversible destruction of the soil has not lost its relevance. However, in addition to prices and

¹ "In agriculture on a large scale, and in the case of large estates resting upon a capitalist mode of production, private ownership likewise acts as a barrier, because it limits the tenant in his investment of productive capital, which in the last analysis benefits, not him but the landlord. In both forms the exploitation and devastation of the powers of the soil takes the place of a consciously rational treatment of the soil in its role of an external social property, of an indispensable condition of existence and reproduction for successive generations of human beings. And besides, this exploitation is made dependent, not upon the attained degree of social development, but upon the accidental and unequal situations of individual producers. In the case of small property this happens from lack of means and science by which the social productivity of labor power might be utilized. In the case of large property, it is done by the exploitation of such means for the purpose of the most rapid accumulation of wealth for the tenant and proprietor. The dependence of both of them upon the market price is instrumental in accomplishing this result." *Ibid.*, pp. 944-45.

tenancy conditions, there are such institutional factors as uncertainty, farm credit and taxes as well as rising land values, which also have adverse social effects. In the following discussion we will deal briefly with these general relationships.

Unstable and depressed farm prices may make the application of soil conserving methods of cultivation unprofitable and hence unlikely. High and unstable input costs (costs of fertilizer, seeds, implements) have the same effect. However, as experiences during World War I and II indicated, even higher and especially rising prices of certain crops may lead to soil depletion when the resulting extension of the margin of cultivation is carried too far from the standpoint of the pragmatic optimum and natural balance. Under these circumstances it appears that the effect of prices on the rate of land utilization differs and cannot be formulated with any claim to universal validity.¹ What can be said is that unstable prices increase the uncertainty surrounding all farm management decisions. By raising the risk factor and hence the (cost) allowance for such risks fluctuating prices are likely to make soil conserving practices more expensive. In this connection it is necessary to mention the peculiarly vicious circle that may arise from the fact that rising farm prices due to increasing demand for farm products by a rapidly growing population may make for constant and even increasing revenues which obscure, at least temporarily, the declining physical productivity of the land associated with the depletion of soil fertility. Moreover, as long as returns exceed costs, it may simply be more profitable to continue soil depleting methods of cultivation particularly if the cultivator is poor and has a high time preference for present consumption. Even if he realizes that he is gradually destroying the soil, the cultivator is not likely to apply soil conserving methods of cultivation as long as worn-out land can be abandoned for less depleted land or virgin soils. Under these conditions—which were prevailing in the United States until recently—the utilization of agricultural land may be accompanied by a gradual and widespread deterioration of soil fertility even though the individual farmer may

¹ Ciriacy-Wantrup, *op. cit.*, pp. 129-38.

be earning an annual profit. Similarly, short-term tenancy contracts and indefinite and unstable land-holding arrangements in general which cannot provide for adequate compensation for improvements which the tenant may wish to make on the land will have the effect of preventing such improvement and give rise to destructive farm practices. For obviously, "the tenant who has no assurance of permanent occupancy can rarely afford to apply fertilizers beyond the amount which will give him most immediate returns, or to plant soil-building crops."¹

Farm credit and tax systems also affect the rate of utilization of land resources. Their effect may be to increase the elements of uncertainty and inflexibility in farm operations. While adequate credit facilities are the prerequisite of improving farm practices, the recurrent inability to meet the creditor's claims particularly in times of depressed prices, may force the agriculturist into a liquidation of assets and foreclosure at a time when such liquidation can be carried through only, if at all, at disastrously low prices. "This threat cannot fail to influence the utilization plan. Allowance for these uncertainties must result in depletion. In other words, the owner may find it advisable to liquidate through depletion as much as possible of the present value of his resources before foreclosure prevents him from saving his equity."² In a similar fashion, heavy taxes may have the effect of increasing the rate of land utilization in an attempt to realize upon the investment and to provide the liquid funds required for meeting the tax obligation. Moreover, when the demand for land and its products is increasing, land values not only tend to rise, but at any given time are likely to reflect not the present i.e. actual, but rather the future, i.e. anticipated income-producing capacity of the land. Taxes levied upon land in accordance with this assessed capital value make for intensive utilization. Indeed, in their desire to make the most of their investment and to reduce the relative

¹ National Resources, Committee, *Farm Tenancy* (Washington, U.S. Government Printing Office, 1937), p. 6.

² Ciriacy-Wantrup, *op. cit.*, p. 162. For further details on the effects of taxation on the rate of land utilization see *Ibid.*, pp. 168-87.

burden of taxation to a minimum, farmers may intensify the utilization of their land to the point where soil depletion becomes economically irreversible.

Thus far we have considered institutional factors which give rise to social losses reflected in higher costs of farming (or lower revenues) and higher prices—as the case may be. In addition farming may give rise to social costs which the individual farmer is able to shift to a considerable extent to society and which he, therefore, will not, or need not, take into account. These are the secondary and tertiary damages caused by man-made soil erosion.

These types of damage are relatively well understood. As long as the land is protected by its natural vegetative cover no serious erosion is likely to take place. Such vegetation is likely to permit proper absorption and infiltration of precipitation. The soil-binding capacity of the roots of the plants will prevent any excessive run-off of rainfall. However, if this protective cover is removed, the absorptive capacity of land and infiltration of water are reduced and the soil is exposed to, and may be carried away by water and wind. The same thing is likely to happen if sloping land is plowed so that furrows run up and down hill, especially when the land is cultivated with clean-tilled crops such as corn and cotton. In all these cases accelerated run-off may dissolve the soil and carry it down the slope.

The type and extent of the harmful consequences of soil erosion depend upon such natural factors as the composition of the soil, the amount and distribution of rainfall, and the topography of the land. Thus, the sandier the soil, the more intensive the precipitation, the steeper the slope of the land, the more pronounced will be the effects of erosion. These natural factors are, however, given and not subject to human control. In other words, in order to avoid soil erosion, methods of cultivation have to be adapted to the conditions of the natural environment. If the farmer fails to do so and if rapid erosion sets in as a result of a combination of natural factors and price-induced farm practices, it is obviously the latter which must be considered as the cause of the devastation of the land and not the high rainfall or the steepness of the slope.

Two kinds of erosion may be distinguished: water and wind erosion. While both types of erosion may affect the soil and hence the returns of the farmer who caused the erosion, their indirect effects may be even more farreaching. Since it is the latter which give rise to most of the social costs caused by erosion it may be worth while to describe them briefly.

Once the surface soil is altered by cultivation or overgrazing its permeability is lowered. As a result run-off may be accelerated and the frequency and height of floods is likely to be increased. The lowered permeability of eroded soils increases the frequency and height of floods and reduces the natural replenishment of ground water stores, thereby affecting the water supply for domestic and irrigation purposes. Finally, the deposition of erosion debris may lead to the sedimentation of bottom lands, reservoirs and stream channels. In the semi-arid regions "... winds sweeping across the bare, dry surface lift the smaller, lighter particles into the high pathways of air currents, and carry dust great distances. . . . The coarser, less productive particles left by this process of wind assortment roll or leap along the surface until stopped by some obstacle in the pathways, thus covering fields of good soil and burying fences and other structures."¹ Other important social damages of wind erosion are evidenced by obstructive accumulations in fields, along fences, highways, and railroads, and by filling of ditches and covering of farm machinery and buildings. Also considerable damage is caused through the cutting-off of young grain by the abrading sand, and by covering of pasture grasses to be followed by weedy vegetation.

These destructive effects of wind erosion will be felt not only by farmers responsible for it but may spread over considerable distances. The development of the "dust bowl" in the arid regions of the American plains which led to the migration of hundreds of thousands of impoverished farmers from the central states to the Pacific coast was brought about by farm and grazing practices of the early settlers, the lowering of the ground water level by drainage of swamps several hundreds miles away as well as by the removal of the natural grass cover during the

¹ National Resources Board, *Soil Erosion*, (Washington, U. S. Government Printing Office, 1935), p. 10.

first World War in response to the increasing war-time demand for wheat. While individual farmers may have been able to recover their private outlays for a certain period, the price mechanism failed completely to record the social losses caused by the destruction of the ecological balance.

Deforestation

Forest resources may be said to have a natural growth rate which can serve as a bench mark for the evaluation of actual forestry practices. If the rate of cutting exceeds this annual increment of growth, the resource base is diminished; a capital asset is being consumed. Again we are not suggesting that rates of utilization must always be kept within the limits set by natural growth rates¹. However, competitive business enterprise has neither kept within these limits nor has it paid much attention to the social costs of a rapid depletion of available timber resources. As previously pointed out the process of depletion tends to feed upon itself, that is, it sets the stage for a cumulative process. One factor which plays a major role in this circular process is the long period of maturation for trees. Trees planted today will not reach maturity (i.e. the minimum size needed for lumbering) before half a century has passed. Indeed some species may take 100 years before they are ready for selective lumbering operations. For this reason investments in seed plantings are long-term investments which yield their income only after an exceptionally long period of time. As we shall show in the note on a fictitious optimum, any increase in the rate of time preference of their owners or any increase in uncertainty will be equivalent to reducing the present value of the expected future income flow. The way is then open to a gradual depletion regardless of the discounted long-run effects on the capital asset. Indeed the desire of private owners of forest lands to realize as quickly as possible

¹ Although there are forest regions in Sweden in which a multimillion dollar wood pulp industry is based on nothing more than the annual growth of pine and spruce forests of the Swedish hinterland. See *Resources* (Resources for the Future, Inc. Washington), February, 1960.

a maximum income from their initial investment has repeatedly led to a rapid expansion of lumber operations and has tended to intensify the competitive struggle for producing timber in the United States. Competition between different timber producing regions becomes ruinous and the resulting depressed prices, in turn, cause the use of destructive methods of production. Instead of applying methods of selective logging and systematic tree renewal without which forest resources deteriorate and sooner or later tend to be exhausted, lumber companies may find it more profitable, at least in the short run, to cut trees indiscriminately. In some cases only the best trees will be taken whereas, in other instances, it may be more profitable to cut even smaller and younger trees especially if the latter are found in more accessible areas. Moreover, low and depressed prices of lumber make it difficult to apply conservational practices such as proper disposal of slash (a substantial fire hazard), the elimination of insect pests and plant diseases, and the prevention of forest fires. In American private forestry, it is not so much the large private holder such as the big pulp and lumber manufacturers but farmers and other small owners whose cutting practices leave the land either without or with limited means for natural reproduction. Here, as in the case of other social costs, it is the competitive sector of the industry consisting mostly of small-scale operators who have remained the greatest offenders.

The progressive deforestation has had the effect of raising the costs of timber especially that of high quality and has made it necessary to use inferior woods. Furthermore, lumbering operations had to be shifted to areas far removed from the principal markets—which led not only to higher freight charges but also caused the migration of entire wood industries. As a result of the transient nature of these industries, forest communities have suffered and not infrequently have been left stranded.

The full extent of the social losses which arise from the competitive exploitation of private forest resources is realized only if we keep in mind that forests, in addition to being a source of timber, also perform important protective and economic functions, which accrue to people living in the entire drainage basin.

More than any other vegetative cover "forests retard run-off during heavy rains and periods of rapid melting of snows, and increase the amount of water that percolates into the ground."¹ This quality of forest vegetation, together with the soil-binding capacity of plant roots, not only prevents erosion and minimizes the sediment load of rivers and lakes, but, at the same time, equalizes flow of streams and thereby reduces the frequency and height of floods.² In addition, forests provide habitat, feeding ground and refuge for wildlife which has important economic and recreational values. To these values must be added the utility derived from the use of the forest ranges for grazing livestock³ and the income which thousands of persons obtain from the commercial exploitation of various minor forest by-products such as turpentine, nuts, fruits, sugar, syrup, tan bark, cascara bark, dye-stuffs, pharmaceuticals, etc. Forests may also contribute to favourable weather conditions by exerting a beneficial influence on wind velocity, humidity and temperature. The importance of forests as windbreaks has been emphasized by the experience of the Soviet Union and by the systematic establishment of tree belts along the Western border of the American plain.

Most of these utilities and protective functions of the forest remain inappropriable for the private owner of the forest land. The latter is not able to exact a remuneration for the soil-binding and flood preventing capacity of his trees. It is, therefore, not surprising to find that private management of forests tends to neglect these inappropriable utilities in its economic decisions and may sacrifice them completely in the course of intensive lumber operations.

¹A. E. Parkins and J. R. Whitaker, *Our Natural Resources and their Conservation* (New York, John Wiley and Sons, Inc., 1939), p. 244.

²For a more detailed and highly interesting discussion of these protective functions of forests see H. H. Bennett, *Soil Conservation* (New York, McGraw-Hill Book Co., 1939), pp. 421-22 and Parkins and Whitaker, *op. cit.*, pp. 244-48.

³About 342,000,000 acres of forest land are grazed seasonally by domestic stock. In some regions the agricultural economy depends upon the forage from forest ranges, the crop land being used for the production of hay and grain to carry flocks and herds during the winter. *Forest Land of the United States*, Report of the Joint Committee on Forestry, Washington, U.S. Government Printing Office, 1941), p. 13.

The neglect and disregard of the protective functions of forests may have all the farreaching negative consequences which we have just discussed in connection with the problem of erosion. Thus, subsequent to the progressive clearing of the land of its forest cover, infiltration of precipitation is reduced, water run-off is increased and valuable soil elements begin to be washed away. In periods of torrential downpours and melting snow the excessive run-off tends to increase the extent and magnitude of floods. "Sediment is carried into streams where it silts up reservoirs used for irrigation, for water-power development and for water supply; impairs the navigability of streams; injures their habitat value for fish; and spoils the recreational qualities of the water. During flood periods, moreover, the sediment may be spread over fertile lowland farms ruining or seriously injuring them."¹

In addition, if lumber operations clear the land faster than it can be taken into cultivation vast areas of cut-over land or "slashing" are created. These slashings are especially susceptible to fire which destroys not only the remaining shrub but causes damage to litter and humus under timber. The destructive effects of such fires again opens the way for an acceleration of run-off which, in turn, may cause serious damages to the soil by exposing it to erosion.

In short, private profit maximization in these industries has the effect of disregarding and sacrificing important protective functions of the forest and sets the stage for significant social costs. What causes these social costs is not lack of awareness or ignorance² of the physical interdependence between the forest, erosion, floods and forest fires but rather the lack of concern for any social benefits under the price system.

Wildlife and Fisheries

Wildlife and fisheries may be said to be legally "free" commo-

¹Parkins and Whitaker *op. cit.*, pp. 247-48.

²The negative effects of destructive methods of cultivation have not only been known for a considerable period of time but have also been given wide publicity. See A. R. Hall, "Early Erosion Control Practices in Virginia, U.S. Department of Agriculture, Miscellaneous Publication, No. 256 (Washington, U.S. Government Printing Office, 1937).

dites prior to their capture. The fact that property rights can be established only after their capture makes these "fugitive" resources particularly vulnerable to depletion by private hunters and commercial fishing interests. The fact that resources are fugitive and are owned neither in common nor privately, induces the individual hunter or fisherman to maximize his catch for fear that what he does not get will be caught by his competitor.

And yet, as we have pointed out, wildlife and fisheries are vulnerable self-renewable resources. The destruction of the breeding stock or the destruction of the habitat of these resources makes their depletion irreversible. Modern techniques of hunting and fishing enable man to reach this point with relative ease. Only as long as the rate of capture does not exceed the rate of reproduction of these animal resources, may their income yielding capacity be kept intact indefinitely. However, even if individual hunters and fishermen were to pursue a policy of reasonable conservation, they could hardly be expected to do so as long as cost-price conditions make it profitable for their competitors to continue "production". Far from preventing the depletion and possible extinction of renewable resources, a policy of conservation pursued by individual hunters or fishermen would in effect merely permit competitors to take their place and to produce a larger share, of the legally "free", although practically limited, animal resource. As a matter of fact, not even depressed prices and lower returns resulting from excessive production will necessarily lead to a curtailment of output. Quite the contrary, lower yields may actually prove an incentive to greater efforts on the part of the individual fisherman or hunter, inducing them to make up for their declining return by still greater output. In these efforts they will be aided greatly by highly efficient methods of fishing and hunting by which available animal resources can be depleted and extinguished within a remarkably short time.

Summary and Conclusions

The present chapter has dealt with another failure of the

price system: The tendency to extend the rate of utilization of renewable resources beyond the critical minimum and the neglect of physical interdependencies which we have described as the ecological balance. It is not the lack of awareness of these relationships between the vegetative cover and its protective functions—between the forests, the meadows and the rivers—but the institutionalized lack of concern of the private owner for all social benefits which causes this failure of the price system. In addition, as we shall show in the Note on the Fictitious Optimum, the institutionalized distortion of private time preferences tends to accelerate the rate of depletion beyond the safe minimum.

Starting with a discussion of the concept of ecological balance we developed what we called a pragmatic technical optimum in terms of the critical minimum beyond which any further increase in the rate of depletion leads to irreparable and irreversible exhaustion of resources. The concept can be defined with considerable precision. Although modest as an aim it serves as a bench mark beyond which organized society can go only by setting the stage for a narrowing of its opportunities of further growth and diversification and indeed, in some instances, by exposing itself to stagnation. And yet, as we have shown, the price system offers no guarantee that this point of no return will not actually be reached. In fact, under certain conditions the process of depletion may feed upon itself and become cumulative. This tendency is accentuated by the fact that some natural resources are "free" commodities prior to their capture. In these cases, any incentive to consider the depletion of the available stock as a deterioration of a valuable capital asset is lacking and even the gradual destruction of the resource remains substantially unaccounted for. But even when ownership rights to renewable resources can be established prior to their capture—as in the case of soil and forest resources—it is by no means certain that the farmer will or can avoid a rate of utilization which maintains the fertility of the soil or prevents deforestation.

Just as the fertility of the soil may be depleted if proper measures are not taken to maintain it, so may timber resources be destroyed if lumber operations are permitted to interfere with the normal

renewal of trees and other plants. The fact that both soil fertility and forest growth (unlike petroleum and coal) would remain dependable "flow resources" as long as certain ecological relationships are not disturbed, tends to emphasize the wasteful character of productive activities leading to their depletion and destruction.

Whereas the social losses arising from the destruction of wildlife are largely confined to, and measured by, the value of the capital asset which they represent, soil depleting methods of cultivation and forest depletion may have consequences which exceed in magnitude and importance those bound up with the loss of soil fertility and forest resources. In all these instances, the price system may be said to fail on three counts: (1) it cannot rationally define and aim at an ideal output position with regard to renewable resources; (2) it cannot take account of social benefits and hence fails to avoid or minimize the social costs born by third persons or society as a whole; and (3) it has a tendency to accelerate the rate of use of resources, thereby shifting utilization from the future to the present due to a general tendency to maximize current profits and to minimize current costs. That this may be the road to maximum future costs and minimum future benefits is either tacitly ignored or openly denied by those who put their trust in the price system.¹

¹ We have not felt it necessary to deal with the question of whether various forms of government "interferences with the price system" have not successfully arrested the trend toward depletion and accelerated utilization of renewable resources in the United States. This is a factual question which certainly ought to be investigated. Among the concrete questions that might be raised in this connection are the following: What authority do state and local governments actually have to regulate the rate of use of privately held resources? How effective have been the various soil conservation programs which provided the constitutional basis and cover for many of the farm-price and income stabilization efforts of the federal government? Why have the principles of TVA which was designed to capture a maximum of the elusive social benefits and to avoid the traditional social costs in resource use not been applied to other regional water utilization schemes in the United States? And, to anticipate our discussion of non-renewable resources, are federal tax subsidies and tax incentives conducive to a rational use of privately-owned resources or are they successful primarily in their effort to stabilize income and encourage research and development? And finally, what have been the actual conservation effects of pro-rationing agreements and interstate oil company commissions? For tentative answers to some of these questions see G. F. White, *Broader Bases for Choice: The Next Key Move* in H. Jarret (ed.) *Perspectives on Conservation*, (Baltimore, The Johns Hopkins Press, 1958), pp. 205-26.

Note on the Fictitious Optimum

The institutional approach to the study of resource depletion is based upon a pragmatic concept of a technical optimum. This concept includes the notion of ecological balance and is expressed in terms of a social minimum standard. It can be defined in operational terms. The concept of social minimum or critical zone makes it possible to trace the effects of different institutional arrangements on the rate of utilization of renewable resources and can serve as the basis for the formulation of alternative policies and practices. While it is not a policy objective, it is a bench mark which enables policy makers to appraise private practices and public policies. In this sense the social minimum standard may be said to be an organizing principle for the understanding of socio-economic reality and the prediction of the general direction of social processes under different institutional arrangements.

By contrast the definition of the optimum advanced by traditional economic theory is purely formal and non-operational. It does not and cannot take into account the effects of institutional arrangements and behavior patterns other than those based upon the maximization principle. It must disregard factors of uncertainty and formulate an optimum on the basis of the tacit belief that uncertainty and institutional behavior patterns can be disregarded without distorting the social process under investigation. As a result what starts out as a deliberate simplification and a legitimate fiction turns into a dogmatic identification of the fiction with reality.¹

In the course of this formal and at first purely fictitious determination of the private optimum the utilization of resources by private owners is considered as a process of maximizing the flow of net revenues derived from the physical asset. In order

¹ "A scientific fiction should be useful as a stimulus for or as part of hypotheses and theories which *can* be so tested. That means the test of a scientific fiction is its conceptual usefulness, its expediency in understanding, explaining, and predicting reality. A fiction becomes mere dogma, and, therefore, unscientific if its two characteristics—consciousness of its fictional nature and conceptual usefulness are obliterated." S. V. Ciriacy-Wantrup, "Philosophy and Objectives of Watershed Development," *Land Economics* August 1959, vol. xxxv, p. 214 n.

to define the optimum under these conditions it becomes necessary to maximize a flow of expected net revenues accruing over time. That is to say, the optimum is identified with the maximization of the present values of future revenues which would accrue as long as the physical asset is capable of yielding revenues. In short, what is called for is an estimate of the economic life expectancy of the physical asset and the discounting of this flow of revenues so as to reduce them to their present values. Such discounting calls necessarily for the use of an interest rate by which the future expected probable values are reduced to present values. The optimum rate of utilization under conditions of competition may be said to be that rate which enables the private owner (or user) of physical assets to maximize the present (i.e. discounted) value of the flow of expected net returns. This optimum rate is a theoretical construct believed to be useful as an analytical tool for the explication of the decision-making process as related to the determination of the rate of utilization of natural wealth under conditions of the price system.¹

We are not concerned here with the question of whether such "maximization" actually takes place and whether the individual owner of a resource makes the type of calculation which the theory has devised as a prerequisite of the attainment of the formal optimum. (It is indeed more likely, that entrepreneurs, in the field of resource utilization as in many other fields, follow various hunches and habits which serve as a kind of private pragmatic test, rather than a careful maximizing and discounting decision.) We are concerned here rather with the question of the operational character and logical consistency of a construct which defines the optimum as the maximization of the present value of expected revenues over the life expectancy of the assets as a social optimum. That is to say, we are not interested in refuting the maximization principle in the light of empirical evidence to the contrary; but we are interested in "testing" the operational implications of the construct of the private optimum. In short, our problem is to make explicit

¹ Ciriacy-Wantrup, "Resource Conservation," *op. cit.*, p. 93.

what would be necessary if one wanted to give operational meaning to a concept which operated with the maximum present value of expected net revenue over time.

Obviously in order to discount expected net revenues these revenues would have to be either known or at least knowable. This, we consider, is precisely out of the question. Future net revenues are intrinsically indeterminable, because neither future prices nor costs are or can be known beforehand. Future net revenues of long-term resource assets are not subject to any rational anticipation or reasonable calculation because such knowledge would have to include a variety of future developments which are indeterminable: future demand, future discoveries of reserves, future technical improvements in exploration and methods of recovery, technical progress in the use of resources and the development and availability of substitutes are some of these imponderables. Only if these factors could be deliberately controlled and determined beforehand would it be possible to "anticipate" and use them in projections of future revenues likely to accrue to the resource user. In the absence of such deliberate planning future net revenues are shrouded in uncertainty and indeterminacy.

It is sometimes believed that the projection of future demand can be calculated and projected on the basis of past rates of growth or growth correlations between resource input and G.N.P. Such an assumption is hardly warranted. For instance, recent studies have demonstrated beyond any doubt that the ratio of energy input to total output (G.N.P.) has varied widely; that there have been farreaching variations in the rate of growth of energy consumption from decade to decade and year to year and that the pattern of utilization of different substitutable resources has undergone continuous and radical change over the years.¹ A similar variability of input-output ratios over time, particularly at different levels of economic development,

¹S. H. Schurr, 'Past and Prospective Demands', in *Two Statements on The Nation's Energy Position*, Resources for the Future, Inc., Reprint No. 14 Washington D.C., December, 1959, pp. 7-9. See also *Energy in the American Economy 1850-1975*, Resources for the Future, Inc., (Baltimore, The Johns Hopkins Press, 1960). This study speaks of a tendency of decreasing input ratios of energy due to increased thermal output, transition to liquids, and increasing productivity of labor.

must be assumed to exist in the utilization of practically all other resources.

If the demand pattern of the future cannot be ascertained with any degree of certainty the future rate of discovery of new reserves, and the rate of technological progress in the use of recovered resources is even more uncertain. Once more we face a truly cumulative social process of causation. No doubt, as the recovery of known resources proceeds and is accompanied by increasing real costs and prices (measured in stable prices) there is an incentive to develop new and improved techniques of exploration which will make it possible to exploit lower grades and formerly submarginal deposits. Indeed as high grade deposits are depleted and exploration technology progresses it becomes economically worth while to exploit lower grade deposits. Since these lower grade deposits seem to occur in greater frequency than high grade deposits it follows that "as we go to lower grades the amounts of potentially usable materials usually become larger."¹

In short, the individual owner of a physical asset the use of which extends far into the future is confronted with factors and conditions which preclude any reasonable estimate of future net revenues. That is to say, the owner is unable to attribute any probable value to the flow of revenues. He may arbitrarily assume a value but any one such assumption is almost as good as any other. If the owner is incapable of attributing any probable value to future net revenues the latter obviously cannot be discounted in any reasonable fashion.

But even if the future probable value of a flow of new revenues could be meaningfully determined its present value could be calculated only by means of discounting operations which would equalize future and present values. The higher the interest rate chosen the lower the present value of the future flow of net revenues. That is to say the higher the rate of time preference the lower will be the value attributed to the flow of future expected net revenues, with the result that revenues will be sought in the present rather than in the future. In other words,

¹ Paul McGann, 'Economics of Mineral Exploitation', in *Science and Resources*, (H. Jarret, ed.) (Baltimore, The Johns Hopkins Press, 1959), p. 102.

the rate of utilization will be increased and shifted to the present by an increase of the interest rate.¹

The actual conditions which influence the competitive evaluation of present as against future revenues are such that they inevitably "distort" the discount rate in favor of present revenues as against future revenues. This is due to several factors. In the first place, the factors of risk and uncertainty which inevitably surround the expected net revenues tend to raise the discount rate at which, in the mind of the owner, future and present revenues must be exchanged or equalized. Secondly, the time horizon of the individual owner in calculations of this kind is necessarily shorter than that of society. That is to say, expected revenues will be progressively discounted as the "life expectancy" of the asset is longer. Thirdly, institutional factors will have a major influence on the actual rate of interest which will be used for the discounting operation. Foremost among these factors is the influence of advertising on consumers' and producers' time preference. Indeed, the interaction of the interests of consumers and producers in present satisfaction and the creation of "synthetic" wants by advertising has the effect of raising the general time preference over and above the relatively high preference which the private individual has anyway. Thus, while poverty makes for a high rate of time preference in the underdeveloped world the combined pressures and interests of producers in a modern affluent society lead to synthetic wants of consumers which likewise press in the direction of relatively high values placed upon current consumption. Whereas organized society has important reasons to place a relatively high value on the continued satisfaction of the needs of future generations the various factors just mentioned operate in favor of relatively high discount rates thereby tending to raise the rate of utilization in the direction of the present. The inevitable

¹"An increase in interest rates means, therefore, a progressive decrease (one that becomes greater with distance) in the present value of future net revenues—the progression being proportional to distance. The result will be an attempt by planning agents to change the time distribution of net revenues in the direction of the present. This can be accomplished through redistributing revenues in the direction of the present or through redistributing costs in the direction of the future or through both." Ciriacy-Wantrup, "Resource Conservation", *op. cit.*, p. 98.

outcome must be a widening of the gap between the rates of private and social time preference. Indeed it is the former and not the latter which determine the rate at which the future flow of expected net revenues is discounted. In fact, if the banking system and the government did not keep interest rates at which it is possible to obtain funds at a minimum, this distortion of the private rate of time preference would constantly give rise to the most serious underestimation of future goods and satisfactions. We are not arguing that the loan rate determined by the government and the banking system is able to keep the private time preference rate in check or that the latter "gravitates" toward the former. But we do suggest that in the absence of an official interest policy the private preference for present consumption would reach even higher levels.

As a matter of fact an economy which identifies all growth with consumption and stimulates the latter by all imaginable means including the powerful techniques of persuasion and manipulation of the modern mass media can only give rise to an uninhibited growth of consumption. Such an economy will persuade consumers to satisfy any and all conceivable whims and fancies no matter what the input requirements in terms of steel, energy, and other resources may be. Under such conditions, the rate of resource utilization is likely to be accelerated. Indeed the more such an economy follows the principle of accelerated obsolescence of all kinds of goods and gadgets,—the more will it be guided by the motto: "Produce it, buy it, throw it away"—and the more pronounced must become the progressive depletion of the nation's resource base.¹

We are thus led to the conclusion that the theoretical optimum

¹ The wood pulp that goes through the paper mills to be used for writing advertising copy, the extra steel that is needed for private automobiles of 2 to 3 tons each, the extra gasoline that is required to drive these vehicles often carrying only one person, the lead required to give us the high octane gasoline needed for the quick start, the chromium which adorns our cars, "that part of our food production which contributes not to nutrition but to obesity." (J. K. Galbraith, "How much should a Country Consume" in *Perspectives on Conservation*, *op. cit.*, p. 94)—these are only some of the aspects of a consumption economy which has been lavish in the use of its materials. "Vast quantities of materials have been wasted by over-designing and over-specification. We have frequently designed products, with little concern for getting maximum service from their materials and labor." *Resources for Freedom*, Washington, U.S. Government Printing Office, June 1952. Summary

formulated in terms of the maximization principle is unsuited for the definition of a social optimum of the rate of resource utilization. It creates an illusion of precise quantification which is purely formal (i.e. without content or operational substance). It is more than doubtful whether it helps in the understanding of the decision-making process under conditions of uncertainty; it fails to take account, and indeed, it forces the analyst to ignore institutional behavior patterns and conditions which determine the rate of resource use at any given time. A formal optimum which is not capable of taking into account these institutional arrangements turns out, upon closer analysis, to be a purely fictitious norm whose formal and abstract character precludes any practical-operational usefulness for purposes of policy formation. In fact, this as well as other optima of economic theory are what Veblen called "feats of the scientific imagination" which although originally not intended as a competent expression of the actual have nevertheless assumed the character of a scientifically validated norm and a tendency found in reality.¹ The norm based upon the maximization principle has become a dogma which makes it possible to criticize illegitimately practical policies as violations of the principle of economy. If this norm were followed, i.e., if the theoretical optimum actually determined the rate of resource use without any institutional restraints, it would have only one effect: to accelerate the rate of utilization of natural resources beyond anything that could be tolerated by organized society in the light of any reasonable concern for the interest of future generations.

When the most probable values of future revenues cannot be

of Volume I, p. 16. In 1955 our oversized private automobiles used up more than 45 percent of the total energy output in transportation. The significance of this figure for the rate of the utilization of this important energy resource is emphasized by the estimate that the number of private cars will rise from 52 million in 1955 to 114 million in 1975. Assuming that the consumption of gasoline per car will remain the same the rate of utilization of petroleum on this account alone will more than double in 20 years.

¹ "As happens in such cases, having once been accepted and assimilated as real, though perhaps not as actual, it becomes an effective constituent in the inquirer's habit of thought, and goes to shape his knowledge of facts. It comes to serve as a norm of substantiality or legitimacy." Th. Veblen, "The Preconceptions of Economic Science," *Quarterly Journal of Economics*, Vol. XIII, July, 1899, p. 442.

ascertained and discounted because of the intrinsic indeterminacy of the factors which determine this value; when private time preference and discount rates are distorted under a system in which the rate of consumption is increasingly influenced by producers and sellers; when furthermore the life expectancy and hence the discounting period for natural assets might vary from 10 to 100 years, one wonders whether the whole fictitious notion of a private optimum defined in terms of maximization of the present value of future expected net revenues is not in fact one of those withdrawals from reality which make it possible to preserve one's feeling of security in the face of disturbing social conditions and practices.¹

¹ For a more detailed analysis of the role of "withdrawal from reality" in scientific analysis particularly in the social sciences see W. A. Weisskopf, "Psychological Aspects of Economic Thought", *Journal of Political Economy*, (1949), LVII, 4, pp. 307-308.

CHAPTER SEVEN

NON-RENEWABLE RESOURCES AND SOCIAL COSTS

WHILE NON-RENEWABLE resources cannot have a "critical zone" beyond which an irreversible process of depletion may set in, they are for all practical purposes limited in quantity and hence exhaustible. Indeed, the higher the rate of utilization the sooner will this point of exhaustion be reached. There is no rate of utilization at which the resources may be said to renew their flow. There is no natural rate of reproduction, for all practical purposes, within the time horizon of human history. The fact that many of these non-renewable resources like oil, coal and metals have become the foundation of man's industrial civilization seems to make their exhaustion an equally if not more serious social problem than the depletion of renewable resources.

However, while these resources are, by definition irreversibly exhaustible, their relative importance in modern industry is affected by technological change. In short they are replaceable. There are those who argue that these opportunities for substitution which technology can open and is in fact constantly providing obviates any major concern for the rate at which modern industrial societies consume their non-renewable industrial resources. This position, however, oversimplifies the problem by disregarding not only important social costs connected with the commercial exploitation of these resources but also the costs and uncertainties which surround all phases of technological advance. Technological progress is neither automatic nor is it available without cost. In fact in the absence of substantial public investments and deliberate public policies devoted to the promotion of research many important substitutes would not be available to-day and many materials would have already become scarce and prohibitively

expensive. Business enterprise and the market incentive did not, after all, develop the basic research which gave us the three most important substitutes of the twentieth century: synthetic nitrogen, synthetic rubber and atomic energy.¹ Current research devoted to the desalinization of ocean water, the mobilization of solar energy, the development of rocket fuels and the application of atomic energy to industrial uses is financed almost exclusively from public sources. While the development of substitutes is possible—although always at a price—the result of investment in research is neither automatic nor certain. Moreover, the view cannot be rejected outright that increasing scarcity and rising prices of vanishing resources might benefit some owners of private resources and that the development of substitutes is a field that does not offer adequate incentives to business enterprise. For this reason the development of substitutes may be another area which calls for decision-making in terms of deliberate technical calculations and projections, taking into account the relative state of exhaustion of different non-renewable resources. The economist who is used to operate with an economic optimum expressed in terms of marginal private costs and marginal private returns may have to devise more relevant tools if he wants to make a contribution to this important field of public policy.

It is true, as we have pointed out in the preceding discussion on the fictitious optimum, that increasing private costs and prices will act as an incentive to develop new and improved techniques of exploration and recovery. As a result it will become worth while to exploit lower grade deposits and the amounts of potentially usable (i.e. lower grade) materials will actually increase. In short, just as the concept of "commercial resource" depends upon current costs and prices, the concept of "available reserve" depends upon future costs and prices. These in turn depend again upon several factors such as the progress of technology and the utilization of the formerly submarginal substitute (as, for instance, atomic energy or solar energy). In any area that is shrouded in great uncertainty it

¹ J. K. Galbraith, "How much Should a Country Consume?" in *Perspectives in Conservation*, *op. cit.*, p. 91.

is of course always possible to arrive at diametrically opposed interpretations. However, no responsible social scientist can overlook the fact that while linear projections and assumptions are always risky in social affairs they are particularly hazardous in the field of non-renewable resources. Furthermore, whatever substitutes may become available in the future, we cannot be sure and have to discount the probability of their becoming available and, moreover, we will have to make allowance for the fact that the development of substitutes requires substantial investments and deliberate research policies. Above all, the time horizon of organized society in all matters related to the resource base must necessarily extend further than that of an individual or a private firm.

While it has always been an illusion to assume that mankind, or for that matter a country like the United States, faces disaster owing to the rapid depletion of its mineral resources the fact remains that the resource base is given and constitutes a limit regardless of price-cost considerations and technological progress. And even though it is true that "proved", i.e. commercial or recoverable reserves are doubtless underestimated, because of the fact that only *current* cost-price relations are considered, the actual available reserves may be a relatively sufficient and secure resource base if viewed in the perspective of the next fifteen or even fifty years. The outlook will be considerably less reassuring if viewed in the perspective of the next hundred or two hundred years.

Even the next fifty years may see such an expansion of world demand for mineral resources (due to a cumulatively rapid expansion of output in industrially underdeveloped countries) that all past rates of growth will have become out of date. Thus, if the short- and medium-run perspective is still reassuring the long and very long perspective is far from secure. For this is the period in which all projections point to an enormous increase of demand for mineral resources not only from the developed countries where an increasing tendency of "waste-making" and planned obsolescence seems to become characteristic but from the now developing countries with their rapidly increasing populations. In a thousand years "no one would say that we

can depend heavily upon coal and petroleum for the energy base of our world economy. Unless 'breeding' of nuclear materials becomes economic, we would also probably be running out of economic ores of uranium and thorium regardless of any practical exploration efforts. This is the 'conservation nightmare'—that our civilization would follow that of the Mayas into oblivion, having depleted its basic natural resources that are within the scope of its technical knowledge."¹

Meanwhile, i.e. even within the next fifty years, the depletion of specific resources will make itself felt in a gradual increase of (real) costs because recovery and exploration will have to shift to less accessible and lower grade deposits. The principle of increasing costs will make itself felt long before the point of exhaustion is reached and regardless of the fact that new explorations will make available—at least for the foreseeable future—increasing supplies of commercial low grade deposits. Furthermore as this process of depletion continues both industrial and newly developing nations may have to adjust themselves to the position of importers of raw materials. The implications of such a position for national defense raises farreaching consequences especially for a country like the United States that has long enjoyed a position of relative self-sufficiency in most although certainly not all minerals.

Current calculations of the mineral reserves of the United States tend to support the view that the domestic supply curve of crude petroleum, which had been shifting steadily outward (at given real prices) has since been fixed in position with output increasing about ten percent for every ten percent increase in real price."² In contrast, bituminous coal and anthracite seem to exhibit inward shifting supply curves "mostly because of rising labor costs, but depletion has been significant for anthracite."³ Iron ore is believed to have stable supply curves with output rising by ten percent in response to a ten percent change in deflated prices. The supply situation of copper and lead is less favorable with output changes lagging behind

¹ Paul McGann, "Economics of Mineral Exploration," in *Science and Resources*, (Henry Jarrett, ed). (Baltimore, The Johns Hopkins Press, 1959), p. 111.

² *Ibid.*, p. 103. ³ *Ibid.*, p. 103.

increases of real prices.¹ But here too, as in the case of water and air pollution, available data are less than adequate for the purpose of ascertaining the true effects of increasing outlays for exploration and of the investment of billions of dollars of indirect subsidies granted in the form of special depletion allowances and favorable tax treatment.

Estimates of possible price increases (in constant dollars) of important minerals in the United States range from twenty-five percent for crude petroleum, to forty, forty-five and fifty percent for aluminium, bituminous coal, iron ore and copper respectively². Admittedly these estimates are based upon projections of past rates of increase of GNP and mineral consumption. The competitive coexistence of America and the Soviet Union, increasing rates of "planned obsolescence" and development in the direction of a gadget economy are likely to invalidate all past input-output relationships that have marked the rate of consumption of non-renewable resources.

On the other hand, the commercial development of nuclear energy for running factories and trains, and for lighting and heating homes would radically affect these forecasts and might actually put an end to the "conservation nightmare." There seems to be little doubt that atomic fission offers potentialities of an abundant supply of energy for industrial purposes. Atomic energy plants could provide power and heat for cities and factories, for ships as well as for remote places where the costs of oil and coal are prohibitive. The advantages of atomic power seem to rest primarily upon the "extraordinarily low rate at which fuel is consumed in proportion to the energy released, the consequent low first cost of fuel considering the energy available in it, and the wide flexibility and easy control of the rate at which power is developed. The insignificant weights of uranium as compared with coal or other non-atomic fuel for equal amounts of heat energy may also play a role in areas of high transportation costs."³

However, the use of atomic energy for industrial purposes still depends upon the solution of many technical problems. Its application to peacetime uses is still in the early stages. Not

¹ *Ibid.*, p. 104. ² *Ibid.*, p. 109.

³ *The International Control of Atomic Energy*, The U.S. Department of State (Washington, U.S. Government Printing Office, 1946), p. 84.

the least important among these problems which tend to delay the application of atomic energy to industrial uses is the need for heavy protective shields against radioactivity which, at least at present, eliminates the use of atomic energy for such purposes as driving motor cars or airplanes of ordinary size. While it is impossible for the social scientist and perhaps even for the physicist to foresee all of the possibilities of atomic research, it seems probable that the economical application of atomic energy for industrial purposes may well be delayed for years or even decades. But even if unforeseen progress in atomic research should shorten this period considerably, it seems safe to say that atomic energy is not likely to replace altogether the use of coal and petroleum resources. These considerations as well as the fact that substitutes for limited petroleum resources of the United States are still in the submarginal state, make the premature depletion of energy resources a matter of concern not only for the conservationist but for the economist as well.

An institutional approach to the problem of the utilization of non-renewable resources reveals the occurrence of substantial social costs in the sense of technically and economically avoidable wastes which the competitive recovery of these resources apparently cannot avoid. Thus there are not only avoidable duplications of capital inputs and unnecessarily high current costs of recovery but also economically non-recoverable losses of reserves as well as typical cumulative processes which tend to accelerate the rate of utilization of resources and thereby sacrifice important future uses for present uses which have at best only a low priority status.

The Competitive Recovery of Petroleum Resources

Like wildlife, petroleum and natural gas are "fugitive" or "migrating" resources in the sense that they are capable of changing their location. Crude oil tends to flow "toward any point where the pressure is reduced below the equalized natural pressure throughout the reservoir. This means it flows toward any well that penetrates the structure."¹ Moreover, crude oil

¹ M. W. Watkins, *Oil: Stabilization or Conservation* (New York, Harper and Brothers, 1937), p. 38.

and natural gas are also "free" resources inasmuch as property rights to these resources are recognized only after their capture. Just as game belongs to the hunter who kills it, crude oil belongs to the owner of the oil well from which it is produced regardless of whether or not the oil migrated from beneath land to which some one else had title.¹ "Consequently, when a new pool is discovered, each operator races to drain the field before the oil migrates and is produced through a neighboring well."² Even if an individual owner should prefer to postpone production in anticipation of higher prices in the future, he will not do so because he would probably lose the resource altogether.

It is, therefore, not surprising that the discovery of new reserves usually gives rise to a race of competitive drilling in the course of which wells tend to be spaced in a manner designed to maximize their offsetting effect upon each other. Not only will an excessive number of wells be drilled, in each newly discovered dome but the position and spacing of these wells will be governed by the desire of each operator to capture as much oil as possible³. As a matter of fact, the more scattered the ownership of the surface land the more accentuated will be the general rush to withdraw oil from as many "offset" wells as possible. This practice of draining oil pools as rapidly as possible receives additional impetus from the fact that oil wells are often operated under a leasing system. In the majority of cases the owner of the oil-bearing tract receives a royalty on the oil produced and therefore is materially interested in the technique and volume of oil recovery from his property. Not infrequently, special stipulations in the leasing contract compel the operating company to produce and to drill offset wells. In

¹ In fact, this so-called "rule of capture" which for all practical purposes, determines the ownership of crude oil was first laid down in strict analogy to the case of wild game whose fugitive character made the establishment and enforcement of property rights prior to its capture difficult, if not impossible.

² National Resources Committee, *Energy Resources and National Policy* (Washington, U.S. Government Printing Office, 1939), p. 201.

³ For an illustration by maps of the location of oil wells designed to offset the draining of oil from adjacent tracts under competitive conditions, see G. W. Stocking, *The Oil Industry and the Competitive System* (Boston, Houghton Mifflin Co., 1925), pp. 140-64.

other words, if the lessee decides to retard production he would not only "suffer" the loss of oil captured from him, but also forfeit the lease itself for neglecting the interests of the lessor."¹

As a result of the general rush to recover crude oil from all existing fields production may be so far in excess of demand that construction of extensive new storage facilities are required.² The oversupply of oil resulting from the competitive expansion of oil-producing facilities depresses prices and may lead to the shut-down and even complete abandonment of marginal wells,³ thus causing social losses which go far beyond the usual capital losses of any shut-down of over-expanded plant capacity. For the premature abandonment of pumping wells may cause the oil and gas to migrate from productive strata to beds from which the fluids cannot be reclaimed, or may prepare the way for the invasion of surface and underground water into the oil sands. Furthermore, "once oil wells are plugged, it may be impossible to open them again [even if] prices rise above their costs of operation."⁴

Moreover, low prices of oil and oil products force operating companies to restrict capital input by producing with cheaper and less efficient equipment or by resorting to technically

¹ F. E. Pogue, "Economics of Conservation and Proration in the Petroleum Industry", *Petroleum Industry*, Section I, Part 14, Hearings before the Temporary National Economic Committee, Seventy-Sixth Congress (Washington, U. S. Government Printing Office, 1940), p. 7439.

² If open pits or open tanks are used the storage of surplus quantities of oil is bound up with certain losses due to evaporation, seepage and heavy rains.

³ It must be emphasized, however, that "once a well has been sunk, the marginal cost of production, consisting of labor to watch the well and power to pump it (if it needs pumping) is extremely small. The price at the well can, therefore, fall to almost nothing without discouraging production." A. R. Burns, *The Decline of Competition*, (New York McGraw-Hill Book Company, 1936) p. 23. According to Professor Isc, millions of barrels of oil are reported to have been sold for as little as 10 cents a barrel. *Petroleum Industry*, *op. cit.* p. 7102.

⁴ National Resources Committee, *Energy Resources and National Policy*, *op. cit.*, p. 193. The impossibility of reopening abandoned wells may be due to the fact that the "well casings corrode when wells are shut in, and in some areas the rate of corrosion in shut-in wells is at least three times as great as when wells are producing. Corrosion causes well casings to collapse, and redrilling and clean-out jobs are imperative if the wells are to be pumped again." U.S. Bureau of Mines, *Third World Power Conference*, Transactions, Vol. VI, Paper 12, pp. 768-9, (Washington, U.S. Government Printing Office, 1938).

wasteful methods of recovery.¹ Finally, depressed prices tend to stimulate the use of oil and its products for purposes for which non-exhaustible resources would have been used if the price of oil had been maintained at a higher level.

Other social losses arise as a result of the fact that oil is often produced together with natural gas. In many cases, oil and natural gas are actually produced at joint costs, that is, "the production of gas with oil cannot be avoided, and the gas cannot be shut in entirely without shutting in the oil as well."² As often happens in cases of production at joint-costs, profit considerations may require a level of production at which one or several of the joint products have to be sacrificed, due to the lack of proper marketing facilities or even the absence of any demand for a particular product. Thus, if, at any given time, more gas is produced than can be absorbed by consumers, the profitability of the production of oil may induce the operator to waste the "useless" gas entirely. In other instances, oil wells have been "blown into production" and gas has been permitted to blow into the air in order to appropriate as much oil as possible in the shortest possible time from the common reservoir. Instead of providing first for adequate storage and marketing facilities (such as reservoirs, pipe-lines and processing plants) for gas, one of the two joint-products is wasted entirely. The social costs involved in this practice are not confined to the loss of so many cubic feet of gas discharged into the air. They go much further because the loss of natural gas reduces the pressure in the oil reservoir and thereby "greatly increases the cost of recovering oil, because pumping has to be initiated sooner. Not only that, but the obtaining of the remainder of the crude requires a much longer period of time, which means more labor and a greater use of capital."³ The premature loss of pressure

¹ We refer to methods involving, for example, the use of inefficient equipment and defective well casings resulting in losses of oil, gas and reservoir energy; other wasteful practices have already been mentioned as, for example, the operation of oil wells with improper gas-oil ratios and the physical wastage of gas at the surface.

² *Petroleum Investigation*, Hearing before a Subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, Seventy-sixth Congress (Washington, U.S. Government Printing Office, 1939), p. 400. (quoted as *Petroleum Investigation*, 1939).

³ National Resources Committee, *Energy Resources and National Policy*, *op. cit.*, p. 190.

in the oil reservoir also increases the proportion of the oil deposits which will have to be left underground in strata from which they cannot be recovered at all. In spite of these facts, the practice of permitting gas to blow into the air may be more profitable for the private operator than any other procedure. This again is due to the fact that slower production would result in the migration of oil and gas to neighbouring fields and thus be entirely lost for the owner of the tract of surface land.

As in the case of renewable resources only an institutional analysis is capable of focusing attention upon the significant social costs connected with the competitive exploitation of these important energy resources. As a matter of fact, such an analysis brings to light important opportunities of economies which would accrue if technical standards of recovery were permitted to guide productive activities in this field. Not only could unit costs of recovery be reduced if reserves were treated as what they technically are—namely, geological units—but the percentage rate of recovery of the total resource underground could be increased. A similar situation will be found to exist in the exploitation of coal reserves.

The Competitive Recovery of Coal Reserves

The recovery of coal takes place under conditions which differ only slightly from those prevailing in the petroleum industry. In contrast to crude oil and wildlife, coal reserves have a fixed location and property rights can, therefore, be clearly delimited and established before the coal is recovered. Consequently it is not possible for one producer to take the coal from underneath a neighbor's land without committing an act of robbery and without exposing himself to his neighbor's claim for damages. Nevertheless, the economic and technological conditions under which coal is being produced under competitive conditions lead to a rate of production and to methods of recovery which in many respects have the same effects as those prevailing in the petroleum industry. Scattered private ownership of the surface land and the relatively great number of mines in operation, the desire of private owners and commercial operators to realize upon their property *now* rather

than in the future, the private costs (in terms of interests and taxes) of holding undeveloped coal land, the extension of railroad facilities to remote coal regions together with maintenance of special freight rates for such regions and highly mechanized methods of mining—all of these factors¹ have been responsible in the past for the opening of mines and the development of coal fields with a capacity to produce coal in excess of actual requirements. It is needless to say that such overexpansion has had the effect of accentuating the periodic depression of the American coal industry.

The social costs resulting from such overdevelopment are first reflected in a depletion of irreplaceable coal reserves with varied negative consequences for the future. They find their expression in excessive capital outlays, depressed prices and an uneconomical inducement to employ coal for less urgent uses. More than this, low prices and the general uncertainties of the industry make it often impossible to plan and carry out mining operations as economically as would have been feasible had coal prices been higher. Thus, under the pressure of competition, individual operators find it profitable to minimize current outlays "by mining only the most readily available portion of the reserve . . . although the ultimate result is either higher costs of mining or a compulsory shift of operations to a new location."² The objective of reasonable conservation is likewise defeated when recovery of coal from underlying thicker beds makes it impossible to mine overlying thinner beds. "These beds, if of minable thickness, are likely to be so broken and crushed by the setting of the rocks forming the roof of the thicker bed and the floor of the thinner bed that the overlying thin bed cannot be recovered at all or only at very great expense."³ Furthermore, during depressions mines may not be operated "at a sufficiently high percentage of capacity to maintain them in good condition."⁴ Depressed prices likewise

¹ For a more detailed analysis of the effects of some of these as well as other factors see: National Bureau of Economic Research, *Conference of Price Research, Committee on Prices in the Bituminous Coal Industry* (New York, 1938), pp. 12-27.

² National Resources Committee, *Energy Resources and National Policy*, *op. cit.*, p. 100.

³ *Ibid.*, p. 341. ⁴ *Ibid.*, p. 93.

account for the use of mining methods which fall short of certain minimum standards of technical efficiency which it would be possible to maintain if conditions in the industry did not make for an accelerated expansion of operations.¹ A general demoralization of prices may finally cause marginal mines to be shut down with the inevitable choice of either heavy maintenance costs or premature abandonment, or both. In addition, any premature abandonment makes coal mines, like oil wells subject to progressive deterioration and destruction. For 'pillars may then crumble and stopes cave in, haulways break down, waters collect and in a relatively few years, the accumulative effects may be so bad that the life hazards alone may make the reopening highly questionable.'²

No attempt will be made to extend our institutional analysis to other non-renewable resources such as lead, copper, iron ore, phosphate, potash, or uranium. The competitive exploitation of these important industrial resources is also marked by significant losses.³

Summarizing the preceding discussion it may be said that the social costs resulting from the competitive exploitation of energy resources are reflected in

- (1) An unnecessary duplication of capital outlays;
- (2) The loss of reserves as a result of the fact that surplus capacity and depressed prices force operators to make use of technically less efficient methods of production and to abandon wells and mines prematurely;

¹ For a comprehensive and descriptive analysis of certain wasteful mining practices see *Ibid.*, pp. 93-95, and pp. 338-45.

² A. E. Parkins and J. R. Whitaker, (ed.) *op. cit.* p. 416.

³ These social costs will vary from case to case. They may take the form of an unnecessary loss of reserves, a duplication of capital inputs, high costs of recovery and a cumulative acceleration of the rate of recovery. That, in addition, mining operations may cause social costs which are shifted to third persons may be seen from the following conditions reported to prevail in a region of phosphate mining in the United States. "The companies mining phosphate in Tennessee tear up many thousand acres of good farming land and leave the earth and topsoil piled in big windrows. Rain-water then courses down the gullies and soon cuts them so deep that there is no longer enough earth in the windrows to fill the gullies. The land is thereby ruined for agricultural use." H. A. Curtis, "The Barrier of Cost," in *Perspectives on Conservation*, *op. cit.*, p. 83.

- (3) The premature depletion of oil and coal reserves and the negative consequences thereof upon future generations.

As far as the total social costs resulting from the premature depletion of energy resources are concerned it is impossible to estimate their probable magnitude with any meaningful precision. This is partly due to the fact that it is not known how long present reserves of energy resources will last. For obviously, their "life expectancy" is dependent upon such unpredictable factors as new discoveries of reserves, improvements in methods of their recovery and use, the development of substitutes and future demand. Furthermore, the magnitude of the social costs caused by the premature depletion of non-renewable oil and coal reserves is largely dependent upon the value which these resources will possess in the future. This future value cannot, however, be ascertained since it depends to a considerable degree upon the extent to which substitutes and other potential power resources (as, for example, atomic energy, water, wind, and tidal power) may become active energy resources.

Although the foregoing considerations introduce elements of uncertainty into all problems related to the depletion and conservation of natural wealth, it would be an illusion to believe that the present depletion of energy resources will affect only future generations. In the first place, such a belief fails to take into consideration that long before the point of complete exhaustion is reached, their recovery will become increasingly costly, because oil production and mining will have to shift to deposits with leaner and leaner contents and will have to be undertaken at greater depth and in more inaccessible regions. For example, it has been estimated that drilling costs mount more or less geometrically as wells go deeper. This rapid increase in costs is due to various factors such as the need for more and heavier equipment, the greater hazards involved, the loss of drilling equipment and all sorts of tedious and expensive delays.¹ In other words, continued recovery of oil and coal and the production of their derivatives is possible only at constantly

¹ National Resources Committee, *Energy Resources and National Policy*, *op. cit.*, pp. 150-51.

increasing costs. In conclusion, it is only necessary to emphasize that energy resources, such as petroleum and coal, play a strategic role in modern industrial economies both in connection with the requirements of peace-time production and the provision of airplanes, tanks and ships in the emergencies of war. This fact alone, it would appear, tends to make it hazardous for any country to look with equanimity upon the depletion of energy reserves as long as satisfactory and cheaper substitute power resources are not available. At any rate, organized society can hardly base its policy towards the depletion of non-renewable resources upon the doctrine that the future will take care of itself and that shortages in times of emergencies will lead to the development of the required substitutes for scarce resources and materials.

CHAPTER EIGHT

SOCIAL COSTS IN RESOURCE UTILIZATION: EVIDENCE AND ESTIMATES

THE preceding two chapters have been concerned with an institutional study of the social costs which may arise in the competitive utilization of resources. In this context we have developed general criteria for the determination of these social costs. In the case of renewable resources, we have emphasized the relevance of a technical pragmatic optimum based upon the related concepts of the ecological balance and the "critical zone". In the case of non-renewable resources we stressed the complications which result from the fact that the future is shrouded in the general uncertainties which surround all conditions of demand, the development of substitutes, and improvements in the recovery and use of most mineral resources. While these uncertainties may or may not reduce in the long run the risks involved in a policy of rapid depletion, we cannot dismiss easily the long-run "conservation nightmare". In addition, there are the specific social costs to which the competitive exploitation of non-renewable resources gives rise. These costs resemble in character and mode of origin the social losses which occur in the utilization of renewable flow-resources. The present chapter presents some quantitative evidence and estimates of social costs in the use of resources.

Many of these data go back to a chapter in economic history that is now closed. In some instances the depletion has run its course and the exhaustion is irreversible. In others, more or less effective institutional restraints have put an end to the most obvious social losses which resulted from the rapid exploitation of the resource due to the increasing demands of an expanding population and "improvements" in the techniques of recovery or "capture". In still other cases where no restraints and institutional controls were set up—as, for instance, in the

competitive exploitation of some "fugitive" fisheries in international waters—the process of depletion is still going on.

Wildlife

A classical case of depletion beyond the critical zone is the commercial exploitation of many animal resources. As we have shown, the destruction of the breeding stock or the habitat of animals causes an irreversible extinction of these resources. This is precisely what has happened in the United States and elsewhere as a result of the uninhibited exploitation of many animal resources. Admittedly, the wildlife of America could not have been preserved undiminished. The gradual settlement of the continent, the expansion of population, the removal of the forest cover for farm and town sites and, the transformation of prairie areas into grain and cattle producing regions, made these former domains of animals more or less unsuitable for practically all kinds of wildlife. However, there can be no doubt that the competitive exploitation of fish and of most game and fur-bearing animals went far beyond the extent to which wildlife had to be sacrificed in the course of the settlement of the continent.

In the United States, the fur-bearing animals were among the first to be depleted by the competitive process. As Veblen pointed out: "Business enterprise has run through that range of natural resources, the fur-bearing animals, with exemplary thoroughness and expedition and has left the place of it bare. It is a . . . concluded chapter of American business enterprise."¹ The social consequences of this extinction of fur-bearing animals went far beyond the destruction of valuable capital assets. For, "indirectly and unintentionally, but speedily and conclusively, the traffic of the fur traders converted a reasonably peaceable and temperate native population to a state of fanatical hostility among themselves and an unmanageable complication of out-laws in their contact with the white population."² How effective the competitive exploitation of animal resources has been in

¹ Th. Veblen, *Absentee Ownership and Business Enterprise in Recent Times* (New York, The Viking Press, 1923), p. 168.

² *Ibid.*, p. 169.

the past is perhaps best illustrated by the effects which certain methods of hunting and trapping had upon wildlife.

"Traffic in game as food flourished after the Civil War and probably reached its peak in the 1880's. During that time uncounted millions of passenger pigeons, prairie chickens, grouse, ducks, geese, upland plover, snipe, woodcock, quail, and other food species were annually sent to market by gunners who, except for a few months in midsummer, shot and snared game the whole year around."¹

The literature on conservation is replete with evidence on this point. Suffice it to cite only two examples:

"In Southern California during the winter of 1902, two hunters armed with automatic shotguns killed 218 geese in one hour and their bag for the day was 450 geese."² "Night hunting was formerly the cause of great killings. A boat could be poled in the midst of flocks of sleeping ducks and dozens killed with a single discharge. Many more were hopelessly crippled but died where they could not be recovered by the market hunter."³

No elaborate analysis is required to show that these and similar highly effective hunting methods made not only for an abundant supply of game on the market but also for low prices⁴ of meat and furs which in turn stimulated the demand for these products of hunting and trapping. The depletion of animal resources thus tended to become cumulative and self-sustaining.

The final results of this cumulative process of depletion may be seen from the following nostalgic account of the present wildlife situation in the United States:

¹ I. N. Gabrielson, *Wildlife in the New World Economy* (Washington, D.C. Bureau of Biological Survey, U.S. Department of the Interior, 1940) mimeographed, p. 3.

² A. F. Gustafson, et. al. *Conservation in the United States* (Ithaca, Comstock Publishing Co., 1939), p. 301.

³ *Ibid.*, p. 311.

⁴ In Western markets wild turkeys are reported to have been sold for 25 cents, wild geese for 10 cents and ducks could be obtained three for a quarter; skins of buffalo sold for as little as 50 cents each. *Ibid.*, p. 301.

"The great herds of buffalo no longer blacken the plains. . . . The antelope millions have been greatly reduced until they number thousands rather than millions. Elks have long disappeared from the East, and are largely restricted to the western mountains. Moose are so rare in the East that their occurrence brings about newspaper comment. Our fur-bearers have been greatly reduced. Marten, fisher and otter are now scarce. The wolverine is almost gone from our forests. Beavers have disappeared with the cutting of the forests. Such common fur animals as muskrat, mink, racoon, and skunk, have declined. The wonderful and impressive spectacle of immense flocks of passenger pigeons is but a memory. . . . The great armies of wild fowl are seen no more, but only the survivors of their broken ranks. The very last of the once abundant heath hen died in 1931. The whooping crane and trumpeter swan seem destined to go."¹

No wonder that Veblen who must have witnessed the last stages of this depletion of wildlife resources described the whole process as a conversion of "unexamined natural resources to absentee ownership, with all haste and expedition so soon as they . . . became valuable enough to be worth owning."² To be sure the process is not particularly an American one. "In the last analysis, the difference in this respect between the American and other civilized nations will probably resolve itself into a difference of opportunity, and there is no wide difference at that. This American plan or policy is very simply a settled practice of converting all public wealth to private gain on a plan of legalized seizure."³ A similar "plan of legalized seizure" has caused the rapid depletion of such free and fugitive resources as seals and whales which once formed the basis of prosperous industries.

Fur seals once existed in great numbers on the Pribilof Islands. "It is estimated that before the purchase of Alaska by the United States in 1867, several million fur seals inhabited

¹ *Ibid.*, p. 300.

² Veblen, *Absentee Ownership*, *op. cit.*, p. 168.

³ *Ibid.*, p. 168.

these islands in a single season.”¹ As a result of excessive slaughter, “the animals were much reduced and actually threatened with extinction”² until the taking of fur seals in the North Pacific was regulated by an international agreement between the United States, Japan, Russia and Great Britain in 1911. Since that time, “the seals have increased from approximately 125,000 animals in 1911 to more than 1,800,000 in 1937.”³

In contrast with this policy of deliberate restriction of the taking of fur seals, the progressive depletion and rapid extinction of the whale is still under way.⁴ The practical extinction of whales in regions where they formerly were plentiful, merely reflects the growing efficiency of the international whaling industry. This “efficiency” of modern methods of whale-hunting is indicated by the fact that nowadays whales are “located and reported by wireless-equipped airplanes and killed by electric harpoons.”⁵ Moreover, the competing whaling industries of Great Britain, Norway, Germany, the Soviet Union, and the United States consists of “large steel vessels . . . which have been turned into veritable floating factories. . . . Each of these mother-ships employs a number of small but high-powered chaser boats. Equipped with a Norse invention, the Foyn harpoon gun which shoots a harpoon carrying a bomb in its tip, the chaser hunts down the whale, then tows it back to the mother ship. The carcass is dragged up a runway to the cutting floor inside the vessel, where it can be completely processed in two hours. . . . A single successful whaling season in the Antarctic may result in products worth \$2,000,000 per

¹ Gustafson, *et. al.*, *op. cit.*, pp. 290-91.

² *Ibid.*, p. 291. For details see F. Tomasevitch, *International Agreements on Conservation of Marine Resources*, (Food Research Institute, Stanford University 1942), pp. 77 and 88-90. The Fur Seal Convention was abrogated by Japan in 1940.

³ Gustafson, *et. al.*, *op. cit.*, p. 291.

⁴ Estimates place the whale population of the globe at not more than 350,000 — “a mere remnant of the hordes which once frequented the seas.” A. E. Parkins and J. R. Whitaker, *Our Natural Resources and their Conservation* *op. cit.*, p. 526.

⁵ Gustafson, *et. al.*, *op. cit.*, p. 289.

vessel.”¹ Though highly profitable in terms of outlays and returns from a short-run point of view, such methods of hunting have been responsible for a rate of killing far in excess of the natural replacement rate of the animals thereby preventing their natural reproduction. This international scramble for commercially valuable animals and their ultimate extinction can be prevented only by means of international agreements.²

The decline of the shad and salmon fisheries on the Atlantic and Pacific Coasts is another example of substantial social losses caused by the uninhibited exploitation of a valuable natural asset beyond or close to the critical zone. The breeding habits of these two species make them especially vulnerable to destruction. While their feeding grounds are in salt water, both salmon and shad must leave the sea and enter rivers to spawn. This is the time when they are caught in substantial numbers. Salmon packing plants are located along the coast from northern California to western Alaska usually near river mouths. “By means of traps, purse seines, and gill nets, the fish are caught by the thousands and taken to canneries where machinery does most of the work.”³ Some of the streams of Alaska “were blocked so completely by traps that practically no fish ascending to spawn escaped. After a few years of heavy packs but scant returns of young salmon, the runs stopped and the canneries had to be abandoned.”⁴

“Salmon canning along the small coastal rivers of Northern California, Oregon and Washington reached a peak of about 250,000 cases in 1911; the 1936 pack in the same area was 29,000 cases. The Columbia River, a steady producer for over 60 years, reached its maximum of 634,000 cases in 1895. Since then the teeming sockeye runs in the

¹ Parkins and Whitaker, *op. cit.*, p. 526-27.

² For an account of the largely unsuccessful effort at conservation by international agreements see Ciriacy-Wantrup, *Resource Conservation, op. cit.*, p. 308.

³ Parkins and Whitaker, *op. cit.*, p. 517.

⁴ *Ibid.* p. 518.

Columbia have shrunk to a fraction of their former size."¹

Similar evidence of decline could be cited with respect to the Pacific halibut, the haddock and the giant sturgeon of Chesapeake Bay "which was slaughtered indiscriminately for the roe, the bodies frequently being left to rot along the shore"², and which is now in danger of extinction. Fresh water fisheries have suffered in a similar manner.

It may be argued that the destruction of a renewable resource does not differ fundamentally from the economic depreciation and physical deterioration of an ordinary capital asset. However, whereas the depreciation of privately owned capital assets tends to be translated, by means of depreciation charges, into entrepreneurial outlays, the depletion of animal resources remains largely unaccounted for in the cost-return calculations of the individual hunter or fisherman. What appears to be a highly renumeration exploitation of fisheries and game resources may in reality be an extremely costly and wasteful process of capital consumption. For example, if by overfishing or excessive hunting we destroy the resource altogether we destroy a capital value that can be calculated in monetary terms. The same may be said of other resources such as forests, soil and even non-renewable resources. They are income yielding capital assets. Anybody can calculate their monetary values by dividing the value of their annual yield by an interest rate. Thus

"at an interest rate of 5%, an annual yield of \$100 worth of fish represents a capital value of \$2,000; if by taking \$200 worth of fish we prevent them going up the river to spawn so that the flow completely stops, then we have destroyed a \$2,000 capital asset to obtain a present income of \$100."³

¹ *Ibid.*, p. 517. More recent reports seem to indicate an improvement of the run at least as far as the salmon catch in the Columbia River is concerned.

² Parkins and Whitaker, *op. cit.*, p. 515.

³ A. C. Bunce, "Time Preference and Conservation", *Journal of Farm Economics*, XXII (August 1940), p. 541.

In addition to the capital value of the annual monetary returns derived from the resource there are, however other social costs which may be even more important, but more difficult to measure. These are the widespread consequences of the narrowing of economic opportunities which the destruction of the resource base entails. As we have shown, the depletion may become irreversible and thereby threaten the continuity of economic activities of the entire region. However, even before the region may become a depressed area living costs will rise and employment and incomes will fall.

Deforestation

The depletion of American timber resources is another striking example of social costs connected with the utilization of renewable resources. Repeated surveys of cutting practices in privately owned forest lands have shown that annual cutting has continued to exceed the natural replacement of forest resources despite repeated warnings by forestry experts. Significantly the poorest cutting practices prevail on forest land that is held by small owners. In fact, a post-war survey by the United States Forest Service found sixty-four percent of the timber cutting on privately owned forest lands to be not yield-sustaining, and only eight percent to be good. Only four percent of the small owners' cutting can be classed as good or better (i.e. designed to build up and maintain quality and quantity yields consistent with the full productive capacity of the land) as contrasted with twenty-nine percent of large holdings. The bearing which these cutting practices have upon the country's future supply of timber becomes clear if it is realized that privately owned forest lands "contain seventy-five percent of the commercial forest acreage; they contain much more than that proportion of the better site-class lands. . . . Until recently, something like ninety percent of the timber cut has come from private lands."¹ A total of 4,200,000 farmers and other small owners whose cutting practices are to seventy-one percent 'poor' and "destructive" (i.e. not yield-sustaining) hold seventy-six percent of

¹ U.S. Department of Agriculture, Forest Service. *The Management Status of Forest Lands in the United States* (Washington: 1946), p. 5.

all private forest land. Furthermore, thirty-seven percent of all privately owned commercial forest land has either poor (less than minimum standard) or no fire protection. In the thirties

"the total drain through cutting and losses by fire, insects, disease, etc. on our combined forest capital of saw-timber and cordwood-size material exceeded growth by 2,200,000,000 cubic feet. The drain on saw-timber estimated at 47,800,000,000 board feet, exceeded total saw-timber growth by 15,800,000,000 board feet or by fifty percent. This drain exceeded growth in every major forest region except the North East. Because of poor quality, species and remote location, not all growth really counts. Drain exceeded effective growth by an additional 4,500,000,000 board feet."¹

A special Presidential Message on Natural Resources in 1961 substantially confirmed these earlier findings concerning the unsatisfactory state of the rate of utilization of American timber resources adding only that most projections of future timber requirements predict a doubling of current (1960) consumption by the year of 2000.²

The most important results of this depletion of forests are to be found in rising costs and prices of lumber despite the increasing significance of substitute building materials and the narrowing of economic opportunities for entire industries and communities in some regions of the country. Today's depressed areas in coal mining districts had their forerunners in the stranded communities and ghost towns in the lumber territories of Michigan and the North-West.

The typical sequence of events and the variety of social costs connected with the depletion of timber resources are illustrated in the following account:

¹ Report of the Joint Committee on Forestry, *Forest Lands of the United States*, (Washington, D.C., U.S. Government Printing Office, 1941), p. 25.

² President Kennedy's Special Message to Congress on Natural Resources, *The New York Times*, Febr. 24, 1961.

"While lumbering was flourishing in the northern part of Michigan, population steadily increased, villages and cities grew up, and thousands of settlers took up farms, marketing their products in the logging camps and milling centers. But after a few decades, logging and fires had destroyed all but scattered fragments of the original forest. The number of employees in camps and mills dropped from many thousands in 1889 to a few hundred in 1929. Many railroad lines were abandoned, leaving farmers without adequate transportation. As the cost of roads, schools, and other government services mounted, taxable rural values declined and the income of local governmental units was, perforce, greatly reduced. Many farmers, no longer able to find winter work in the woods and deprived of a local market for their produce, left the region. . . . As the forest industry waned and farmers became less prosperous, the villages and towns lost their chief support and dwindled away. A desolate cut-over of barren sands or scrubby second growth, abandoned or poverty-stricken farms, and ghost-like community centers have characterized this final stage in the sequence of forest exploitation of non-agricultural land, a sequence which ordinarily has required but 25 to 40 years from beginning to end."¹

Similar social losses are reported in other areas:

"In the Pacific Northwest 76 ghost towns have resulted from disorderly forest liquidation; and in another 77 communities decline of population has kept steady pace with the closing of mills due to dwindling timber supply. . . . Millions of acres of cut-over land have become tax delinquent and abandoned."²

"The Ozark region of Missouri contains 35 counties originally covered with splendid stands of pine, oak and hickory. With the cutting out of timber, forest industries moved out, leaving a large dependent population unable to

¹ Parkins and J. R. Whitaker, (ed.) *op. cit.*, pp. 242-43. See also W. T. Chamber's account of lumbering in the Pine Wood areas of South-eastern Texas, *Ibid.*, p. 243.

² Forest Lands of the United States, *op. cit.*, pp. 16-17.

support itself in decent fashion. The farmers lost both nearby markets for farm produce and the opportunity for profitable winter employment. More than 20 percent of the rural families went on relief, with the remainder eking out a sorry existence. . . . In many Ozark counties thirty to fifty percent of the land has gone tax delinquent. Expenditures for essential road, school and county government services are only a third of reasonable requirements."¹

Soil Deterioration and Erosion

Evidence of the social costs of erosion and soil deterioration goes back to a time which had not yet felt the effects of the determined educational and research effort of the Federal Government and the states to stop a cumulative process which threatened to destroy the fertility of the soil upon which American farmers grew the food and raw materials for an increasing population at home and abroad. "Today after fifty years, we see the fruits of the efforts started in 1908. It took nearly thirty years to get into operation, but then the pay-off came."² The pay-off of organized research, agricultural extension work, scientific agriculture and mechanization took the form of an unprecedented increase in productivity which now makes it possible to raise an increased farm output on a reduced acreage and with fewer farm laborers.

While the significance of the following data on soil deterioration and erosion is historical they illustrate the effects of private farm policies prior to the start of the greatest and most successful attempt to improve American crop yield. Despite many improvements in soil and crop management crop yields per acre had remained unchanged between 1865 and 1908 and were beginning to increase only thereafter.³

¹ *Ibid.*, p. 15.

² B. T. Shaw, "Technology on the Land," in *Perspectives on Conservation*, *op. cit.*, p. 68.

³ "There had been many changes in land use that should have raised yields. Vast areas of highly fertile virgin land had been plowed up and worn-out areas had been discarded. Millions of acres of potentially productive wet land had been drained. Fertilizer and lime use had increased to substantial quantities. New higher yielding crop varieties had been introduced. Controls

Although the situation has changed today due to deliberate efforts by public agencies, it would be a mistake to believe that the soils of American agriculture are improving. In many parts of the nation soils are still deteriorating despite the fact that methods of maintaining soil productivity are known.¹ However, we are here concerned primarily with the evidence of soil deterioration and erosion which accounted for the stagnation and disproportionately slow increase of agricultural yields up to World War II.

In 1934 evidence of erosion (with a loss of from one-fourth to three-fourths of the top-soil) was found on 663,2 million acres comprising 34.8 percent of the entire country. Sheet erosion occurred on 855.2 million acres in varying degrees of severity with severe sheet erosion involving a total loss of over three-fourths of the top soil existing on 192 million acres or 10.1 percent of the total land area. The major part of this type of eroded soil was considered unsuited for tillage. Severe gullying ("embodying frequent and deep dissection on agricultural, cut-over and abandoned land") was found to have affected an area of 337.3 million acres, whereas wind erosion prevailed on approximately 322 million acres.²

According to H. H. Bennett, 282 million acres had been either ruined or seriously impoverished and

"from an additional 775 million acres, erosion has stripped away varying proportions of the fertile topsoil. Considering only crop land, it is estimated that erosion has ruined about 50 million acres for further practical cultivation. Another

had been developed for a number of insect pests and crop diseases. Yet with all these improvements yield levels had stayed the same. There was only one possible conclusion. All the improvements that had been made had barely succeeded in offsetting the decline in soil productivity that was taking place. *Ibid.*, pp. 67-68. See also R. M. Salter, R. D. Lewis and J. A. Slipher, *Our Heritage, The Soil*. Bulletin No. 175 (Third Edition, revised June 1941), Agricultural Extension Service, The Ohio State University, p. 5. See also Wm. A. Rockie, "Soil Conservation", in G. H. Smith, (ed.) *Conservation of Natural Resources* (New York, John Wiley and Sons, Inc., 1958).

¹ "The problem varies by region. . . . There is still much serious erosion in the Southeast and practically all Southern soils need further improvement. Much of the Northeast is on the upgrade. In the rest of the nation soils are still deteriorating." Shaw, *Perspectives on Conservation*, *op. cit.*, p. 70-71.

² National Resources Board, *Soil Erosion*, (Washington, D. C., U. S. Government Printing Office, 1935), p. 24.

area of crop land approximating 50 million acres is bordering on the same condition. Nearly 100 million acres more, still largely in cultivation, have been severely damaged by the loss of from one-half to all the topsoil. On at least another 100 million acres of crop land, erosion is getting actively under way."¹

Erosion washed away annually at least 3 billion tons of solid material which contain large quantities of valuable plant nutrients such as phosphorus, potassium, nitrogen, calcium and magnesium.²

As a result of this washing away of solid materials vast areas of fertile land have been ruined and costly water utilization facilities have been injured or destroyed. Special sedimentation studies of the U. S. Soil Conservation Service estimate that the annual losses resulting from "damage and maintenance costs chargeable solely to the effects of soil erosion on water utilization facilities run into tens of millions of dollars."³ We shall not deal here with the further consequences of the accelerated run-off caused by improper farm practices and deforestation such as the increased frequency of and damage caused by floods.

Social Costs of Petroleum Production

Turning to non-renewable resources we shall concentrate on evidence illustrating the duplication of capital input and certain technical inefficiencies which have the effect of a premature and accelerated depletion and an inadequate recovery of the deposits.

Unnecessary Wells. As pointed out before the fugitive character of petroleum gives rise to a competitive scramble for the capture of the resource. In an effort to maximize his own output, each competitor will drill and space wells in a fashion that does

¹ H. H. Bennett, *Soil Conservation*, (New York, McGraw-Hill Book Company, 1939), p. 7. For more recent estimates see Rockie, *op. cit.*, pp. 70-71.

² Bennett, *op. cit.*, pp. 9-10.

³ *Ibid.*, p. 253.

not take into account the technical requirements of the field, thus precluding recovery at minimum costs and ultimate maximum rates of output from the reservoir. Rates of recovery may affect adversely not only future costs of recovery but also decrease the ultimate yield of the pool. Illustrations of these social costs and technical inefficiencies which have marked the recovery of this important resource can be found almost at random.

In the East Texas field it is estimated that

"3,000 wells would have been sufficient for production and that in the drilling of 21,000 additional wells perhaps \$300,000,000 have been wasted up to the middle of 1937. Moreover, new and unnecessary wells are being added to the field at an additional cost of about \$13,000,000 to \$20,000,000 per year."¹ In the Oklahoma City field it was estimated that 360 instead of 677 actually drilled wells would have been ample to recover the oil. At an average cost of \$100,000 the total unnecessary expenditures for the 317 wells amounted to \$31,700,000.²

An even more striking example of the high costs of competitive drilling was found in the case of the Golden Lane field in Mexico. "The competitive part of that field is reported to have produced oil at a cost of 19.3 cents per barrel in comparison with the cost in the non-competitive part of the field of 5.9 cents per barrel."³

Conservative estimates place the total number of unnecessary wells in the United States at between four and five thousand at an annual cost of \$100 million, which would be equivalent to a

¹ *Petroleum Industry*, Section IV, Part 17. Hearings Before the Temporary National Economic Committee, Seven-Sixth Congress, (Washington, D.C., U.S. Government Printing Office, 1940), p. 9529. (quoted as TNEC Hearings)

² *Petroleum Investigation*, Hearing before a Subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, 76th Congress, (Washington, D.C., U.S. Government Printing Office, 1939), p. 354. Professor McLaughlin refers to estimates according to which the unnecessary expenditures in the Oklahoma City field are placed at \$67,000,000 up to the middle of 1930. See TNEC Hearings, *op. cit.*, Section IV, Part 17, p. 9529.

³ See E. L. Estabrook, "Unit Operation in Foreign Fields," (Petroleum Dev. Tech. 1931), p. 44. (quoted from National Resources Committee, Energy Resources and National Policy, (Washington, D.C., 1939) U.S. Government Printing Office, p. 191 n.

self-imposed gross production tax of about ten cents per barrel of oil produced.¹ If the ratio of unnecessary wells to total wells drilled in the East Texas field is more representative—a ratio of twenty-one to three—and if we include the costs of the operation and maintenance of these wells the annual excess costs and the corresponding production tax would be considerably higher.

Estimates of losses resulting from the waste of natural gas vary from ten to twelve percent of the total gas produced.² Total loss of gas equalled nearly one third of the total gas utilized between 1922 and 1934.³

Nor is this all. The technical wastes and social losses resulting from the drilling of excess wells and the loss of gas lead to a premature dissipation of pressure in the pool. As we have pointed out in the preceding chapter this in turn raises the costs of oil production because pumping has to be introduced at an early stage and may render impossible the recovery of a substantial proportion of the oil underground. The relative magnitude of the permanently lost reserves may be as high as one-third of the total reserve.⁴ In striking contrast to these losses of reserves is the fact that in fields exploited as a unit wells may be operated until the reserve is exhausted and the well turns into a gas well.⁵

In the light of the foregoing discussion it would appear that both the maintenance of minimum costs and of a maximum rate of recovery require greater adherence to technical criteria which are not observed in the course of competitive exploitation of petroleum reserves.

Surplus Capacity and Premature Abandonment of Coal Mines. The phenomena of unnecessary wells in the petroleum industry has its parallel in the competitive overexpansion of coal mining

¹ N. Ely, "Legal Restraints on Drilling and Production", Reprint of Address delivered before Section of Mineral Law of the American Bar Association, Kansas City, September 28, 1937. p. 47, quoted from *Petroleum Investigation*, 1939, p. 353, footnote 68.

² *Ibid.*, pp. 400-01.

³ TNEC Hearings (Part 17) *op. cit.*, p. 9529.

⁴ *Petroleum Investigation*, 1934, p. 1253; See for other estimates, p. 1240; and pp. 1245-58.

⁵ For an account of continued production of oil wells under conditions of unit operation in Iran see *Ibid.*, p. 1255.

capacity. The U.S. census in 1880 first revealed the existence of excess capacity in the American coal industry. In the ensuing years "capacity continued to expand, always outstripping requirements, and in the 25 years immediately preceding the First World War, the bituminous mines of the country operated on the average only 213 days a year."¹ "A period of coal shortage and high prices during the war and reconstruction period (1916-1923) led to a further expansion of mining capacity only to result in drastic liquidation and acute crises long before the outbreak of the depression in 1929. As a result more than 200,000,000 tons of mine capacity was forced out of production, and 3,274 mines . . . were shut down or abandoned. The closing of these mines involved the premature abandonment of several hundred million tons of . . . finest coals, much of which was left underground under conditions which render its subsequent recovery possible, if at all, only at great increase in cost."² During the subsequent decade no less than 4,802 mines were abandoned east of the Mississippi River and outside Ohio alone before the reserves in the holdings were exhausted.³

Of course, it is true that some of these losses are unavoidable inasmuch as even the most advanced mining techniques can not be expected to recover 100 percent of the reserves. However, it is significant that responsible estimates place the extent of avoidable losses in bituminous coal at 19.4 percent of the total reserves of bituminous coal, and 9 percent in the anthracite fields.⁴ It must be added that if more recent and more efficient methods of recovery were chosen as standards for the distinction between avoidable and unavoidable losses of reserves left underground the percentage of avoidable losses would increase considerably.

Other social losses in coal mining result from the fact that the more readily available top beds have often been mined first. When these mines are abandoned subsidence, cave-ins, pit holes, and cracks of the surface land may develop despite the fact that supporting pillars are left underground. Such

¹ National Resources Committee, *Energy Resources and National Policy*, *op. cit.*, p. 15.

² *Ibid.*, p. 17. ³ *Ibid.*, p. 97. ⁴ *Ibid.*, p. 96.

undermining and subsidence of surface land may cause serious damage to homeowners and farmers. This problem is still acute in the mining area of Pennsylvania.

Summary and Conclusions

Summarizing our data it can be said that there is no assurance under competitive conditions that the exploitation of wildlife resources will not be intensified beyond the critical zone at which hunting, trapping and fishing begin to interfere with the natural replacement of the resource. The history of the seal and whaling industries and the depletion and the almost complete extinction of some species in the United States are cases in point.

But even if we consider renewable soil and forest resources which are not fugitive and to which clearly defined property rights can be established the market system offers no guarantee against social losses in the form of deterioration and deforestation. It took the deliberate effort of state and federal government to reverse this trend which for years made it impossible to raise farm yields substantially. In the field of forestry the process of depletion still prevails especially on small holdings of forest land which constitute the bulk of all forest ownership. In the case of non-renewable resources such as coal and petroleum a variety of factors contribute to an essentially similar acceleration of the rate of depletion. If we consider the migratory character of crude oil and the fact that ownership rights to oil are recognized only after its capture; the resulting rush to drain newly discovered oil reservoirs as rapidly as possible; the scattered ownership of coal reserves; and above all, the tendency of each owner to realize upon his property as quickly as possible—these largely institutionally conditioned factors combine to bring about a neglect of future needs. In addition, unregulated exploitation of these resources gives rise to various social losses which take the form of a duplication of capital input (unnecessary wells), surplus capacity (in coal mining), the loss of natural gas and reservoir pressure and the premature abandonment of mines and, as such constitute social costs. Far from preventing the premature depletion of energy re-

sources, the price mechanism actually tends to accelerate the rate of their utilization. Even depressed prices of oil and gas do not necessarily lead to a contraction of production due to the fact that the operation of oil wells is possible at extremely low (marginal) costs. Indeed, low prices of energy resources and of their products tend to increase rather than decrease the rate of utilization of available reserves. For low prices will not only induce consumers to use oil and coal for relatively less urgent purposes, but they will also make it even less profitable for the individual producer to apply technically efficient methods of production which would permit a higher rate of total recovery of given reserves.

The combined effect of the competitive depletion of natural wealth is to be found, as we have pointed out, in an increase of future costs and prices and a restriction of opportunities and choices of the next and future generations. Because of the fact that the future is uncertain and contingent and because of the difficulties inherent in the application of the time preference calculus to an appraisal of future interests and benefits any quantification of these social costs seems to be difficult if not impossible.¹ But the real question is whether such a quantification is really necessary for practical purposes. Does the formulation of public policies with regard to the conservation of natural wealth really require the degree of precise measurement and quantification which the fictitious optimum seems to call for and which appeals to the canons of traditional scientific procedures? The answer is clearly in the negative. The protection of the breeding stock in wildlife resources, the prevention of soil deterioration and deforestation, the optimum recovery rate at lowest costs from a given oil pool through proper spacing of wells, the maximum recovery of coal reserves from a given

¹ The appraisal of future interests and benefits belongs to the most elusive type of calculation imaginable. The further the benefits and costs extend into the future the more hopeless and impossible does it become to apply the hedonistic calculus and mathematical calculations in terms of a social time preference rate. For all practical purposes the evaluation of the future can only take place by substituting a present evaluation for a future calculation. What is called for is a deliberate social determination of the importance to be attributed to future interests and future benefits in the awareness that, while the future may be uncertain and contingent it will not take care of itself.

bed, the prevention of cave-ins—these are pragmatic-technical optima which can be maintained but which do not require the high degree of precision of quantitative measurements which is characteristic of the formulation of theoretical optima. In short, what is needed is a general sense of direction in which to move. Such a sense of direction is provided by the technical necessities of social minima and the definition of the critical zone in the case of renewable resources and a general over-all appraisal of possible future requirements and future supplies in the case of non-renewable resources.¹

Nor is it difficult to select the appropriate techniques and methods of conservation that may be called for in each case. A wide variety of measures are available ranging from educational persuasion, closed seasons for hunting and trapping, specific interdictions, the subsidization of substitutes in plentiful supply, taxation, price control, rationing and outright prohibitions placed on the use of certain materials for low priority uses. Those who are inclined to object to such a policy of redistributing the use of some resources in the direction of the future on the ground that it interferes with the "sovereignty" and the freedom of choice of present consumers overlook that without such a policy we interfere with the freedom of choice of future generations. Indeed, freedom too has a time-dimension, and "the price of a wide choice now is a sharply constricted choice later on."²

¹ "Some of the most important decisions in modern land and water policy are of a kind which, as their predictive basis, do not require a high degree of quantification. Stated positively, significant policy decisions are concerned with successive incremental improvements in social welfare that can be projected only in terms of direction of changes, their relative speeds, and their sequence in time." S. V. Ciriacy-Wantrup, *Conceptual Problems in Projecting the Demand for Land and Water*, Giannini Foundation Paper, No. 176, University of California, May 1959 (mimeographed), p. 11.

² Galbraith, in *Perspectives on Conservation op. cit.*, p. 96. Indeed the whole argument that the restriction of present uses in favor of the future has anything to do with individual freedom belongs to those specious arguments which tend to replace serious analysis by moral or social indignation. It is part and parcel "of the desolate modern tendency to turn the discussion of all questions, however simple and forthright, into a search for violation of some arcane principle, or to evade and suffocate common sense by verbose, incoherent, and irrelevant moralizing. Freedom is not much concerned with tail fins or even with automobiles. Those who argue that it is identified with the greatest possible range of choice of consumers' goods are only confessing their exceedingly simple-minded and mechanical view of man and his liberties." *Ibid.*, p. 96.

CHAPTER NINE

THE IMPAIRMENT OF THE HUMAN FACTOR OF PRODUCTION

THE IMPAIRMENT of man's physical and mental health in the course of productive activities is an old and generally recognized case of social costs. Indeed, it might be argued that social insurance and particularly legislation which provides compulsory compensation for industrial accidents, tend to translate these social costs into entrepreneurial outlays. However, this argument assumes that the acceptance of the principle of compulsory compensation is equivalent to guaranteeing the adequacy of compensation. Actually, workmen's compensation acts have never provided adequate compensation and it may even be true that the relative share of social costs borne by the worker is increasing if we consider the manner in which workmen's compensation acts are operating at least in the United States. In short, while protective labor legislation has expanded, the optimistic conclusion that it has eliminated the social costs resulting from the impairment of the human factor of production cannot be maintained.

Human Costs and the Price System

In its economic implications the impairment of the health and efficiency of the worker in the course of the productive process does not differ from the gradual deterioration of durable agents of production. In both cases a progressive reduction or even complete destruction of the economic usefulness of valuable factors of production is taking place. And yet, in the absence of a comprehensive system of social insurance the market economy, operating as it does within a given framework of contractual obligations, tends to deal with these two cases of deterioration of valuable factors of production in an entirely different manner. Indeed, no owner of durable factors of

production would be willing to make use of any capital equipment if some provision were not made to compensate him for the deterioration of his asset. Such provision is usually achieved by depreciation charges which provide the funds for the replacement of any given fixed agent of production. In the terminology of accounting, depreciation charges are actually said "to maintain intact the value of the original capital investment."¹ By furnishing a convenient and more or less satisfactory method of accounting for that part of the costs of production which results from the use of durable agents of production, depreciation charges enable the individual producer to see to it that his total monetary outlays do not exceed the returns obtainable from the goods and services produced.

In sharp contrast to this treatment of durable agents of production is the manner in which the competitive process deals with the impairment of the human factor. This difference is largely due to the fact that laborers, as human beings, are not subject to private ownership rights. They are free persons whose services may be hired but who have to provide for their own livelihood. If these free laborers are affected adversely by the productive process, there is nobody—except the laborer himself—who has any interest in insisting that an adequate "depreciation" charge be made for the impairment of his physical and mental health. In fact the entrepreneur, in his desire to reduce costs of production as far as possible, will be generally reluctant to consider the impairment of the physical and mental health of his laborers as part of the costs of his enterprise.² Unwillingness to consider the impairment of the worker's health will be the more pronounced, the larger the number of unemployed and the lower the skill and training requirements. For, under these conditions he will find it relatively easy to replace "worn-out" workers by new laborers. These happen to be the conditions of relatively less developed countries without a fully

¹ R. B. Kester, *Advanced Accounting*, (New York, The Ronald Press, Co. 1933), p. 245.

² It is hardly necessary to point out that this is in contrast with the conditions prevailing under slavery systems and feudalism, where the producer is likely to consider the impairment of the human factor by the productive process as a depreciation of the capital value of his property and thus as part of the costs of production.

developed system of labor unions and social security legislation. The high level of open and disguised unemployment in these countries makes not only for wages near or below the subsistence level but actually facilitates the systematic replacement of injured and sick workers with new laborers from the large reservoir of unemployed. Because of his relatively weak bargaining position the individual worker will find it impossible to have his claim to compensation recognized in case of accidents and occupational diseases. He and his dependents will be forced to bear the brunt of the social costs resulting from the impairment of his health and from subsequent unemployment.

In economically more advanced societies the situation differs to some extent. Lower rates of unemployment and a greater influence of workers on the political decision-making process are likely to increase the countervailing power of labor. Social legislation will force the entrepreneur to translate at least part of the social costs of production into private outlays. During the relatively rare periods of full employment and acute labor shortage (e.g. in war-time or post-war reconstruction periods) wages may be high enough to cover a substantial part of the impairment of the human factor of production. However, even under these conditions three important qualifications need to be kept in mind. First, there is the question of the adequacy of compensation acts. Even the most advanced protective labor legislation—with the possible exception of legislation in some of the Scandinavian countries—fails to cover all workers and all occupations. Secondly, even those injured workers who are covered by provisions guaranteeing indemnification in the form of maximum compensation (either as a percentage of earnings or in the form of maximum payments) will see their actual standard of living severely undermined by a gradual erosion of the compensation system through rising prices over the years. In periods of unemployment even the most advanced countries tend to replace their "worn-out" laborers by persons out of work. Thirdly, there are always declining industries and declining occupations in which the working force and particularly the injured or older workers find themselves in a precarious position and are not adequately protected by

seniority rules or, for that matter, by strong labor unions. In fact, the strength of the latter in these industries is continuously jeopardized and traditional systems of social insurance and workmen's compensation acts tend to provide only limited protection.

It might be argued that entrepreneurs, in their own interest, will tend to provide for healthy and safe working conditions because damage to the worker's health reduces the latter's efficiency and, by the same token, increases the costs of production. However, this arguments neglects two things: in the first place, private producers are under no obligation to keep inefficient laborers, but may simply hire new men whose efficiency has not yet been affected by unhealthy working conditions. Secondly, the introduction of safety and health protection devices, though ultimately contributing to higher labor efficiency and lower costs, will necessarily add to the producer's present costs and thus affect adversely his competitive position. Or, it might simply be more profitable to operate the plant without safety devices—considering even adverse effects on labor efficiency—than to introduce such devices (still assuming their introduction to be worthwhile in terms of outlays and expected "returns" in the form of greater efficiency and good will). In this case, as well as in the probably much greater number of instances where the provision of healthier working conditions is directly unprofitable in terms of entrepreneurial outlays and returns, the deterioration and even destruction of the human factor is likely to become a chronic feature in competitive economies if not corrected by comprehensive social legislation. These losses will be borne either by the injured worker, or by the taxpayer in the form of greater public expenditures for medical care, hospitals and relief. The fact that these losses in the absence of adequate social legislation, are not charged against the operating costs of private enterprise but are borne largely by the laborer or the community makes them typical social costs in the sense in which the term is used in this study. The most significant aspect of the "human costs" of production is the fact that they are to a large extent avoidable. Competent authorities have estimated that seventy to ninety percent of

all work injuries could be prevented by proper safety devices. If instead they are permitted to occur and to cause social costs of considerable magnitude, this is due partly to ignorance of the actual costs of work injuries and accidents, and partly to unwillingness or inability on the part of the individual firm to bear the costs of adequate health and accident prevention programs. It may be said therefore that in so far as the impairment of the human factor gives rise to uncompensated social costs production is being subsidized by labor or by society.

While in general the value of the original capital equipment is being kept intact through the use of depreciation charges, there is no built-in tendency to maintain the "capital value" of the human factor of production under conditions of unregulated business enterprise. If instead of 20,000 workers 20,000 heads of cattle were exposed to certain death due to an epidemic and recurrent disease, there would be an easily calculable incentive to adopt required preventive measures. The fact that the human factor of production has no capital value places it in a market economy in a less favorable position than machinery or cattle unless strong "countervailing" and political forces interfere with the free operation of the competitive process.

*The Impairment of the Human Factor: Evidence and Estimates
of Social Costs*

It is difficult to indicate with any degree of accuracy the possible magnitude of the social losses caused by the impairment of the human factor of production in modern industrial societies. Available statistical data on the number, frequency and effects of industrial accidents and occupational diseases offer only a partial answer to the question as to the actual magnitude of these social costs. Most data are intended to indicate the total number of injured persons, the number of man-hours lost, or the annual wage loss caused by work injuries. Such figures do not indicate the extent to which the resulting losses are shifted to and actually borne by the injured worker and his dependents and by the community.

In the last analysis the social costs resulting from the impairment of the human factor by work injuries and occupational diseases depend upon the extent to which workers are covered by safety legislation and the adequacy of compensation they receive. Nevertheless, in view of the fact that even "adequate" compensation cannot undo the permanent physical impairment of workers and certainly does not bring to life again those killed in industrial accidents, it is not irrelevant to state the magnitude of the problem of work injuries in modern industrial society in terms of frequency rates and severity data.

The number of totally disabling work injuries in the United States has continued to be near 1.9 million per year during the last years for which data are available (1954-1958).¹ Of these injuries 13,300 resulted in death and around 80,000 in permanent impairment—the impairment varying from the loss, or the loss of use of eyes, hands, fingers, or limbs. The direct time lost from disability resulting from work injuries was 38 million man-days in 1958. Translated into total man-days lost with allowance made for the cumulative effects of permanent impairment or death the total time lost is approximately 160 million man-days or the equivalent to a year's full employment of about 515,000 workers.² Calculated on the basis of a working force of 60 million the loss of 160 million man-days would be equivalent to almost nine percent of the total annual work-days.

It should be added that the frequency rate (disabling injuries per 1 million man-hours) and the severity rate (days lost per 1 million man-hours) have shown a persistent decline since the end of World War II. The former is now (1959) at 6.47 as against 13.11 in 1935-39 and the latter is at 754 as against 1,550 in 1935-39.³ The number of deaths per 100,000 workers has likewise shown a persistent decline (from a high of forty-three in 1937 to twenty-two in 1959).⁴ The National Safety Council places the total monetary losses caused by work accidents at \$4.2 Billion in 1959 of which \$1.2 Billion are wage losses. (\$4.2 Billion in 1959 would be roughly nine percent of the G.N.P.⁵.)

¹ These and the following data are based upon calculations of the U. S. Bureau of Labor Statistics. Department of Labor. *News from the U.S. Department of Labor*. February 10, 1959, No. 2703, p. 1.

² *Ibid.*, p. 2. ³ *Accident Facts*, National Safety Council, Chicago, 1960, p. 27.

⁴ *Ibid.*, p. 27. ⁵ *Ibid.*, pp. 13, 24.

A variety of direct and indirect social costs arise in connection with workers' injuries. First, there are the direct costs of medical and hospital care. Secondly, there are various indirect costs for the individual plant due to the loss of working time during an accident and the necessary work stoppage, damage to equipment, temporary idle machinery, spoilage and wastage of material, lower efficiency of the new man who replaces the injured worker and the selection and training of new laborers. In addition to these indirect costs which are reflected in entrepreneurial expenses, there are the repercussions of work injuries on the injured worker and his family. Thus, industrial accidents may either partially or totally disable the injured worker and prevent him from earning any further income. His reduced earning power, in turn, may have serious consequences for the general economic and social status of his family with all the subsequent effects on family life, health, and education of children and other dependents. In one way or another the financial support of these dependents may have to be provided out of public funds. Finally, there is the loss of life and the physical and mental suffering due to work injuries for which there can be no compensation.

The cost of medical and hospital care, whether paid for directly or indirectly in the form of insurance premiums to an insurance company, are entrepreneurial outlays and as such cannot be considered as social costs. The same is true of the costs caused by the loss of time and by damage to materials and equipment. These losses are also borne by the firm and as such are not social costs. However, few entrepreneurs have a clear conception of the nature and size of these costs of work injuries. Most indirect cost items are hidden and affect many or all productive processes. Moreover, insofar as compensation and medical costs are paid by an insurance company the individual entrepreneur is likely to consider these costs as outside his particular concern. "He realizes that insurance premium rates are based on experience. However, since the experience of the individual small employer is so small a part of the total on which the rates are based and since a considerable part of his premium goes to overhead expenses and profit, it

is very difficult for him to obtain a premium reduction even reasonably commensurate with his reduction in accidents. Private insurance companies generally find it impractical to give any form of merit rating to a risk whose premium averages less than about \$500—\$750 per year. . . . The result is that the average small policy holder, unless he is threatened with the possibility of increased premiums or cancelled coverage, has little direct financial incentive to reduce accidents. Ignorant of the 'indirect costs', he feels that his premium covers practically the entire cost of injury, and that a reduction in costs is of concern only to the insurer."¹

It is true that entrepreneurial outlays for in-plant medical services have shown a steady increase since 1929. (From 30 million dollars per year during the thirties to more than 200 million dollars per year since 1954).² In fact, sample studies by the National Association of Manufacturers and the Liberty Mutual Insurance Company indicate that industrial safety and hygiene programs cost between 10 to 20 dollars per employee per year. The trouble with data of this kind is not that they are wrong—although their representative character may be seriously questioned in view of the fact that they apply to large-scale enterprises only and do not take account of the situation in small concerns without organized safety programs—but that they answer the wrong question. What really matters from the perspective of an inquiry into the social costs of production are not the expenditures for safety measures that are being met and their positive effects but the adequacy and the neglect of these measures. Doubtless without the present expenditure level for the prevention of work injuries and occupational diseases the impairment of the human factor would be worse. But this does not mean that the present safety programs are either adequate or that social costs are not likely to rise with new technological developments creating new and as yet incompletely understood health hazards. The inadequacy

¹ *Safety Subjects*, U.S. Department of Labor, Bulletin 67 (Washington D.C., U.S. Government Printing Office, 1944) p. 15.

² See C. Merriam, "Social Welfare Expenditures", 1957-58 in *Social Security Bulletin*. U.S. Department of Health, Education and Welfare, Washington D.C., October, 1959, No. 10, p. 8.

of present safety measures is perhaps best illustrated by estimates of the United States Bureau of Labor Standards according to which "the majority of accidents occur in plants, especially small ones, which have no organized safety program"¹ The fact that small concerns may find the costs of an adequate industrial safety and health program prohibitive may explain why progress has been slow and inadequate for the country as a whole; if so, it constitutes one of the most problematical aspects of small business and its survival. In any event our data on the unpaid human costs of work injuries in American industry and our doubts concerning the adequacy of our social security legislation is indirectly confirmed by the authors of the report of the President's Commission on the Health Needs of the Nation: "The study, control and prevention of occupational health hazards in the United States is not yet at par with similar activities in other countries."²

Under these circumstances it is still true that while many large firms have reduced their injury rates by more than ninety-percent in recent decades, small firms as a group have shown relatively slight gains.³ The important point in this connection is the fact that the greater part of the working force in America is employed by smaller firms (employing 500 workers or less). It is in plants of these relatively smaller firms which have not been sufficiently affected by organized safety movements that the majority of all accidents occur. In the light of the experience of state and local occupational agencies that have direct responsibility for the investigations of hazardous conditions in industry, the Chief of the Division of Occupational Health, U.S. Department of Health, Education and Welfare speaks of "the absence of even the most rudimentary type of industrial hygiene programs in over one half of the industrial plants in the United States."⁴

¹ H. J. Magnuson, Chief, Division of Occupational Health, Public Health Service, Washington, D.C., Private communication, September 15, 1960.

² *Building America's Health*. President's Commission on the Health Needs of the Nation Vol. II, Washington, D.C., 1953, p. 76.

³ Safety Subjects, Bulletin No. 67, *op. cit.*, p. 3.

⁴ H. J. Magnuson, Anticipating Safety and Health Needs, *Public Health Reports*, U.S. Department of Health, Education and Welfare, Washington D.C., 1960, Vol. 75, No. 1, p. 73.

It is true that small plants face special problems in introducing safety measures. Certainly the per capita and average costs of such preventive measures are much higher in small industries and any attempt to pattern health services to employees in small plants according to that of larger industries may be unrealistic. But the fact remains that as long as only larger plants can provide occupational and safety protection the greater part of the labor force can be expected to receive at best only emergency treatment in case of accidents.

How adequate is the compensation which the injured worker or his family receive under existing workmen's compensation acts? In order to arrive at a realistic appraisal of the adequacy of workmen's compensation acts it is important to recall that the history of the compensation acts in the United States was marked by extreme reluctance to recognize that work injuries are after all costs of production. For decades it has been possible to shift these costs to the worker and his family under the restrictive interpretation of the common law. When the principle of compensation for work injuries was finally established the old reluctance and the fear of enacting into law an undue financial burden carried over into the new legislation. This fear was reinforced by the attempt of each state to ensure that its own legislation would not place industry at a competitive disadvantage in comparison with other states. The right of each state to enact its own compensation laws worked, and is still working at cross purposes with the objective of providing adequate coverage and adequate compensation for the social costs of the impairment of the human factor.

In order to give a satisfactory answer to the question of adequacy it would be necessary to determine the extent to which existing schemes of social insurance and workmen's compensation acts fail to translate the social costs of production into entrepreneurial outlays. In other words, it would be necessary to calculate the ratio of the compensation received to the sum total of losses sustained. In the light of available data and in view of the lack of uniformity of existing workmen's compensation acts, it is impossible to arrive at an over-all percentage of losses compensated; all we can do is to calculate a ratio of wage losses

compensated. The most important factors which lead to inadequate compensation are exemptions (i.e. non-coverage) of specific employments and employers as well as of certain injuries. In addition, there are short periods of disabilities which are excluded from compensation as well as inadequate compensation scales.

Despite the expanding scope of workmen's compensation detailed appraisals based upon 1940 Census data indicate that only approximately 27.2 million workers or about fifty-three percent of the nation's working force were covered by workmen's compensation acts. More recent estimates (for 1952) place the average coverage at almost four out of five civilian wage and salaried workers (exclusive of railway employees as well as self-employed)¹. The most important categories of workers normally excluded are domestic and farm workers. Other persons not covered by workmen's compensation acts of certain states are workers engaged in non-hazardous employments and employees of small firms as well as casual workers and public employees. The exclusion of "non-hazardous" employments and special exemptions in some states leads in many instances to highly arbitrary results and, moreover, accounts for an increasing obsolescence of the law.² The same result follows from varying definitions of compensable injuries and occupational diseases which were originally excluded from most workmen's compensation acts.

Furthermore, all compensation acts provide for waiting periods (ranging from 3 days to 2 weeks) before any compensation can be claimed. The declared purpose of such waiting periods is to exclude short periods of disability, and minor disabilities, to prevent malingering, and to avoid excessive overhead and administrative costs. However, it has been estimated that "for the country as a whole . . . 44 percent of temporary injuries are barred altogether . . . While another 45 percent are compensated, but not for [the] waiting period."³ Practically all

¹ D. McCamman and A. M. Skolnik, "Workmen's Compensation; Measures of Accomplishment", *Social Security Bulletin*. U.S. Department of Health, Education and Welfare, Washington, D.C., March 1954, p. 4.

² H. M. Somers and A. R. Somers, *Workmen's Compensation*. (New York, John Wiley and Sons, Inc., 1954), pp. 45-7.

³ A. H. Reede, *Adequacy of Workmen's Compensation* (Cambridge, Harvard University Press, 1947), p. 58.

acts specify time limits for the filing of claims as a precaution against abuses and fraudulent claims. However, these time limits have also the effect of excluding the increasingly important group of slow-starting and chronic diseases which may manifest themselves only after many years of exposure. Such diseases as cancer and radiation diseases which may result from the cumulative effects of exposure over several decades raise difficult legal and medical issues which will find a satisfactory solution only by a comprehensive system of free medical care.¹

In addition to inadequate coverage serious inadequacies result from the fact that workmen's compensation acts limit indemnification payments to maximum amounts which are inadequate or tend to become so as wages, costs of medical care and rehabilitation and the costs of living rise. Indeed, with prices rising, the cash, medical and rehabilitation benefits tend to cover steadily shrinking proportions of the actual losses sustained by the worker which is another way of saying that the share of social costs is increasing.

As far as the compensation for loss of income is concerned rates differ from state to state. They vary depending upon the type of injuries (temporary-total, permanent-total, permanent-partial and fatalities). All laws limit the compensation to a maximum percentage of the injured worker's average weekly earnings with specified maximum weekly payment limits, limits on total payments and permanent absolute time limits (except in several states which provide payment for life for permanent-total disabilities). Rates of compensation for dependents in case of fatal injuries vary from less than thirty-five percent to sixty-six percent (and seventy-five percent and ninety-seven and a half percent for widows with children in North Dakota and Minnesota respectively) of weekly earnings and, in most instances, are limited as to both duration and maximum total compensation, irrespective of working-life expectancy.²

The restrictive effects of these provisions hardly require any

¹ For a detailed analysis of the legal aspects of Workmen's Compensation Acts which lead to this corrosion of the law see H. M. Somers and A. R. Somers, *op. cit.*, and a forthcoming study by A. H. Reede's entitled *Social and Labor Legislation: An Economic Analysis*.

² Reede, *op. cit.*, 1947, p. 92.

special emphasis. With rising wage levels the percentages of average weekly earnings tend to be superseded in effect by the provisions governing weekly maximums as well as other qualifications of the law. Minimums are losing their protective quality due to rising prices. Injured workers who happen to be unemployed or partially employed during the period counted for the determination of their average weekly earnings are being penalized. Waiting periods which are characteristic in most jurisdictions tend to reduce substantially the cash benefits in some states.¹ Under these circumstances compensations for all types of disabilities fall far short of actual monetary losses sustained by the injured persons and their dependents.

In cases of compensation for permanent total disability indemnification falls far short of the total loss of earning power calculated on the basis of working-life expectancy. Not only is the compensation substantially below past average earnings, but benefit scales also limit payments both as to maximum amounts and maximum duration which again bear no relation to working-life expectancy. Similar limitations apply to compensation benefits for permanent partial disabilities. The most important shortcomings are compensation at "less than 66 2/3 percent of past earnings, weekly maximums of . . . \$25, and periods or amount limitations in serious cases shorter than working-life expectancy."²

Furthermore, variations from state to state introduce the most chaotic and inconsistent provisions into the compensation pattern. Thus for permanent partial disabilities

"the maximum period of scheduled compensation for the loss of a foot ranges from 100 weeks in New Mexico to 250 weeks in Wisconsin. For a total loss of hearing it varies from 65 weeks in Maine to more than 5 times as long in Oregon. Loss of hearing in one ear in Oregon is worth more than loss of hearing in both ears in 5 other States. A New Jersey hand is worth more than an entire arm in Alabama and

¹ For detailed comparative studies see Somers and Somers, *op. cit.*, 1954, p. 66.

² Reede, *op. cit.*, 1947, p. 169.

24 other States. The maximum monetary compensation for the loss of an arm at the shoulder may be as high as \$37,850 under the Federal employees' law, \$18,500 under the Wisconsin law, but only \$3,600 in Maine. One eye is worth up to \$10,175 in Wisconsin but in Arizona only \$1,650. Variations of 50 percent or more are characteristic as between adjoining states."¹

In the case of death benefits variations in amounts and maximum periods range from \$3,500 to \$20,000 and from 200 weeks to 780.

"In many States, the compensation received by an injured worker (for the disability resulting in death) is deducted from the death award. The family of a worker with a broken back who lingers for several years before he dies is thus penalized to the extent of the money paid during his life. One indignant union spokesman says of this provision, 'It is not uncommon for a widow and children to wind up with nothing . . . there is a premium for the family of the husband and father who dies quickly. . . . In these situations, workmen's compensation becomes a cynical farce.'"²

As far as the scale of medical benefits is concerned it will suffice to mention that payments may be limited as to maximum duration and maximum amounts. The maximum period for which medical care must be furnished (in 18 states with time limits) varies from 4 weeks in Texas to 9 months in Montana. Financial maxima for medical care are below \$1,000 in most states and vary from \$225 in Pennsylvania to \$2,500 in Kentucky.³

Thus, under the extremely heterogeneous system of provisions governing compensation payments for work injuries in the United States only a part, and for that matter a declining proportion of the social costs of the impairment of the human factor are translated into entrepreneurial outlays. A steadily

¹ Somers and Somers, *op. cit.*, p. 71.

² *Ibid.*, p. 77. ³ *Ibid.*, pp. 83-88.

increasing proportion continues to be borne by the injured worker and his family. Indeed, despite repeated liberalizations of the provisions of the laws, it appears doubtful whether compensation payments approximate a subsistence level and whether the injured worker would not be forced to starve if he had to depend exclusively upon the compensation. These doubts are strengthened by the fact that in at least one state (Pennsylvania) maximum compensation payment benefits were \$16.40 below the maximum relief allowance for a family of 4, \$38 below the allowance for a family of 5 and \$58 below that of a family of 6.¹ This is the inevitable outcome of a system of legislation that sets maximum benefits as a fraction of average earnings and then proceeds to superimpose another maximum limit upon the "maximum", not to mention other qualifications and exclusions. The net result is that with rising prices and wages "workmen's compensation laws are approaching a flatsum system, at a low level, and doing it with complex formulas."²

Compensation for wage losses seems to be even more inadequate. According to a detailed calculation by Professor A. H. Reede the proportion of wage losses compensated has declined steadily since 1913/4. In Illinois, the maximum weekly compensation payments in cases with two children or one child as a percentage of average weekly earnings dropped from \$98 to \$34 between 1913 and 1952.³ For specific categories of work injuries official data indicate that the following proportions of wage losses were actually recovered: fatalities, 5.6 percent; permanent-total, 13.4 percent; permanent-partial 14.0 percent; temporary, 30.5 percent; average, 13.4 percent.⁴ In North Carolina, the average proportion of wage losses compensated dropped from 26.4 to 22.1 between 1940 and 1952. The following is the breakdown based upon Professor Reede's findings and calculations:

¹ Pennsylvania Department of Public Assistance, "Current Living Costs as Related to Standards of Public Assistance in Pennsylvania, as of December, 1952" pp. 4-5, cited in J. Pollack, "A Policy Decision for Workmen's Compensation", *Industrial and Labor Relations Review*, October, 1953, p. 55.

² Somers and Somers, *op. cit.*, p. 82.

³ *Ibid.*, p. 78, (See Chart III B) ⁴ *Ibid.*, p. 80.

*Proportion of Wage Loss Compensated in North Carolina, 1940 and 1952 (Theoretical)*¹

Extent of Disability	Percent compensated	
	1940	1952
Fatal	19.6	15.5
Permanent-total	24.2	21.2
Permanent-partial	24.4	21.3
Temporary	47.7	41.7
Average	26.4	22.1

Based upon Reede, *op. cit.*, 1947, p. 207 and new calculations by Reede for 1952, quoted from Somers and Somers *op. cit.*, p. 81, (for a detailed explanation of methods of arriving at these estimates, see Reede, *op. cit.*, 1947, pp. 195-210.)

In the light of these data which can be supported by similar and in some instances even more unfavorable estimates it appears that the social costs of work injuries may be borne up to seventy-five percent by the injured workers. Indeed, in the case of fatal permanent-total injuries the worker or his survivors bear 86 and 79 percent of the total wages loss alone. These inadequacies and inequities cannot be justified by the necessity for reducing malingering and avoiding fraudulent claims. After all the dead do not mangle nor do the permanently disabled and yet it is precisely these categories which show the highest percentage of unmet costs.

The foregoing calculations concerning the relative magnitude of the social costs of work injuries do not include losses sustained by the injured workers and their families as a result of the failure of private insurance companies which carry the employers' insurance against liabilities arising from workmen's compensation acts. Admittedly this is a problem that grows out of the peculiarly inadequate and inefficient method of solving the compensation problem in the United States. After all, there is no reason—except the desire to follow tradition and to adhere to the principle of commercial insurance where it has no place—to organize the system of compensation for injured workers through a multitude of private carriers.² Private

¹ *Ibid.*, p. 81.

² The more recent system of Social Security in the United States (i.e. unemployment compensation and old age benefits) has moved already in the direction of greater centralization and eliminates private insurance altogether from these important fields of social insurance.

carriers have frequently failed with heavy losses not only to the injured workers, their widows and dependents,¹ but also to the insured employers in cases where the compensation act holds the employers liable in the event of the failure of the insurance company.

Occupational Diseases and Social Costs

The original workmen's compensation acts made no provision for the coverage of occupational diseases. And even at the present time occupational diseases covered in one state may not be covered in others and many such diseases are still completely outside the scope of compensation acts. A similar lack of uniformity exists with respect to the coverage and treatment of the problem of aggravating existing diseases or illnesses only indirectly attributable to the occupation. A more thorough analysis of the conditions under which workers injured by occupational diseases go without compensation would require a highly technical discussion of the legal and administrative problems inherent in the operation of workmen's compensation acts. Such an analysis lies, however, outside the scope of the present study.² Suffice it to say, therefore, that insofar as workmen's compensation acts cover occupational diseases at all, they apply in many cases only to a specified list of diseases and they place maximum limits on the amount and duration of compensation payments.

These exclusions, restrictions and limitations which vary from state to state may reach such proportions that at least in the case of one act (The Colorado Occupational Disease Disability Act) it has been said "that a disabled workman would be better off if the Act were repealed. At least before the passage of the Act the workman had a common-law remedy—now barred—against his employer. The Act (gives)

¹ For a detailed account and estimates of losses see J. B. Andrews, *Progress of State Insurance Funds Under Workmen's Compensation*, U.S. Department of Labor, Division of Labor Standards, Bulletin No. 30 (Washington, U.S. Government Printing Office, 1939), p. 11, and W. F. Dodd, *Administration of Workmen's Compensation* (New York, The Commonwealth Fund, 1936), pp. 541-52.

² See however Dodd, *op. cit.*, pp. 757-83 and Reece, *op. cit.*, 1947, pp. 45-53. See also Somers and Somers, *op. cit.*, pp. 49-55.

complete protection to employers from any liability for occupational diseases whatever."¹

While it must be added that adequate coverage of occupational diseases could give rise to compensation claims of incalculable proportions and may open the way to endless litigation and excessive legal costs it is equally inadequate, particularly in the absence of a national health insurance system, to shift the losses caused by occupational diseases to the worker and his family.

It is difficult to determine the possible magnitude of the problem of occupational diseases in modern industrial society. Current estimates making use of an extrapolation based on figures provided by governmental agencies which have the most comprehensive statistics on occupational health (notably the California State Department of Health and the United States Navy Bureau of Medicine and Surgery) suggest a national incidence of between 200,000 to 400,000 easily recognized cases of occupational diseases per year² or roughly three to six percent of the total labor force. Estimates by the Bureau of Labor Statistics place the number of man-days lost due to occupational diseases at two percent of the total direct time-loss due to non-occupational diseases (or roughly 7.5 million man-days).³

But these data do not take account of the fact that the occupational origin of many diseases is only inadequately, if indeed at all, recognized. Occupational diseases resemble the environmental diseases caused by air and water pollution. They develop slowly; they have a long period of latency between exposure and the appearance of damaging health effects. It may take years and even decades before the latter manifest themselves in some cases. Understanding of these diseases with long periods of latency is still rudimentary.

In addition to the older occupational health hazards there are the increased industrial radiation hazards which may create chronic diseases with long latency periods. Similarly, the

¹ Quoted by Somers and Somers. *op. cit.*, p. 52n.

² Magnuson, cit September 5, 1960.

³ Somers and Somers, *op. cit.*, p. 218.

occupational diseases connected with automation are still unknown. Will automated industries, by placing a higher emphasis on close concentration and attention subject workers to greater nervous strain and tension or will the automated factory of the future lead to greater boredom and monotony and heighten the health problems associated with sedentary occupations? Will the increased strain and tension give rise to a greater incidence of heart diseases, peptic ulcers and vascular disturbances? Or will the automated factory of the future with its push-button features and its greater cleanliness in general reduce the exposure to and incidence of work injuries and occupational diseases? What indeed are the psychological hazards of the work in a highly automated work process? There seems to be no clear-cut answer to any of these questions at the present time. Suffice it to point out merely that the role of stress and strain as a source of disease is generally recognized. Thus, muscular and nervous stress often result in injurious fatigue, nervous disorder, greater susceptibility to industrial and non-industrial diseases and accidents and other physical injuries. Furthermore, there are the negative effects resulting from irregular employment and "the related injury inflicted on the physique and morale of the worker by sandwiching periods of over-exertion between intervals of idleness."¹

Industrial noise is another case in point which illustrates the particular difficulties encountered in the determination of causal relationship between occupational exposure and disease. Thus, exposure to industrial noise may not only increase the general stress and strain which accompanies the work process but it may also produce a loss in the auditory capacity. However, the effect may vary depending upon the length of the exposure. Thus a short-term exposure to high intensity noise may produce a hearing loss that is usually transitory in nature but if exposure is sufficiently long and severe the loss of hearing may become permanent.²

¹ J. A. Hobson, *Work and Wealth A Human Valuation* (New York, the Macmillan Company, 1914), p. 80.

² According to a study of inmates in four federal penitentiaries reported by H. J. Magnuson, Chief, U.S. Public Health Service in *Scope Weekly*, September 2, 1959, p. 3.

Despite the development of preventive methods cases of lead poisoning occur every year. There are today (1960) no less than 10,000 distinct chemical compounds in use in industrial production of which but a few hundred were known as recently as twenty years ago.¹ Not a few of these compounds are toxic or potentially toxic and will give rise to an increasing incidence of specific syndromes of occupational diseases. The possible magnitude of the problem of occupational diseases in modern industrial society is still far from being adequately explored and understood: While some of the older cases of occupational health hazards seem to be fairly well established new technological developments, new products and new processes continuously add to the host of industrial toxic substances to which the worker is exposed. Among the older hazards that have continued to be present major sources of occupational diseases are industrial poisons, and non-poisonous dusts. As early as 1935 it was established that there are poisons that is "raw materials and products, by-products and waste products which in their extraction, manufacture and use in industrial processes, notwithstanding the exercise of ordinary precaution, may find entrance into the body in such quantities as to endanger, by their chemical action, the health of the workmen employed".² "One of these industrial poisons, lead, is in daily use in about 150 trades, causing 'painters' colic', 'wrist drop' or even death. In dusty trades, from silk weaving to quarrying, non-poisonous dusts may infiltrate and by mechanical irritation affect the health of the workers. In fact, one of the most common of these diseases is silicosis which has remained one of the most important occupational diseases in the United States in terms of disability, human suffering and compensation costs."³

¹ H. J. Magnuson, Sept. 15, 1960, cit. and L. I. Dublin and R. J. Vane, *Occupation Hazards and Diagnostic Signs*, U.S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 582. (U.S. Government Printing Office, Washington, 1933), pp. 13-49.

² J. R. Commons and J. B. Andrews, *Principles of Labor Legislation* (New York, Harper and Brothers, 1936), p. 166.

³ Magnuson, *Anticipating Safety and Health Needs*, op. cit., p. 70.

The Social Losses of Woman and Child Labor

Substantial agreement exists as to the general character of social losses caused by the industrial employment of women and children. "The distinctive physical characteristics of women make them more susceptible than men to certain industrial hazards. Noise and vibration probably have a more detrimental effect upon their nervous system; long periods of standing or sitting have been demonstrated to be injurious to them and their offspring; overstrain is more likely to produce organic disturbances; and there is respectable medical opinion that women exhibit greater susceptibility to some industrial poisons than do men."¹ In view of these facts, it is not surprising to find that morbidity rates are substantially higher for working women than for non-working women and that the infant mortality among children born to working women is similarly higher.²

The social losses resulting from the employment of children and young persons are equally significant. "When children leave school at an early age and seek gainful employment, their opportunity for normal physical development . . . is curtailed. Normal family life very often is disrupted. Frequently, thrown into environments that are conducive to harshness, crudity, roughness and disrespect for the privileges and immunities of others, child workers are likely to become juvenile delinquents and public charges."³ In addition the gainful employment of children usually implies a restriction of opportunities for education. As a result of limited educational opportunities, their mental faculties are not fully developed; adaptability to occupational conditions is reduced and general productivity in later years lessened. Moreover, child labor is not only responsible for raising the accident rates of the trades in which children work but also results in bad health of the children in later years because "undeveloped muscular and nervous systems

¹ H. A. Millis and R. E. Montgomery, *The Economics of Labor*, Vol. 1, *Labor's Progress and Some Basic Labor Problems* (New York, McGraw Hill Book Co., Inc., 1938), p. 404.

² *Ibid.*, p. 404. ³ *Ibid.*, p. 417.

are unable to resist the strain incident to many industrial occupations. . . ."¹

Thus the employment of women and children gives rise to social losses which go far beyond those sustained by the individual woman or child laborer. By disrupting family life and by preventing the full mental development of young persons, woman and child labor may have particularly far-reaching and detrimental effects upon society and future generations.

While cultures differ in the extent to which they employ women and children in different occupations and while the underdeveloped world makes extensive use of both, the fact remains that the industrial system has not put an end to this type of employment. Existing legislation still varies widely "in the standards of conditions which they set up for the employment of boys and girls. They are also extremely uneven in the occupations to which they apply. Some provisions extend to all gainful employment. Many, however, apply only to specified establishments or occupations, or exempt certain types of employment, such as work in agriculture, in domestic service in private homes, in the sale and distribution of newspapers and magazines. Thus, even within a state, a child-labor law may not apply equally to all children."²

Summary and Conclusions

In the light of the preceding discussion it is still correct to say that modern industrial production tends to give rise to a serious impairment of the physical and mental health of the individual worker. Among the more important of these human costs of production are the harmful effects of industrial accidents, occupational diseases and the employment of women and children. In its economic implications such impairment of the physical and mental health of human beings does not differ from the deterioration of non-human durable agents of production. And yet, whereas the depreciation of the latter tends to be translated into entrepreneurial outlays by means

¹ *Ibid.*, p. 418.

² L. Manning and N. Diamond, *State Child-Labor Standards*, U.S. Department of Labor, Child-Labor Series, No. 2 (Washington, U.S. Government Printing Office, 1946), p. 5.

of depreciation charges, damages to persons would remain unaccounted for in private costs if the competitive process were left to itself. As a matter of fact, in the absence of protective labor legislation and compulsory social insurance these human costs of production not only would be shifted to, and be borne by the individual but would also be considerably greater than they are at present. Workmen's compensation acts, by placing upon the employer the financial responsibility for work injuries regardless of fault have had the effect of translating some of these human costs of production into entrepreneurial expenditures. Despite the fact that a considerable extension of protective labor legislation has taken place in recent decades all available evidence points to the conclusion that the present scope and operation of existing laws still permits the shifting of the major part of the human costs of production to the injured worker and his dependents, or to the community.

The fact that social costs resulting from the impairment of the human factor have remained high and indeed are likely to increase in the future is not contradicted by important reductions in the incidence of work injuries and the effective reduction of specific occupational diseases. As we have pointed out injury trends have shown a downward movement during the last fifteen years. Both the frequency and severity rates of work injuries have been declining. This decline supports the conclusion that many of the work injuries can be avoided and that industrial development and progress do not have to be purchased at the price of increasing social costs in terms of an increasing number of disabling injuries and loss of human life. Many occupational hazards have been eliminated or at least considerably reduced. Workmen's compensation acts have not been without effect. Industry has taken cognizance of the fact that industrial hygiene and safety measures may actually pay for themselves. Indeed there are specific instances which demonstrate in a dramatic way the effects of a vigorously enforced safety and accident prevention program.¹

¹ Thus, the ruling of the New York Court of Appeals that a loss of hearing from industrial causes was an occupational disease is said to have prompted a vigorous program of noise control on the part of the New York shipbuilders and others in the noisy trades. For this and similar advances in specific cases see Somers and Somers *op. cit.*, p. 233 and pp. 214-15.

It is true nevertheless that the remaining weaknesses of social legislation are due to difficulties and obstacles which the competitive calculus places in the way of the development of an adequate system of industrial health legislation. As long as individual firms have to be concerned primarily with their relative competitive position, as long as state legislators are trying to protect industries in their respective states, as long as safety programs and their administration and enforcement at state, local and federal levels remain uncoordinated and decentralized, in short as long as industrial health programs are guided by competitive cost-price calculations they will not be adequately expanded and the impairment of the human factor will neither be prevented nor kept at a reasonable minimum.¹

¹ Indeed it has been asserted that the intrusion of the competitive calculus into all problems of industrial safety may block progress toward the prevention of the human costs of production. "The plain fact, for example, that the diagnosis of an occupational disease may cause expense to the employer creates an atmosphere in which science often is subordinated to a desire to minimize or even to suppress knowledge which might prove the relationship of occupational environment to disease". *Ibid.*, p. 77. and Building America's health, *op. cit.*, p. 77.

CHAPTER TEN

TECHNOLOGICAL CHANGE, UNEMPLOYMENT AND SOCIAL COSTS

IN THE PRESENT chapter we propose to deal with the social costs of economic fluctuations, and more specifically, with the social losses brought about by technological change, unemployment and economic instability. Despite the emergence of a body of literature which has contributed greatly to our understanding of economic fluctuations and their possible control by fiscal and monetary policies, the problem of economic instability has not lost its practical significance. For the fact remains that despite built-in and automatically operating anti-cyclical devices and a whole battery of fiscal and monetary policies, periods of unemployment and idle capacity have alternated with relatively high levels of employment. When involuntary unemployment affects between seven to ten percent of the total labor force and when more than eight percent of the insured unemployed are forced to live on unemployment insurance, it can no longer be denied that serious contractions of economic activities have remained a characteristic feature of business enterprise. Even if these periods of contraction do not become chronic, their general significance is underlined by the fact that they seem to be superimposed upon a less dramatic but actually more fundamental process of slow growth or chronic sluggishness with levels of unemployment remaining at a rate of five percent or higher.

We need not concern ourselves with the causes of economic fluctuations in order to discuss the social costs of technical change and unemployment. For the purpose of our discussion we accept the views of those economists who hold that the typical operation of the competitive market economy sets the conditions for recurrent periods of depression, and that business cycles would occur even if such special circumstances as extreme income inequalities were entirely absent.

Suffice it to add that productive activities under modern conditions presuppose corporate investments which mobilize the nation's disposable funds through the issuance of negotiable securities. This process, as Veblen pointed out long ago¹, gives rise to, and feeds upon a cumulative and circular expansion in the course of which investments or the purchases of durable means of production add to aggregate demand, thereby supporting rising prices, increasing profits, increasing earning capacity with new rounds of corporate mobilizations of disposable funds following each other in rapid succession. The cumulative inflation of all monetary values according to Veblen is speeded up by increasing anticipations and expectations and is more than fully reflected in rising capitalizations i.e. the anticipated earning capacity of the corporation. Since prices and capitalization feed upon themselves and are also speeded up by repeated commercial transactions, corporate capitalization sooner or later loses its relation to actual costs or tangible equipment. Instead, they become essentially what Veblen called a pecuniary fabric of "make-believe" which is continuously threatened by the expansion of output, technological progress and cutthroat competition. It is these three endogenous "built-in" forces which bring both the prosperity and the inflation of all monetary values to a halt by producing unemployment and idle capacity.

Technological Change and Social Costs

As we have just pointed out the cumulative inflation of all monetary values does not go on indefinitely because it is continuously threatened by three counteracting forces among which the improvement of the industrial arts plays a major role. Technological change threatens the cumulative process of increasing investment, increasing prices and increasing capitalizations because it undermines the earning capacity of all those firms whose relative competitive position is threatened by the

¹ T. Veblen, *Absentee Ownership and Business Enterprise in Recent Times*, (New York, The Viking Press, 1923), ch. 5. Veblen's emphasis on the cumulative and "inflationary" character of the expansion phase due to the enlarged use of credit, goes back to his *Theory of Business Enterprise*, (New York, Charles Scribner's Sons, 1904) ch. 5.

innovation. Improvements in the industrial arts are thus a double-edged sword. While they contribute to lower costs and the development of new products they also contribute to important social costs by reducing the capacity of older firms to remain in business and by creating unemployment among those workers who are set free by the new techniques of production. It is hardly necessary to point out that these are issues which have been the subject of serious controversy among economists for a considerable period of time. The current concern with the effects of automation has made this controversy once more pertinent.

The Earlier Controversy

According to Adam Smith, and later J. B. Say, the introduction of new machines has a tendency of reducing costs and prices and thereby opening the way for a rise in production. This increase, Say pointed out, is not limited to those industries which produced and introduced the new machine, but the subsequent reductions of costs and prices of commodities are said to enable consumers to demand more goods and services of other industries not directly affected by the new machine. The resulting increase of production in all industries, according to Say, makes possible the employment of a greater number of workers than were originally displaced by the new method of production. The effects of technological improvements are thus presented as unequivocally beneficial not only from the point of view of society but also from the standpoint of the individual worker whose temporary loss of employment is more than offset by his gains as a consumer.¹ More than a hundred years after Say's writings, P. H. Douglas² and W. I. King³ on the basis of statistical investigations arrived

¹ J. B. Say, *A Treatise on Political Economy* (3rd American edition, Philadelphia, John Gregg, 1827), Chapter VII, pp. 26-31. For Adam Smith's position on the advantageous effects of machines see *The Wealth of Nations*, *op. cit.*, pp. 271-72.

² See P. H. Douglas, "Technological Unemployment," *American Federalist*, Vol. 37, No. 8, August 1930, pp. 923-50. See also P. H. Douglas and A. Director, *The Problem of Unemployment* (New York, Macmillan and Co., 1931), esp. pp. 121-41.

³ W. I. King, "The Relative Volume of Technological Unemployment," *Proceedings of the American Statistical Association*, Vol. 28 (March 1933), pp. 33-39.

at substantially the same although perhaps more refined conclusions. Thus, according to King, "no facts or figures thus far discovered cast any doubt upon the approximate validity of the orthodox economic theory that the forces giving rise to technological unemployment tend, at the same time, to create a demand for new goods, and that the production of these new goods, normally calls for a volume of labor roughly equalling the quantity displaced. From this premise it follows that since labor-saving devices increase production without materially decreasing the ability of workers to find jobs, such devices are decidedly beneficial rather than injurious to society as a whole."¹

These optimistic conclusions were not held unanimously even among classical economists. Ricardo revised his earlier contention of the impossibility of lasting displacement of labor by machinery in later editions of the *Principles* (Chapter 31). Important qualifications of the orthodox doctrine were advanced by John Stuart Mill and J. E. Cairnes. Open opposition to the doctrines of Smith and Say came from some of the earliest dissenters and critics of classical economics, namely Sismondi and Malthus.²

It remained, however, for Marx to view the introduction of technical improvements in relation to the pattern of the cyclical instability of capitalism. Indeed, the introduction of new and improved machinery is, according to Marx, an integral part of the capitalist process and the decisive factor in the process of continuous structural change which has been the most significant feature of capitalist production since the Industrial Revolution. Technological progress is viewed as the weapon with the aid of which entrepreneurs tend to accumulate more surplus value and to keep abreast in the competitive struggle. At the same time technological improvements provide the outlets for an expanded investment of available surplus value (or profits). While such expansion is under way technological improvements tend to lead to a temporary contraction of the

¹ *Ibid.*, p. 39.

² Sismondi's position has been indicated briefly in chapter 3. See *supra*, p. 33. An excellent summary of this controversy is to be found in A. Gourvitch, *Survey of Economic Theory on Technological Change and Employment*. Work Projects Administration, National Research Project, Report No. G VI (Philadelphia, 1940), pp. 39-79.

reserve army of the unemployed and raise wages above the minimum level. However, technological progress also sets into motion tendencies in the opposite direction. By increasing the amount of capital per worker (the "organic composition of capital") new machines lower the relative demand for workers which means a lower surplus, reduced investments and ultimately an expansion of the reserve army of unemployed with the simultaneous effect of wages falling below the minimum level. Thus, according to Marx, the displacement of workers by technological improvements is not only functionally related to the cyclical process but has ultimately the effect of swelling the ranks of the unemployed and of keeping wages at the minimum level. In other words, "it is capitalistic accumulation itself that constantly produces, and produces in the direct ratio of its own energy and extent, a relatively redundant population of laborers, i.e. a population of greater extent than suffices for the average needs of the self-expansion of capital, and, therefore, a surplus-population."¹ This relative surplus population may take "the more striking form of the repulsion of laborers already employed, or the less evident but no less real form of the more difficult absorption of the additional laboring population through the usual channels."² In short, "the laboring population . . . produces, along with the accumulation of capital produced by it, the means by which itself is made relatively superfluous, is turned into a relative surplus population and it does this to an always increasing extent."³

This is not the place to discuss the special conditions which prevailed during the second half of the nineteenth century and which led to an increase rather than a decrease of employment as well as a higher rather than a lower level of living. What Marx, writing during the first fifty years of mechanized production in England, did not and perhaps could not foresee were primarily four factors: first, the strong expansionist effects of the extension of capitalism on the rest of the world; second, the special role which the economic development of America

¹ K. Marx, *Capital*, (Chicago, Charles H. Kerr and Co., 1906), Vol. I, p. 691.

² *Ibid.*, pp. 691-92. ³ *Ibid.*, p. 692.

would play both as a market of goods and as an outlet until the early twentieth century for Europe's surplus population; third, the effects of trade unions and collective bargaining on the nature of competition among workers and the distribution of the national product; and fourth, the improvements of working conditions due to social legislation. Even without a detailed analysis of these factors it must be clear that the impact of technological change is not necessarily the same at different times. There can be hardly any doubt about the fact that the conditions which made for a rapid expansion of production during the second half of the nineteenth and first decades of the twentieth century were exceptionally favorable for a relatively quick reabsorption of displaced workers.¹

Furthermore, the capacity for assimilating technical changes depends upon a number of conditions which are not always fulfilled in all sectors of modern industrial economies. Thus, the absorption of workers displaced by new machinery is dependent, as Say earlier pointed out, upon the subsequent expansion of production either in the same industry or in those branches of the economy which benefit indirectly from the new method of production. This capacity of expanding production and absorbing unemployed laborers is, however, determined by the extent to which the lower costs of production resulting from technical progress are actually passed on to the consumer in the form of reduced prices on the one hand and the responsiveness of the demand to lower price levels on the other. The extent to which savings in the costs of production are passed on to the consumer depends upon the character of competition prevailing in a particular industry. Generally speaking, it can be said that conditions of monopoly and monopolistic competition may reduce the competitive pressure under which lower costs find their way to the consumer in the form of lower

¹ Whether or not the particular circumstances of the period immediately following Marx invalidated his doctrine or merely suspended temporarily the validity of his predictions is a methodological question which need not concern us here. For a detailed analysis of the favorable factors which made for a quick absorption of displaced workers up till 1914 and the obstacles to such absorption see E. Lederer, *Technical Progress and Unemployment. An Enquiry into the Obstacles to Economic Expansion* (Geneva, International Labor Office, 1938), pp. 1-2.

prices. In other words, such conditions are not conducive to an expansion of production in response to technical progress. In fact, all attendant phenomena of monopolistic competition such as price policies and price rigidities (especially of cost prices), product differentiation, restriction of output and the absence of "free entry" conditions in many industries, tend to reduce the capacity of the industrial system to reabsorb workers, displaced by technical improvements at some point, into the productive process. These considerations lend support to the conclusion that substantial obstacles stand in the way of a smooth readjustment of the economy after the introduction of technological changes and that these obstacles tend to increase rather than decrease under modern economic conditions.

Another significant factor which tends to obstruct the automatic and speedy assimilation of improved techniques of production is the immobility of the displaced workers. For, obviously, the more specialized his skill and occupation and the more the worker is tied to his place of residence by family relations or home ownership, the more reluctant will he be to submit to changes and movements which new methods of production thrust upon him.

Finally, the social and economic effects of technological advances can be fully understood only if they are viewed in relation to the cyclical instability of modern industrial society. Indeed, the repercussions of the technological changes are so fused with the general effects of the expansion or contraction of production that it is well-nigh impossible to isolate them in practice. As a matter of fact, it is probable that the favorable effects of technological improvements upon labor actually precede, or coincide with, the introduction of the new method of production. Thus, it has been suggested that "the greatest stimulus to demand for labor is given by technological change *while it is being introduced*, while the instruments designed to embody it are under construction; and the stimulus is given through that construction, through the demand for capital goods which it implies, and through the impulses it thus gives to a general boom in business. The greater the volume of that construction and of that demand, the more powerful is the

boom and the greater the demand for labor."¹ In other words, as Marx pointed out, the actual displacement of laborers after the introduction of technical changes may be felt only in the ensuing depression.

The foregoing discussion leads to a number of important conclusions. In the first place, it must be clear that the effects of technological improvements are far more complex and at times considerably less beneficial than is often assumed. In any event, "a facile dismissal of the problem on the assumption that an automatic adjustment to industrial shifts is effected, with reemployment of all displaced productive factors is no longer possible."²

Secondly, the impact of technological advance cannot be ascertained by questionnaires and statistical measurements. The effects of technical change in a given industry are felt over so vast an area of allied and competing industries and are so interrelated with the consequences of other changes and business movements that neither unemployment surveys nor general investigations into labor productivity and the displacement and absorption of labor by new methods of production, and still less studies based upon questionnaires and interviews of dismissed workers,³ are capable of determining even approximately the impact of technical advances.

Third, traditional economic theory by concentrating its attention upon the problem of ultimate readjustment seems to have led the treatment of technical change into a blind alley. For, even if the introduction of new techniques of production is ultimately followed by some kind of readjustment and even

¹ Gourvitch, *op. cit.*, p. 194.

² F. C. Mills, "Industrial Productivity and Prices," *Journal of the American Statistical Association*, June 1937, Vol. 32, No. 198, p. 247.

³ The industrial worker can hardly be expected to recognize either the cause of his unemployment or the reason for his reemployment. Indeed "a little reflection will . . . show that only in a minority of cases will workmen be able to recognize the technological change responsible for their dismissal. For this it would be necessary that machines be introduced in an existent plant under the eyes of the workmen and that dismissal be affected immediately after." J. A. Schumpeter, *Business Cycles*, *op. cit.* Vol. II, p. 514 n. Moreover, as F. B. Garver, after Marx, pointed out, technological change may simply make unnecessary the hiring of new workers as the old ones leave their job. *Journal of the American Statistical Association* (March 1933), Suppl., p. 40.

by an increase in the demand for labor somewhere in the economic system, the real question is rather how quickly and how smoothly such reabsorption and readjustment is likely to take place. Our analysis so far indicates that the disappearance of the exceptionally favorable conditions for a rapid reabsorption of displaced workers and the development of certain monopolistic practices have considerably reduced the capacity of business enterprise to readjust and adapt itself to technical changes within relatively short periods of time. It is, therefore, not only possible but probable that the introduction of technical improvements will give rise to periods of prolonged economic maladjustments and unemployment.

The Contemporary Situation

The foregoing conclusions gain additional support if we consider the manner in which the market mechanism determines whether or not the introduction of technical improvements is to be undertaken. Two cases may be mentioned. Under competitive conditions with no control of production and free entry of new firms, innovations will be introduced regardless of the (private) losses resulting from the depreciation which the new method causes to the value of existing capital equipment. Entrepreneurs who delay the introduction of new techniques until they have fully amortized the original value of their old equipment (or, what amounts to the same thing, until savings in costs expected from the new method are sufficiently great to compensate for the remaining value of old equipment) will be forced out of business by new firms not burdened by obsolete equipment. In fact, under competitive conditions technical improvements will be introduced as soon as the prospective average total costs of production (with the new equipment) are low enough to permit the recovery of the new capital in a relatively short period of time. In short, no attention is paid to the financial losses resulting from the depreciation of the value of capital already invested.¹

¹ For the detailed analysis of the factors considered in connection with innovation decisions see Eugene L. Grant, *Principles of Engineering Economy*, (New York, The Ronald Press Company, 1938), chs. 14 and 15.

Whenever competition is imperfect, i.e. when entrepreneurs in one way or another exercise control over production and when conditions of free entry of new firms and new investments are not fulfilled, the innovating firm does take into consideration those financial losses which result from the fact that the new technique renders obsolete the capital equipment already in use. And even though these losses are not measured by the value of the original investment but only by that part which is not yet fully accounted for by the sum total of past depreciation allowances, these losses may be substantial. That the entrepreneur will take into account the losses caused by the obsolescence of existing capital equipment in considering its replacement by new equipment is easily demonstrated when we consider the case where the original investment was financed by the issuance of bonds. For in this instance it is clear that the fixed charges for interest and amortization continue regardless of whether or not new equipment is substituted for old. Evidently the situation is essentially the same if the financing of the original investment was made by stock issues. Hence, only if the economies expected from the new equipment are sufficient to compensate also for the financial losses caused by the obsolescence of existing capital will the new equipment be introduced. In other words, under conditions of imperfect competition the replacement of old techniques of production by new ones tends to be slower than under competitive conditions.

However, from the point of view of the analysis of social costs, it is significant that in both cases the introduction of new equipment proceeds in terms of a cost calculation which fails to take into consideration two important kinds of social costs of technological progress, namely, those resulting from the depreciation of existing capital equipment owned by other firms and from certain negative effects of technical change upon workers.

To consider the losses resulting from the obsolescence of existing equipment as social costs calls for further explanation. It is the prevailing opinion that the economic worthwhileness of cost-reducing improvements should be determined on the basis of a comparison of the prospective average costs with the

costs (including repair and increased operating expense) involved in the continued use of the old equipment irrespective of any possible social losses due to the obsolescence of the latter. In support of this view it is usually pointed out that the loss to the owners of the old equipment is offset by an equivalent gain to consumers who obtain their products at lower prices.¹ Such a comparison of gains and losses may satisfy a static, i.e. timeless analysis. However, if the cumulative repercussions of a periodic curtailment of the earning capacity of firms operating with old equipment are considered, the introduction of improvements irrespective of the devaluation of existing equipment appears in a different light. In fact, to the extent to which such periodic curtailment of the earning capacity of existing firms leads to bankruptcy and failure the social costs of technological progress merge into the social costs of depressions and cannot be distinguished from them.²

We do not suggest that durable capital equipment should be discarded only after it is worn out completely and has been fully amortized.³ What we wish to emphasize is the fact that

¹ A. C. Pigou, *Economics of Welfare*, *op. cit.*, pp. 188-190, and Oskar Lange and Fred M. Taylor, *On the Economic Theory of Socialism*, *op. cit.*, pp. 111-14.

² The nature of these repercussions resulting from the constant reduction of the earning power of older establishments has often been analysed especially by those authors who consider technological change and innovation as the primary cause of the business cycle. Veblen, for example, held the view that the progressive improvement of the industrial process and the resulting discrepancy between the current earning power and the accepted capitalization of older firms make for a more or less pronounced but chronic depression under the fully developed regime of the machine industry—a state of affairs which is mitigated only by speculative movements of prices “through a freer supply of the precious metals or by an inflation of the currency, or a more facile use of credit instruments as a subsidiary currency mechanism.” See T. Veblen, *The Theory of Business Enterprise* *op. cit.* p. 235; cf. also pp. 227-34. Another author who like Veblen considers the rapid obsolescence of capital through technological progress as the principal cause of the depression is R. Liefmann, *Grundsätze der Volkswirtschaftslehre*, II, (Stuttgart, Deutsche Verlagsanstalt, 1919), pp. 755-62. It is interesting to note that Schumpeter, whose explanation of the business cycle is based entirely upon his concept of “innovation”, hardly stresses this relationship between technological improvement, obsolescence, capital losses and depression although he describes in considerable detail the effect of innovation upon the “old” firms. See J. A. Schumpeter, *Business Cycles*, *op. cit.*, Vol. I, Chapt. IV, esp. p. 134.

³ Nor do we think that Pigou's arguments on the subject are convincing. Pigou points out that if allowance has to be made for the depreciation which the improvement causes in the value of existing plant, “reason would be shown for attempts to make the authorization of railways dependent on the railway companies compensating existing canals, for refusals to license motor omnibuses in the interest of municipal tramways, and for the placing of

under competitive conditions only a small proportion of the capital losses caused by the introduction of new machines enters into the cost accounting of the entrepreneur; the bulk of these losses has to be borne by other firms in the form of a progressive depreciation of their capital equipment.

Other social costs are revealed if we consider briefly the effects of technical change upon the worker. Quite apart from the net effect which technological improvements are likely to have upon total employment and job security, one thing appears certain: innovations and the increasing use of machinery have had the effect of reducing the skills required in the process of modern production. In fact, particular skills have become obsolete and occupations which formerly could be filled only by a limited number of trained workers can now be occupied by less skilled laborers. This, however, is merely another way of saying that the competition among workers tends to increase—a fact which is bound to be reflected in lower wages. The outstanding historical example is the introduction of machinery during the initial stages of the Industrial Revolution which, by opening the way to woman and child labor in the manufacturing process, led to a continuous increase of competition among workers, depressing wages often to the level of starvation. However, it would be a mistake to believe that the introduction of machinery had these results only during the Industrial Revolution. Virtually every technological advance and especially automation tend to render particular skills and

hindrances in the way of electric lighting enterprises in order to conserve the contribution made to the rates by municipal gas companies." See A. C. Pigou, *Economics of Welfare*, *op. cit.*, p. 188. The answer to this argument was given by J. A. Hobson in 1913. Hobson, whom Pigou criticized for emphasizing the necessity of making allowance for the depreciation of existing capital equipment, replied as follows: "A municipality faced with a proposal to scrap its present expensive plant in favor of a new plant which will work at slightly lower costs, will properly take into consideration the unexhausted value of the existing plant, upon the capital value of which interest must be paid whether it is scrapped or not. If that unexhausted value is great, the new plant will rightly be substituted more slowly than if the unexhausted value is small, for the interest on this capital, if considerable, will outweigh a slight economy of working costs in the case of the new plant. In a word, it is evident that the cost of scrapping must enter into considerations of business policy. Under competitive industry, however, it is not taken into account. The former, not the latter, represents the social policy as regards rate of improvements." See J. A. Hobson, *Gold, Prices and Wages* (London, Methuen and Co., 1913), pp. 107-108.

occupations obsolete and increases the competition among the displaced workers. Laborers with obsolete skills are likely to encounter temporary, if not permanent, unemployment. Indeed, for older workers it may become impossible to find any employment at all; younger workers will be forced to acquire new skills through retraining. If technical changes lead to the disappearance of entire industries and if reemployment opportunities are available only in other localities, displaced workers have to acquire not only new skills but, at the same time, will have to pay the costs of moving to other localities. In fact, technical progress may leave entire communities and industrial areas stranded and create the conditions of "ghost towns."¹ It is needless to say that none of these costs of transition tends to be reflected in private costs, indeed they fail to be taken into account in entrepreneurial decisions as to whether or not and at what speed technological improvements are to be introduced.²

The fact that technological change gives rise to serious social costs which have traditionally been borne by the displaced workers and their families has found belated recognition in the European Community for Coal and Steel. Realizing that these social costs are shifted to the economically weaker elements of society where they arouse legitimate opposition to change and embittered labor relations, the treaty establishing the European Community provides for "readaptation" payments.

¹ For factual evidence on this point see *Technology and Concentration of Economic Power*, Part 30, Hearings before the Temporary National Economic Committee, Congress of the United States, Seventy-Sixth Congress (Washington, D.C., U.S. Government Printing Office, 1940), pp. 17229-17232.

² As pointed out earlier in the chapter dealing with the general nature and significance of social costs, this neglect and shift of the social costs of transition and adaptation to other persons or to the community is not limited to the case of technological change. It is rather a common phenomenon in the free market economy and accounts for example for much of the persistent opposition of large groups of industrial producers and laborers to the removal of barriers of international trade in the interest of a greater international division of labor. Such opposition is based upon the realization of the fact that the competitive process offers no assurance to the individual worker or entrepreneur whose job or business may be eliminated in the course of the transition made necessary by the importation of goods from abroad, that they will receive adequate compensation for their sacrifices either in terms of temporary financial support or in terms of an adequate share in the ultimate benefits resulting from the better utilization of resources incident upon the more effective international division of labor.

These payments are designed not only to forestall the development of depressed areas but also to ensure the re-employment and smooth transfer of displaced workers from one job to another. With these ends in view the treaty introduced a new policy which provides for (1) the payment, for periods up to fifteen months, of "waiting allowances" which are considerably higher than normal unemployment benefits and do *not* depend upon any previous direct contribution from the workers concerned but are financed out of the general resources of the High Authority and the respective government; (2) allowances for retraining for new jobs; (3) payments for travel, the moving of furniture and the reinstallation in a new area; (4) investment loans for new industries to absorb labor even outside the fields of coal and steel; and (5) housing programs and the introduction of a European Labor Card in order to encourage and facilitate labor mobility. This policy of the European Community for Coal and Steel which contrasts sharply with the absence of similar provisions in other countries including the United States is a measure of the failure to take sufficient account of social costs of technical change. It is safe to say that the current transition to automated factories in Europe and America would be facilitated by a similar policy of "readaptation".¹

Before examining these social costs it is necessary to return to the question of whether or not the social costs of technical progress are inherent in dynamic change. Schumpeter, for example, holds with Marx that the most essential aspect of capitalism is its inherent tendency of dynamic change. In fact, according to Schumpeter, the fundamental impulse that sets and keeps the capitalist engine in motion comes from various innovations such as "new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates."² It is these "innovations" and the manner in which

¹ For a critical account of the operation of the new approach to technological unemployment and its social costs in specific countries, see "Europe tests New Approach to Problems of Technological Unemployment", *Bulletin from the European Community for Coal and Steel*, (Luxembourg) July-August 1956, No. 17.

² J. A. Schumpeter, *Capitalism, Socialism and Democracy* (New York, Harper and Brothers, 1942) p. 83.

they are brought about by individual firms, which, "incessantly revolutionize the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in."¹

If the destruction caused by technical advances is implicit in the structure of the business enterprise and can even be called "creative", is it still possible to speak of "social costs of technical progress?" Schumpeter's own position seems to be open to more than one interpretation. After emphasizing the need for judging the performance of "capitalism" as it has unfolded through decades or centuries, Schumpeter states that "a system—any system, economic or other—that at *every* given point of time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at *no* given point of time, because the latter's failure to do so may be a condition for the level or speed of long-run performance."² Once more this thesis seems to challenge the concept of social costs. It seems to assert that these costs are the price which has to be paid for the long-run efficiency of the system which by shifting social costs to the community, accelerates technical progress. Of course, it may or may not do so. We know of no criteria in terms of which this question could find a satisfactory and unambiguous answer. The long-run social performance of any economic system can be accounted for only by considering the interrelated economic, social, political and geographic constellation within which the system operates. The relative weight of any of these factors is not easily measured by statistical tools and is largely a matter of qualitative evaluation. The difficulty of arriving at an answer based upon empirical evidence is even greater; we would have to wait for another two or three hundred years of planned economies before a comparative appraisal of the over-all performance of socialism could be undertaken. But even accepting Schumpeter's thesis—assuming in other words that the social costs of

¹*Ibid.*, p. 83. ²*Ibid.*, p. 83.

production at a given point of time are actually the condition for the most rapid long-run rate of growth and a high level of performance, it would still be important to trace the social costs as fully as possible, to measure their importance, and to take account of them in the theoretical models in terms of which capitalist reality is analyzed. The question remains furthermore whether the shifting of social costs cannot be carried too far beyond the point so to speak of diminishing returns in terms of long-run efficiency and rate of growth and whether a system whose long-run spontaneity and level of performance is bought at the price of social costs is not inherently unstable (and hence inefficient) in view of the opposition it is bound to call forth under democratic conditions from those who are called upon to foot the bill of social costs.

However, it is not necessary to lose ourselves in speculations of this kind. Schumpeter himself seems to provide an answer to the challenge which he raises. In his subsequent analysis of monopolistic practices he shows convincingly, and in opposition to the trend of most modern theories of monopolistic and oligopolistic competition that certain restraints of trade may perform important protective functions against the perennial gale of creative destruction. In fact, according to Schumpeter, there are several situations in which restraints of trade exercised by old concerns, whether or not directly attacked by innovations, may produce positive results. In Schumpeter's own words :

- (1) "Situations emerge in the process of creative destruction in which many firms may have to perish that nevertheless would be able to live on vigorously and usefully if they could weather a particular storm...".
- (2) "Sectional situations arise in which the rapid change of data that is characteristic of that process so disorganizes an industry for the time being as to inflict *functionless losses and to create avoidable unemployment . . .* (*italics added*)
- (3) "there is certainly no point in trying to conserve obsolescent industries indefinitely; but there is point in trying to avoid their coming down with a crash and in attempting

to turn a rout, which may become a center of cumulative depressive effects, into orderly retreat."¹

In all these situations restraints of trade, including price regulations, "may in the end produce not only steadier but also greater expansion of total output than could be secured by an entirely uncontrolled onward rush that cannot fail to be studded with catastrophes."² In his further analysis of business practices designed to preserve capital values by delaying the application of cost-reducing new inventions, Schumpeter points out that restrictive practices of this kind if they existed "would not be without compensatory effects on social welfare."³ And again "a new type of machine is in general but a link in a chain of improvements and may presently become obsolete. In a case like this it would obviously not be rational to follow the chain link by link regardless of the capital loss to be suffered each time. The real question then is at which link the concern should take action. The answer must be in the nature of a compromise between considerations that rest largely on guesses. But it will as a rule involve some waiting in order to see how the chain behaves."⁴ This is exactly the conclusion which emerges from the preceding analysis of the social costs of technological progress under conditions of unregulated competition.

However, the most important social losses bound up with technological improvements are neither the neglected capital losses of other entrepreneurs nor the costs of transition which fall on the individual worker, but rather the costs of "technological" unemployment to which the introduction of new methods of production tends to give rise under certain economic conditions.

The Social Costs of Unemployment

The analysis of the social costs of unemployment is an elaboration of the discussion of the social costs resulting from the impairment of the human factor of production by occupational diseases and industrial accidents. It was argued that the impairment of the worker's physical and mental health in the

¹ *Ibid.*, p. 90. ² *Ibid.*, p. 91. ³ *Ibid.*, p. 97n. ⁴ *Ibid.*, p. 98.

course of modern industrial production does not differ fundamentally from the depreciation of non-human factors of production. And yet, in contrast with the calculable depreciation of privately owned factors of production, the impairment of the physical and mental capacity of the worker fails to be reflected in entrepreneurial outlays under the customary wage system of business enterprise so long as compulsory legislation does not provide for an adequate system of accident and industrial health insurance. Just as the human factor of production is subject to deterioration and impairment in the course of the productive process, so does its "production" and "upkeep" entail certain fixed costs. Not only are monetary outlays involved in raising the new generation of workers, but, young persons have to be educated and trained. In addition to this fixed investment of time and money involved in training the younger generation of workers there are the costs of maintaining the worker himself in "proper working conditions". These costs are relatively fixed; indeed, a minimum of these costs must be borne regardless of "whether the laborer works or not: that is, if it is not borne, if the maintenance is not forthcoming, the community suffers a loss through deterioration of its working power. . . ."¹ In this sense the costs of labor, or at least a substantial part of them, constitute a kind of overhead costs not only for the individual worker but also and especially for society as a whole. As a matter of fact, the costs of labor are overhead costs in an even more fundamental sense than the fixed charges on capital account. Neither the worker nor the community can escape the burden of these costs even if they wanted to do so.²

The price system translates these overhead costs of labor into variable costs "in much the same way in which the constant costs of a telephone exchange are translated into a variable charge

¹J. M. Clark, *Studies in the Economics of Overhead Costs* (Chicago, The University of Chicago Press, 1923), p. 16.

²These ideas make no claim to originality. They were generally accepted by all classical economists since they form the corner-stone of the labour theory of value. See also O. Bauer, *Kapitalismus und Sozialismus nach dem Weltkrieg*, Vol. I, *Rationalisierung und Fehrrationalisierung* (Wien, Wiener Volksbuchhandlung, 1931) pp. 166 ff.

when the user pays so much per call.”¹ In the case of the individual worker this translation of overhead costs into variable costs is the result of the fact that the laborer is a free person who sells his services by means of a free wage contract. Under these conditions the burden of all overhead costs of labor falls upon the individual worker; “he is, under our social system, a free being, responsible for his own continuous support and that of his family; hence his maintenance is his own burden and not an obligation of industry, except so far as he can exact wages that will cover it.”² This is in marked contrast with the costs of machines and the fixed charges of the borrowed capital which have to be met by industry regardless of business conditions.³

It is at this point that the social costs of cyclical unemployment become apparent. For, once the fixed overhead costs of labor have been converted into variable costs, the entrepreneur is able to disregard completely the fixed costs of labor. A decline of business will be met first by a reduction of the “variable” costs of labor and thus tends to give rise to a wave of unemployment. This procedure is not only the most convenient for the entrepreneur, but in view of the fixity of most capital outlays is the only method of reducing costs of production. Periods of depression will thus give rise to a general shift of the fixed burden of labor to the individual worker, his family or the community.⁴

The same disregard of the fixed overhead costs of labor

¹J. M. Clark, “Some Social Aspects of Overhead Costs”, *American Economic Review*, Vol. XIII, No. 1, Suppl. March 1923, p. 55.

²J. M. Clark, *Studies in the Economics of Overhead Costs*, *op. cit.*, p. 8.

³Again it must be emphasized that this difference in the behavior of the costs of capital and those of labor is not unavoidable—or something that must be accepted as being within the nature of things. It is rather the result of the different manner in which labor and capital contracts are drawn up. Although there may be “substantial reason for drawing them in the customary way . . . it would be quite possible to make labor a constant cost by putting it on a salary basis, as the higher officials are now, and to make capital a variable cost by leasing it for a payment depending upon the use that is made of it.” J. M. Clark, “Some Social Aspects of Overhead Costs,” *op. cit.*, p. 56.

⁴It is perhaps useful to re-emphasize that the foregoing argument does not rest upon any assumed moral obligation of industry to provide for the worker's livelihood in good and in bad times. Instead it is based entirely upon the undeniable fact that the maintenance and the training of labor has to be met as a social overhead cost if production and with it individual and social life, are to continue.

marks all entrepreneurial decisions concerned with the introduction of technological improvements. In this case, too, entrepreneurial outlays are bound to fall short of the actual total costs part of which have to be borne by the worker or the community in the form of greater expenditures for relief and unemployment. Needless to add this is not the result of any miscalculation by the entrepreneur but is inherent in the capitalist wage system.¹

A similar shift and disregard of overhead costs is involved in the non-utilization of non-human productive resources. This becomes evident as soon as it is realized that the conversion of fixed into variable costs is not limited to the field of labor but takes place "whenever anybody who has any 'overhead costs' sells his products or his services."² For he then "puts the 'overhead costs' into the price he charges and thus they nearly always become a 'variable cost' to the purchaser. Thus, most of the 'constant costs' of business disappear as constant costs and are converted into 'direct' or 'variable costs. . .'"³ In times of depression these direct costs tend to be shifted backwards all along the line on which goods move toward the consumer. As soon as business conditions begin to deteriorate, each individual firm reduces its variable expenditures by curtailing as far as possible its purchases of raw materials, semi-finished articles, tools and other producers' goods. However, the overhead costs involved in the production of these intermediate goods remain substantially the same. Since their fixed costs have to be borne by a smaller volume of output and sales, unit costs are inevitably increased. It is this increase of costs resulting from any contraction of the demand for intermediate goods by producers closer to the consumer, which fails to be considered entirely in private business decisions and

¹ O. Bauer, *op. cit.*, p. 175. A guaranteed annual wage would do away with this feature of business enterprise. By making the cost of labor a fixed charge for the individual firm it would not only eliminate an important source of social costs but it would at the same time create an incentive to use available resources more fully since the cost of labor would have to be paid anyway. Whether these benefits of an annual wage are offset by new elements of rigidity which such a wage system would introduce into entrepreneurial outlays is as yet an open question.

² J. M. Clark, "Some Social Aspects of Overhead Costs", *op. cit.*, p. 53.

³ *Ibid.*, p. 53.

cost calculations.¹ And similarly, in deciding the question of whether or not it is worth-while to resume production at full capacity, instead of keeping part of his plant idle, the individual entrepreneur can only disregard the entire series of savings which would accrue in all intermediate stages of production as a result of the fact that with increased production the fixed overhead costs in these industries could again be distributed over a larger total output. This is merely another way of saying that for the economy as a whole the difference in costs involved in partial utilization of available plant equipment as against those involved in full utilization is relatively small—so small, indeed, that as long as the additional products have any want-satisfying power there is a presumption that their production is worth-while in terms of total costs and total returns. In other words, the cost calculations of the individual firm fail to record both the social costs resulting from enforced idleness, as well as the economies obtainable from full utilization of productive resources.

It is this "atomistic" method of accounting which tends to distort the economic calculations of the market economy and accounts for the obviously absurd fact that no production whatsoever and complete idleness of plant are preferred to at least some output and partial utilization of available resources. Another reason for this absurdity according to which—while millions of persons are incapable of satisfying their most elementary needs—nothing seems to be preferable to at least something, lies in the fact that during the initial stages of the depression many cost prices reflect what the productive resources were worth in the past and not what they are worth under existing conditions. In other words, "a wage rate of three dollars per day for making shoes ought to mean that there are other opportunities for using this labor to produce something worth three dollars per day. If the worker stands

¹ This shift of "variable" cost backward to intermediate stages of production accounts also for the fact that the capital goods industries seem to bear the brunt of the depression; while all producers close to the consumer find it possible to shift costs to intermediate producers and thereby force unit costs up, the latter have nobody upon whom to shift their own costs since modern production "starts" with them.

idle because he is not worth three dollars per day at making shoes, that means that the three dollars alternative does not exist or at least is not available within the limits of existing knowledge. Under these conditions, to act on the assumption that shoes are not worth producing unless they will cover the three dollar wage is false social accounting, flying in the face of the elementary fact that anything produced is that much more than nothing. It stands in the way of our making the best available use of our productive resources, whatever that use may be, by insisting that they shall not be used at all unless their use will cover 'costs' which changed conditions may have rendered for this purpose, arbitrary and misleading."¹ The same argument applies to interest and rent. They too represent what capital and land were worth in the past in times of prosperity and not what they are worth under the new conditions after business has declined. It is, therefore, "inevitable that productive resources should go to waste, with the further result that they create no purchasing power to buy the products of other productive resources."²

The Social Costs of Depressions

The social costs of economic instability can be estimated either directly or indirectly. A direct measure would be to estimate the difference between the social overhead costs of labor and the actual earnings or unemployment compensation received by the unemployed during the depression. For various reasons apart from the conceptual and statistical difficulties of determining the social overhead costs of labor at any given time, the direct approach to the measurement of the social costs of depressions and idle resources is not likely to command general consensus.

A more satisfactory approach to the measurement of social costs of depression is to compare actual output or national income with potential real income. This is a measure of the economic potential of a given economy which could have been

¹J. M. Clark, "Productive Capacity and Effective Demand," in *Preface to Social Economics*, *op. cit.*, p. 375.

²*Ibid.*, p. 375.

reached under the assumption of specific average rates of growth. It is true that the higher the rates of progression used in the calculation of this potential the higher the social costs. This is a dilemma which has to be acknowledged. Perhaps the most conservative procedure would be to derive the progression coefficient from the average rate of increase over the preceding decade. Even this procedure would be open to the objection that the rate of advance during any specific period may have been either exceptionally low or high, or, clearly, below that of other economies.

In the light of such calculations the social costs of depression seem to have varied from ten to twenty-five percent of the national output. W. C. Mitchell and W. I. King placed the loss of income from depression in one bad year (1914) at nearly 3,500,000,000 of pre-war dollars—not quite one-tenth of the national income. These economists also calculated, on the basis of a rough approximation, that “the worst years (in a cycle period) run something like fifteen to twenty percent behind the best, and something like eight to twelve percent behind the moderately good years.”¹ This was before the Great Depression. In 1939, the National Resources Committee estimated that the loss of national income caused by the depression years of 1929 to 1937 amounted to over 200 billion dollars. This would represent roughly twenty-five percent of the potential income during these years. The social costs of a depression of equal severity as that of 1929 would amount to 125 billion dollars for an economy producing a gross national product of 500 billion dollars. Current estimates (1961) place the loss of potential income at ten percent of the actual output level of the American economy,² or fifty billion dollars. This is the magnitude of the depression loss in potential income through

¹ W. C. Mitchell and W. I. King, “The Economic Losses Caused by Business Cycles”, in *Business Cycles and Unemployment* (New York, McGraw-Hill Book Co., 1923), p. 39.

² “Had our economy progressed since 1956—not at the dramatic sprint of the Western European and Japanese economies or at the rush of the controlled totalitarian systems, but simply at the modest pace made possible by our labor force and productivity trends—we could have expected 1961 to bring a gross national product some 10% above the \$500,000,000,000 level we are now experiencing.” P. A. Samuelson, *Prospects and Policies for the 1961 American Economy*, *The New York Times*, January 6, 1961, p. 18.

failure to use available resources. The significance of these losses is difficult to grasp. It goes far beyond the fact that with unemployment reduced and idle capacity put to work it would be possible to transform a government deficit into a surplus of ten billion dollars (under the present tax structure).¹ Their basic significance lies in the fact that the avoidance of these social costs would make it possible to increase private income and public outlays and beyond that would soften the potential clash between private and public outlays in general.²

Nor are the social costs of depressions confined to any single country. Depressions, particularly in the more advanced centers of industrial production, are transmitted to the rest of the world through the contraction in imports, the curtailment of foreign lending, and the international payment mechanism in general. Depressions are thus truly cumulative and contagious on a world scale.

Apart from this, the social costs of economic instability include certain less tangible consequences such as the deterioration of the state of public health, higher mortality, greater incidence of crime, increased alcoholism and lower marriage and birth rates. They are further reflected in the psychological effects of general insecurity and the frustration of the hopes of millions of individuals. It will probably never be possible to visualize fully and even less to appraise, the possible magnitude of these broader consequences of depressions.³

Summary and Conclusions

The positive results of the present chapter may be summarized as follows. In introducing technical improvements, the individual entrepreneur tends to disregard completely two important types of social losses to which his innovation tends to give

¹ *Ibid.*

² W. W. Rostow, "Summary and Policy Implications", in Joint Economic Committee, *Comparisons of the United States and Soviet Economies*, Part III, (Washington, D.C., United States Government Printing Office, 1959) p. 603.

³ See however D. S. Thomas, *Social Aspects of the Business Cycle*, (London, London School of Economics, 1925); Josef Soudek, *Die sozialen Auswirkungen der Konjunkturschwankungen* (Bonn, Kurt Schroeder Verlag, 1929), Herbert Schwarz, *Kriminalität und Konjunktur International Review of Social History*, vol. 3, 1938, pp. 335-97.

rise: first the capital losses which other firms suffer as a result of the new technique of production; second, the losses which technical changes tend to cause to workers. These latter losses are measured by various individual expenses involved in temporary unemployment, moving, and retraining, in a general reduction of skill requirements, and, more important, they may result in extended periods of unemployment during which the social overhead costs of labor are shifted to the individual worker. In other words, technical improvements may appear economically justified from the point of view of the individual entrepreneur (i.e. in terms of private costs and private returns) although a more accurate calculation of the total costs of the innovation might reveal its introduction to be unjustified, premature and wasteful.

The social losses of unemployment are by far the most important social costs bound up with the operation of the system of business enterprise. They are reflected in a general shift of the overhead costs of labor to the unemployed and to the community as well as in the higher unit costs which result from the peculiar manner in which "variable" entrepreneurial outlays can be shifted backwards to intermediate and primary stages of production. As soon as the demand for its own products begins to fall off, each concern finds it possible and convenient to curtail its orders and "variable" costs irrespective of the effects which such action is likely to have upon costs and employment in the preceding stages of production. In other words, instead of contributing his "share" to the fullest utilization of available productive equipment and factors of production, the individual entrepreneur finds it more profitable, or rather less expensive, to stop producing altogether. By the same token, the private firm can only disregard the economies that would accrue, in the form of lower costs in all intermediate stages of production from any resumption of production at full capacity, by reason of the fact that fixed overhead charges could again be distributed over a larger total output and turnover. In this way, private outlays tend to distort and to magnify the actual costs of production in times of depression.

The economic soundness of deficit spending in times of

unemployment does not rest upon some analogy to "pump priming" or the multiplier effect but upon the fact that the competitive calculus treats as variable costs what are from the standpoint of the economy as a whole fixed costs. Instead of placing the unemployed on relief, public spending for carefully selected public purposes is justified by the fact that the maintenance of the unemployed constitutes a fixed charge for the economy and that the additional costs of public works are likely to be smaller than the social benefits obtained from such works. "It is the divergence between the principles of social and private accounting which holds the clue to the inconsistencies of so-called 'sound' finance."¹

¹ Dudley Dillard, *The Economics of John Maynard Keynes*, (New York, Prentice Hall, 1948), p. 105.

CHAPTER ELEVEN

DUPLICATION, EXCESS CAPACITY AND SOCIAL COSTS

WE HAVE NOTED earlier the duplication of capital outlays in the petroleum and coal industry. This duplication which gives rise to various technical and economic inefficiencies as well as to an accelerated rate of recovery of these non-renewable resources illustrates the case of excess capital investment which tends to play a much greater role than is generally believed. It differs from idle capacity and unemployment in times of depression by the fact that it is a more permanent phenomenon.

It is true that no economy can do without a certain amount of surplus capacity if it is to maintain a minimum of flexibility. Furthermore, excess capacity serves as an essential reserve in times of emergency. However, we are not concerned here with this necessary surplus capacity which we may call frictional excess capacity in analogy to the concept of frictional unemployment. What is under discussion are the dangers of an overexpansion or duplication of capital facilities in certain industries. Such a proliferation has long been characteristic in transportation and distribution and it is to these industries that we turn in our analysis of the general phenomenon of excess capacity. In addition, we shall deal in this chapter with the duplication of industrial research and the effects of the patent system.¹

The problems raised in the following discussion are all concerned with the economics of social efficiency of the economy viewed as a whole. Only from this perspective does it make sense to speak of duplication, excess capacity and lack of coordination of existing capital facilities. While it may be utopian and politically unacceptable, at least under peacetime

¹ For an analysis of the effects of the organization of scientific research in general see Chapter 13.

conditions¹, to draw the practical and normative consequences from the concept of efficiency of the economy as a whole, it is, at least theoretically, important to identify some of the sources of existing social inefficiencies. There are some industries which, by their very nature, call for a physical coordination and technical integration as the prerequisite for any maximal or optimal operation even under contemporary institutional arrangements. Their chronically depressed state in terms of private costs and private returns may well have its origin in the fact that the question of over-all technical coordination and efficiency was not raised from the start, and that the present organization of the industry is still burdened with the initial and continuing neglect of optimal organization and operation viewed from the perspective of the economy as a whole. The results are duplication and a lack of coordination which burden the industry with an unnecessarily high and disproportionate share of fixed costs which represent an avoidable excess capacity and do not even guarantee a maximum of convenience and satisfaction for the consumer. While total capacity is far ahead of actual output, the duplication and initial lack of integration of facilities make it impossible to achieve maximum efficiency with the available equipment, quite apart from the fact that the social costs of operation are unnecessarily high.

The inability to view the transportation industry as a whole in relation to its function within the economy and the failure to raise the question of the objective and technical requirements of a transportation system (or for that matter of the development of urban communities, of the proper organization of the distribution system, and of the development of recreational facilities) have the effect of violating criteria of technical over-all efficiency as well as the economic principle in providing the necessary services with a minimum of outlays. Instead of taking account at least of the socio-technical optimum for the

¹ It is significant that in times of emergency society is quite willing under the pressure of circumstances not only to raise the question of the over-all efficiency of the economy but also to eliminate a wide variety of technico-economic inefficiencies which are the result of the duplication and lack of coordination of capital facilities.

economy as a whole, investment and allocation under conditions of business enterprise tend to be guided by market prices whose relevance, in the long run and under conditions of economic change, cannot be taken for granted. In other words, technical considerations which may be highly significant for the avoidance of social costs especially from the perspective of long-run development are ignored. Indeed, in many instances, unnecessary duplication and inadequate coordination of capital facilities are signs of social inefficiencies resulting from an earlier neglect of basic technical criteria—a neglect which now tends to add to the costs of production. Because previous generations ignored technical criteria and the objective requirements of the socio-technical optimum, present and future generations will continue to pay the price in terms of social losses. The theoretical framework for the following discussion is once more provided by the concept of social costs. It may be pointed out beforehand that the criteria of social inefficiency cannot be based exclusively upon ready-made quantitative market standards. As J. M. Clark once put it, the economics of efficiency must form its measure as it goes along.¹

Duplication and Excess Capacity in Transportation

There are essentially three reasons why the development and operation of a system of transportation along competitive lines leads to duplication and relatively low operational efficiency. First, modern transportation facilities call for heavy initial investment of capital. That is to say, transportation is an industry which operates with a comparatively high percentage of fixed costs. This is due to the fact that transportation is concerned with the movement of commodities and is not, like manufacturing, concerned with their transformation. Whereas manufacturing always requires an investment of capital in materials, transportation requires no such investment. Hence the proportion of overhead costs is usually higher than in manufacturing. As long as the demand for transportation

¹J. M. Clark, "The Socializing of Theoretical Economics," in *Preface to Social Economics* (New York, Farrar and Rinehart, 1936), p. 43.

between two points is such that one initial investment (that is one railroad track, one canal, one tunnel) is sufficient to provide the required services, it would be highly wasteful to erect and maintain two or more such facilities in order to stimulate competition between independent transportation systems. For, any such duplication of transport facilities would make it impossible for any one such facility to operate at full capacity and thus to spread its overhead costs over the greatest possible number of services. Even if the demand for transportation calls for an expansion of existing facilities, it is usually more economical to enlarge the scale of operation (e.g. by adding another track or by increasing the width of the road) and to operate the total equipment as a unit rather than to construct and operate additional facilities under separate management.

Secondly, it is important to note that operational efficiency of any single means of transportation "depends also upon the extent of its integration with all other transport facilities. That is to say, each individual transport facility must form part of an integrated system in order to yield the greatest possible benefits. Every road has to be properly connected with other roads, every railway, every canal has to be conceived and planned as a part of the total transportation net, and railroads, inland waterways, and highways must be systematically coordinated if they are to yield the highest possible utility. If the establishment of the transport net were left to freely formed private enterprises only profitable lines would be constructed which would be highly inadequate as far as the consideration of all collective objectives is concerned."¹ In fact this need for an integrated transport system is not even confined to individual countries; there exists a genuine need for an international integration and coordination of such national transport facilities as railroads, canals, shipping and, most important of all, air transport.

The third factor which places transportation in a special category is to be found in the social character of many of the benefits of transportation. In fact, a substantial part of the

¹ E. Sax, *Die Verkehrsmittel in Volks- und Staatswirtschaft*, Vol. I, Allgemeine Verkehrslehre (Berlin, Julius Springer, 1922), p. 139 (translated by the author).

benefits of transportation tend to diffuse themselves to all members of society and remain largely inappropriable to either the carrier or the consumer. The same railroad, by facilitating the production and exchange of commodities, enlarges the extent of the market of manufacturers, determines the location of industries, influences land values, and serves important military and cultural purposes. Many of these effects of transportation accrue to society at large and are at best only of incidental concern to the private carrier.

The early development of the network of railroad facilities in the United States is a good illustration of the tendency toward duplication and excess capacity of transport facilities which has been carried over to the present.

"The American railroad plant was, in large part, built ahead of the development of traffic and ended by being substantially overbuilt. The proliferation of light traffic branch lines and of duplicate main and secondary lines has always held the average traffic density to a comparatively low figure. Moreover, except during war, few American main lines of railroad have ever been worked to near their theoretical capacity."¹

Actually the railroads as an industry are facing the competition of alternative methods of transportation and in some parts of the country seem to be a decaying industry unable to cope with the competition of highways and air travel.

Under the pressure of competition "each transport agency attempts to share traffic more logically belonging to another. The railroad, struggling desperately to regain its former position, attempts to retain the short-haul and less-than-carload business despite heavy terminal expenses which must often result in handling at a loss. The motor truck invades the long-haul fields by attracting the more lucrative traffic from the rails, despite the greater economy of the latter. The inland

¹ E. W. Williams, *Some Aspects of the Structure and Growth of Soviet Transportation*, in *Joint Economic Committee, Comparisons of the United States and Soviet Economies*, Part I, 1959, 86 Congress, (Washington, D.C., U.S. Government Printing Office), p. 183.

waterway diverts traffic over circuitous routes in order to share in the haul."¹

In addition to this multiplication of transport services, the lack of integration between existing facilities is further emphasized by the absence of unified and central terminals. Under present arrangements freight has to be received at, transferred to, and delivered from widely scattered terminal facilities under diverse ownership. This leads not only to a considerable loss of time, but also to wasteful transfers and duplication of delivery, all of which adds to the cost of transportation. "It has been estimated, for example, that approximately two-thirds of the typical completed car movement, involving about fifteen days on the average, is spent within terminal areas. The fact that the terminal accounts for one-third of railroad freight operating costs emphasizes further the possibilities of terminal improvement as a means of restoring railroad profitability and reducing costs to travelers and shippers."² It is possible to express the resulting social losses in quantitative terms by measuring the savings which would accrue from the coordination of terminals and other transportation facilities. Available estimates go back to the situation before World War II. Nevertheless, these data are still of interest particularly because they indicate a method of approach to the measurement of these social costs. Thus the total annual savings anticipated from specific schemes of consolidation or coordination of railroads alone ranged (in 1940) from a minimum of about \$200,000,000 to a maximum of \$1,000,000,000 with some consensus centering around half a billion dollars of annual savings.³ The relative significance of these estimated savings is indicated by the fact that "each \$100,000,000 of economy achieved through railroad unification would be equal to about

¹ *Public Aid to Transportation* (U.S. Office of the Federal Coordinator of Transportation, (Washington, D.C., U.S. Government Printing Office, 1940) vol. 1, p. 7.

² *Ibid.*, p. 3.

³ These estimates are based upon studies by the Federal Coordinator of Transportation. See National Resources Planning Board, *Transportation and National Policy*, (Washington, D.C., U.S. Government Printing Office 1942), p. 162, 166. See also B. N. Behling, *Railroad Coordination and Consolidation, A Review of Estimated Economies*, (Interstate Commerce Commission, Statement No. 4023, Washington, 1940).

three percent of the operating expenses of all operating steam railways for the year 1939. Savings of about \$500,000,000 would amount to about one-sixth of the operating expenses for that year. Savings of half a billion dollars also would have increased net railway operating income from \$638,766,000 to \$1,138,766,000 for 1939, and would have been equal to more than seventy-five percent of the fixed charges of the carriers."¹ These were the anticipated results of railroad consolidation only, and the estimates do not include the total economies obtainable from the coordination and integration of the entire transport system in the United States.

The effects of the duplication of transport services and their lack of coordination are further accentuated by inequalities in the degree of subsidization of different carriers. While air and water transportation and highways are financed to varying degrees through taxation, railroads do not receive any direct support from public funds. In other words, while some carriers have to cover only part of their costs, railroads have to charge rates high enough to cover their total costs.² As a result of these differences in methods of financing "sufficient volumes of passenger and freight business have been taken from the rails or kept from them, to result in serious financial consequences for rail operation. . . . Furthermore, in the case of air and water transportation the fact that carriers pay little or nothing for these facilities establishes the conclusion that railroads have been the victims of subsidized competition to the extent that traffic moving by air and water would have moved by rail save for lower rates made possible through appropriation from general funds."³ The uneconomical character of such a shift of traffic

¹ National Resources Planning Board, *Transportation and National Policy*, *op. cit.*, p. 162.

² The argument that the roads received public support in the past is not relevant in this connection. For, obviously, profits and business policies are determined by present costs or rather by estimates of future costs and not by costs of the past.

³ National Resources Planning Board, *Transportation and National Policy* *op. cit.*, p. 259. "As for motor transportation which contributed large sums of user revenue for financing highways, it is believed that the multiple nature of the highway function and the predominance of overhead costs combine to make it more a matter of conjecture whether vehicles as a class, or specific types of vehicles, pay a proper share of the highway bill in a particular State." *ibid.*

away from existing railroad facilities requires no detailed explanation: it contributes to the under-utilization of these facilities while scarce resources continue to be used for the construction of new competitive transport services.

A more recent and indeed current (1961) case of duplication and excess capacity is the competitive expansion of jet airliners in the American and international markets of air transport. In a competitive scramble for jet planes a dozen major lines expanded capacity far in excess of actual requirements or total demand (at current prices) with the result that their payload factors (i. e. the percentage of occupied seats) have been steadily declining both in the American and the international markets. In other words, the competitive introduction of rapid air transportation by jets which originally was expected to raise the load factor and increase profits has turned out to be, within a few years, the source of high costs, deficits and potential cutthroat competition. Recent mergers and international agreements of cooperation between several international airlines are a belated admission of the fact that competition in air transportation is bound to give rise to inefficiencies and unnecessarily high costs inherent in excess capacity.

A comparison of the relative efficiency of operation of the American and Soviet railroad system, which has been developed largely as a unified system may be of interest in this connection. Not only has the general density of traffic in the Soviet Union increased steadily¹ with the attendant reduction of unit costs but the turn-around-time of freight cars, which in the United States is fifteen days and even in war-time was not reduced to much below eleven days, was reported to be 5.83 days in the Soviet Union in 1958.² International comparisons of this sort are not always reliable and evoke suspicion as to their accuracy and relevance. After all, there are far-reaching differences in the geographical layout of the two countries, in the location of resources and centers of production, the relative importance

¹ "Gross ton-kilometers per freight train hour, generally regarded as the best single index of line-haul efficiency, increased by 86 percent between 1950 and 1958". W. E. Williams, *op. cit.*, p. 185.

² *Ibid.*, p. 184.

of long-distance shipments, in feeder-line and cross-haul systems and their coordination with the main trunk lines, in the development of different forms of transportation, the regularity of the flow of traffic and in the statistical accuracy of reporting. Nevertheless, if we consider the different conditions which have marked the development and operation of the two railroad systems in the Soviet Union and the United States it would appear not improbable and indeed quite likely that "the Soviet railways handle today approximately one-third more freight traffic than our own with about one-half of the line mileage."¹

It is important to realize, of course, that the American system of transportation is for all practical purposes a mixed system which combines private ownership and competition with a system of public control designed to protect the interest of the consumer and to safeguard national interests. Originally intended to prevent monopolistic exploitation of the consumer, through excessive and discriminating charges, this system of public regulation has been gradually expanded to a point where it includes in addition to the fixing of rates on the basis of the fair-return-on-fair value principle, the supervision and regulation of the establishment and operation of transport facilities, the maintenance of proper services, the financial organization of transport concerns including their accounting and reporting procedures. While this mixed system has helped to prevent the worst abuses characteristic of "natural" monopolies it was never intended to establish and maintain that minimum degree of technical coordination of transport services which would have kept costs of operation at a reasonable minimum. In the absence of the required and essential physical and economic coordination of existing transport facilities costs of operation have remained unnecessarily high while the relative over-all technical efficiency is apparently not improving.

Even within the public sector of transportation the emphasis has been much more upon the promotion of additional facilities and less upon the effective coordination of the new with existing

¹ *Ibid.*, p. 180. For further support of our general conclusion see also Holland Hunter, *Soviet Transportation Policies—A Current View*, Joint Economic Committee, *op. cit.*, pp. 189-99.

facilities. Actually, separate public agencies tend to act as special advocates for their particular forms of transportation. While substantial amounts of capital are being spent to enlarge both new and old forms of transportation it has remained difficult to coordinate the various carriers in accordance with a comprehensive plan. Indeed, broad plans designed to include all forms of transportation and non-transportation objectives are lacking. "The airport plan has no connection with the highway plan and the latter is unrelated to railroad plans, in spite of the fact that tremendous savings and improved services could both be achieved through coordination."¹ Instead, different local, state and federal authorities are responsible for the formulation of transportation policies and various transport agencies seek to compete for traffic which could be carried more economically by others. The consequences of this situation are reflected in wasteful duplication, relatively low traffic densities at times,² and high unit costs.

Here as in other fields of public policy it would be more economical in the long run if greater attention were paid to criteria of technical efficiency as a basis for decision-making than the market calculus permits.

Duplication and Excess Capacity in Retailing

Transportation is not the only field in which evidence of a proliferation of facilities, excess capacity and a lack of coordination can be found. A similar tendency toward duplication is characteristic of other fields of distribution such as retailing and wholesaling, insurance and real estate brokerage and even banking. It is not necessary to examine each of these fields of

¹ Public Aids to Transportation, *op. cit.*, p. 275.

² Even the very high traffic density on highways in and near metropolitan areas at certain times of the day is due less to relative inadequacy of traffic space than to technical inefficiency in the coordination and planning of highway systems which have grown without adequate long-run planning. In addition, of course, it cannot be overlooked that the expansion and congestion of automobile traffic is bound to become cumulative as second-hand cars become increasingly accessible to adolescents and if roads are opened without adequate parking facilities. It would be interesting to establish with some degree of precision to what extent the congestion of traffic at certain hours of the day is due for example to the fact that adolescents are making their way to schools; that access and exit roads are clogged and that automobiles are unable to find parking space.

distribution. The causes of this duplication of facilities are to some extent connected with the relative ease of entry and the preference for independent occupations. We find the same tendency toward a proliferation of distribution facilities in the city bazars and villages of the Orient. Here as in industrialized economies the ease of entry makes it possible and attractive to duplicate existing facilities and outlets even though the chances of commercial survival beyond one or two years of existence are notoriously low, at least in small-scale retailing, as is the case in the United States.

But even where entry is not easy and where relatively high amounts of fixed investments are required for the establishment of retail outlets (e.g. gasoline stations) the obligopolistic market structure of the major gas refineries and distributors tends to support a relatively high degree of duplication and lack of coordination of retail outlets. The outcome is excess capacity without benefit to the consumer except insofar as the resulting excess fixed costs make for instability of the market which takes the form of periodic outbreaks of cutthroat competition in the form of an open "gas war" backed by the major oligopolistic refineries. But these periods of open competition last only until the major distributors once more are able to agree on a price policy of "live and let live" which enables them and their retail outlets to charge off the heavy excess capacity to the consumer in the form of higher prices.

Clearly elements of oligopoly play an important role in the emergence and maintenance of duplication and excess capacity in the field of distribution. Whereas monopoly might be expected to eliminate, to coordinate and to "rationalize" existing outlets and facilities, oligopoly seems to perpetuate the duplication of facilities. It is true, that many small-scale retailers owe their continued existence among their competitors to the willingness to work at hourly wages which are often far below what they could earn as dependent workers. This differential by which their earning capacity is reduced, is the price or his opportunity cost for "independence" or being one's own boss. At the same time however, the small-scale retailer—and *pari passu* all distributors—are able to earn a special return due to the

fact that they enjoy an oligopolistic market power as a result of their location or the relative unresponsiveness of their customers to higher prices which carry the excess capacity. The opening of additional retail facilities where existing outlets are sufficient have the effect of forcing both old and new retailers to operate below capacity without being able to reduce their fixed charges. The result must be a continuous effort to pass these charges on to the consumer in the form of higher prices. In short, the duplication of facilities will be paid for in the end by the consumer even though the market structure may have become more competitive.

The foregoing analysis of the social consequences of excess capacity follows essentially Wicksell's line of reasoning on the same subject.¹ Wicksell goes on to explain that this wasteful duplication of retailers was the reason why the abolition of the tax on the entry of goods into a town never produced the expected reduction in prices. As long as buyers do not establish some form of organization among themselves to counteract the oligopoly of the retailer,—the only correct remedy according to Wicksell—"the anomaly must remain that competition may sometimes raise prices instead of always lowering them, as one would expect."²

It may be argued that the tendency toward duplication of

¹ . . . practically every retailer possesses, within his immediate circle, what we may call an actual sales *monopoly*, even if, as we shall soon see, it is based only on the ignorance and lack of organization of the buyers. He cannot, of course, like a true monopolist, raise prices at will—only in places remote from trade centres can a considerable local rise in prices occur—but if he maintains the same prices and qualities as his competitors, he can almost always count upon his immediate neighbourhood for customers. The result is not infrequently an *excess of retailers*, apparently for the convenience, but really to the *injury, of the consumers*. If for example, two shops of the same kind are situated at different ends of the same street, it would be natural that their respective markets would meet in the middle of the street. Now if a new shop of the same kind is opened in the middle of the street each of the others will, sooner or later, lose some of its customers to the new shop, since the people living round the middle of the street believe that if they get the same goods at the same price they are saving time and trouble by making their purchases at the nearest shop. In this, however, they are mistaken, for the original shops which have now lost some of their customers without being able to reduce their overhead expenses to a corresponding degree, will gradually be compelled to raise their prices—and the same applies to the new competitors who have been obliged from the beginning to content themselves with a smaller turnover. K. Wicksell, *Lectures on Political Economy* (New York, The Macmillan Co., 1934), pp. 87-88.

² *Ibid.*, p. 88.

facilities in the field of retailing and distribution in general demonstrates the need for the respective services rendered. Such reasoning, which does not deny that the existence of an excess number of middlemen prevents each from reaching the optimum scale of operation, fails to demonstrate that the various services would still be in demand if their costs were known, i.e. if the consumer knew by how much distribution costs could be reduced if the scale of operations should approach the optimum size. In short, while it is true that the consumer's demand is at least partially responsible for the emergence of inefficiencies in retailing, it is equally true that he is also the victim of the social costs of an overextended system of distribution.

The social costs of duplication and excess capacity are not confined to the higher costs of distribution and a higher over-all ratio of operating costs to sales in the industry concerned. They are also reflected in higher costs in related industries. Thus, an excessive number of distributors means higher costs for wholesalers and manufacturers who have to supply these outlets. "Fewer and larger stores would mean fewer and larger purchases and lower costs of physical handling and selling, as well as many collateral savings such as lower insurance and credit and collection costs."¹ Furthermore, the constant danger of commercial failure may force the small distributor to adopt practices of cutthroat and fraudulent competition of which he likes to accuse his larger competitors. Competition is thus in danger of sinking to those moral standards which prove more profitable, as J. B. Clark once pointed out.²

Business enterprise promotes a proliferation of capital facilities without necessarily offering a guarantee that the consumer will reap the benefits in terms of greater convenience and lower prices. Even though part of the capacity may be idle the elements of monopoly and oligopoly in most market structures have the effect of protecting private owners against the consequences of competition which would "normally", i.e. under conditions of perfect competition, follow from excess capacity.

¹ *Does Distribution Cost too Much?* The Twentieth Century Fund (New York, 1939), p. 299.

² J. B. Clark, *The Philosophy of Wealth* (Boston, Ginn and Co., 1904), p. 168.

While it may be theoretically correct to say that the social costs of excess capacity are strictly speaking the consequences of oligopoly, for all practical purposes these oligopolistic elements are built-in and in this sense more or less ubiquitous in the system of business enterprise. Under these circumstances it would be more advantageous for the consumer, and socially more efficient, to base investment decisions and particularly decisions on the location and physical coordination of capital facilities on a pragmatic concept of social optimum which incorporates technical criteria and considerations taking into account long-run perspectives and objective standards of capacity. What these considerations and standards are in each particular industry cannot be stated in general terms. In the absence of any pre-existing measure of this social optimum, except in a purely formal sense, it is not possible and perhaps even futile to develop precise criteria. Once the objectives have been formulated in general and incremental terms—such as for instance higher standards of service and cleanliness in retail distribution, or more balanced programming in television, the actual determination and choice of specific measures present no difficulties in principle and, moreover, can take place in terms of calculations of alternative costs. One thing is certain namely that the avoidance of excess capacity and of the uncoordinated proliferation of capital facilities is a prerequisite for the maintenance of a high level of socio-economic efficiency in the utilization of scarce resources under any form of socio-economic organization. Falling short of this, society and the consumer will bear the social costs connected with duplication and excess capacity in the form of unnecessarily high prices and general instability.

Duplication in Industrial Research and the Patent System

Duplication and lack of technical coordination responsible for social costs can be found also in the proliferation of industrial research efforts and the insulation of patented knowledge through industrial secrecy. This is a vast topic which can be adequately discussed only within the institutional context of oligopolistic competition and competition by innova-

tion. Unlike the system of price competition which dominates most models of the textbooks competition by innovation strikes at the very existence of each competing oligopolist. "In capitalist reality as distinguished from its textbook picture, it is not that kind of competition which counts but the competition from the new commodity, the new technology, the new source of supply, the new type of organization (the largest-scale unit of control for instance)—competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundation and their very lives."¹ Even more than cutthroat price competition it is a form of economic aggression which constitutes a constant threat and "disciplines before it attacks."²

The dilemma created by the patent system and industrial secrecy is not that they fail as an incentive to research and investment and to the application of science to industry in in general but that their combined operation tends to "insulate" the invention. The grant of a patent blocks the equal access to, and the practical application of, the results of scientific research for all firms. This has the effect not only of putting all other producers in the industry at a competitive disadvantage but it also retards the application of technical innovations in general and ultimately promotes the growth of oligopolistic elements in the economy. An exclusive privilege of making use of an innovation or improvement puts all competing producers at a competitive disadvantage. Several patents combined provide a convenient and effective means of closing the industry to all newcomers. Not infrequently, the holder of the patents is able to reserve the market for himself and to prevent other producers from competing. Should outsiders, nevertheless, attempt to invade the industry through the use of allied procedures under a separate patent they face expensive and ruinous litigation for infringement of patent rights. If in the ensuing legal struggle one of the rival companies is not quickly exhausted and leaves the field to the other, both claimants might finally

¹ J. A. Schumpeter, *Capitalism, Socialism and Democracy*, *op. cit.* p. 84

² *Ibid.*, p. 85.

accede to a settlement under which "each of the contracting parties takes certain processes as his own, acquires the exclusive right to certain wares, or obtains sole control of the market within a defined area."¹ In other cases, where different patents must be used together in a particular productive process, the holders may decide to "pool" their patents or to grant licences to each other with a view to providing for a uniform policy of production and sale of the article. By thus combining their patent rights manufacturers have been able to "throw a wall about their self-vested interests."²

Similar results may be achieved by licencing agreements through which the corporation owning the patent leases the right to use the patented process to other manufacturers. Such licencing agreements may contain restrictive clauses as to sales territory, output and prices. Under such clauses "the sales of each are limited to a certain territory and there is no competition between them. . . . Quotas are imposed upon all who produce. . . . Plants of licencees are severely limited in their capacities. A system of prices, prescribed by the patentee, becomes a covenant running with the lease. The government's grant blocks the entrance; whoever would enter the trade must come to terms with the owner."³

All this, it might be argued, will not be of long duration, for the expiration of the patent will put an end to any patent pool or licencing agreement based thereon, and the invention, by becoming public property, will finally be an addition to the common fund of knowledge for the benefit of all. This argument, however, fails to take into consideration the realities of modern technology and patent procedure. For there are many devices through which the actual life of a patent may be extended beyond its statutory life. First, it is not uncommon to delay the official sanction of the patent by various tactics such as marking the article with the legend "patent applied for."⁴ Second, a basic invention may be improved by a hundred devices. Thus "a novel twist may give to an old invention

¹ W. H. Hamilton, *Patents and Free Enterprise* (TNEC Monograph No. 31 (Washington, D.C., U.S. Government Printing Office, 1941), p. 161.

² *Ibid.*, p. 161. ³ *Ibid.*, p. 160. ⁴ *Ibid.*, p. 135.

a new lease of life; an improvement may freshen a familiar into a novel process."¹ No wonder then that often not one but scores of patents may serve as the basis of many modern manufacturing processes,² and that "a series of patents, neatly articulated and accurately timed, may be made to carry on indefinitely."³ These conditions together with the fact that the holder of the patent has the exclusive opportunity of further experimenting with the invention often give him a relative secure superiority over all potential competitors.

"Eventually the corporation may enjoy such security that its grants from the government are no longer needed for active service. The patent to Morse for the telegraph expired before the Civil War; yet Western Union—with Postal as its little sister—carries on. That McCormick once had a patent is now a fact in history; yet almost all reapers are now made by the International Harvester Co. In 1880 a patent was issued to Edison for an electric bulb; the shadow was lengthened into the substance of General Electric. The original patents on shoe machinery had run their course before most persons now living were born; the process is still blanketed by official grants—and over it United is an absolute sovereign. The Bell patents gave to the struggling telephone its start; it matters little today to American Telephone and Telegraph—at least in respect to its ordinary service—whether its devices are patented or not; in either event it would enjoy an exclusive right to their use. An invention may open a new art; the patent upon it may serve for decades to exclude the public."⁴

Today all major firms seem to be surrounded by a wall of patents designed primarily to cut off outsiders from their particular techniques. The real function of the patent is to exploit the advantageous position it creates. Patents are thus

¹ *Ibid.*, p. 140.

² "The imperium of the United Shoe Machinery is barricaded by some 6000 patents, Dupont, Hartford Empire, RCA Victor have piled patent on patent to secure against invasion the whole range of their activities." *Ibid.*, pp. 46-47.

³ *Ibid.*, p. 140. ⁴ *Ibid.*, pp. 140-41.

not only the most important obstacles to the general application of the results of scientific research in industry but they serve at the same time the oligopolistic purpose of controlling supply and holding prices at the most profitable levels.

In conclusion it can hardly be denied that the potentialities of technical progress cannot be realized within the institutional framework of the patent system in which innovations come to fruition. In fact the inevitable results of the patent system are duplication and secrecy of research efforts, the insulation of patented knowledge from other firms and the retardation of further research which cannot make use of the latest technical knowledge. "Few of the best patents are licensed to others" and if some are so licensed "a rival will not improve another's invention, since use of the improvement would probably entail patent infringement"¹ The insulation of patented knowledge which is the objective of the patent system restricts the rest of the industrial world to the use of knowledge and procedures that are already in the public domain. What is more, it also insures that much contemporary research tends to avoid the use and incorporation of the latest patented technical knowledge which is not yet in the public domain.² Thus, while the same research problem may be attacked in different companies, the most advanced knowledge and technology are fenced in and for all practical purposes are not available as a basis for further advances. Hence, our technical and scientific development is likely to be severely retarded. This conclusion is not refuted by references to absolute and relative expenditures for industrial research nor by general statements on the rapid rate of technological advances during the last hundred years.³

¹ J. Schmookler, "Technological Progress and the Modern American Corporation," in E. S. Mason, (ed.) *The Corporation in Modern Society* (Cambridge, Harvard University Press, 1960), p. 156.

² Thus "curiously enough, the Russians, at a cost of twenty-five cents each, buy copies of American patents and use the latest discoveries of American industrial laboratories freely in Russian industry. Yet only patentees and their licensees can lawfully use these discoveries in America." *Ibid.*, p. 157.

³ We cannot concern ourselves with the principal alternatives to the present patent system such as compulsory licensing or the payment of bounties to inventors by the government. See *Ibid.*, pp. 159-60.

The "free income" which the oligopolist is able to extract from his patented products or processes constitutes only a part of the social costs caused by the patent system and the duplication of industrial research. Even more significant is the general retardation of scientific progress which leads to a failure to make the best possible use of available technological potentialities. Nobody can say just how high these social costs are although it must be clear that the scientific and technological performance of the Soviet Union in recent years indicates that the lost opportunities are substantial. In short, the social costs of duplication extend to the field of scientific research, the patent system and industrial secrecy which together sustain and strengthen the oligopolistic market structure. They assume the form of "free" income resulting from the oligopolists' capacity to charge prices in excess to costs, the social wastes resulting from a deliberate deterioration of the serviceability and desirability of products, and the reluctance of oligopolists to expand capacity in wartime for fear of cutting into their profits. Some of these issues will be discussed in the subsequent chapter.

CHAPTER TWELVE

THE SOCIAL COSTS OF CUTTHROAT COMPETITION, PLANNED OBSOLESCENCE AND SALES PROMOTION

THREE major factors threaten the earning capacity of the corporation under the system of business enterprise: the danger that production may be expanded beyond the capacity of the market, the improvements of the industrial arts, and the outbreak of open economic warfare. We have dealt with the danger of excess capacity and duplication as well as with the role of industrial research in the preceding chapter. The social costs of open economic warfare will occupy us in the present chapter.

By economic warfare is meant a variety of business practices such as cutthroat competition, planned obsolescence and the systematic encouragement of conspicuous and unproductive consumption through sales promotion and high-pressure sales publicity. We shall deal first with the social costs of cutthroat competition and its counterpart, the administration of prices. This is the traditional case of oligopoly. The phenomenon of planned or accelerated obsolescence is a relatively new phenomenon anticipated only partially by Veblen's earlier discussion of "sabotage" and "the conscientious withdrawal of efficiency in modern industry."¹ The latter part of the chapter will be concerned with the social costs and consequences of sales promotion and high-pressure sales publicity.

Cutthroat Competition and Administered Prices

The fact that the oligopolist tends to produce or to sell under conditions of declining costs acts as a constant temptation to attract a greater share of the market by temporary price reductions designed to undermine the relative position of competitors.

¹ T. Veblen, *The Engineers and the Price System*, (New York, The Viking Press, 1921), p. 20.

This is the situation which Marshall called unstable equilibrium and which induced Schumpeter to speak of the instability of capitalism. Such deliberate economic warfare seriously affects the stability of an industry. While it lasts, it forces competitors to concentrate their attention on defensive practices in order to avert the threat of bankruptcy. This economic warfare benefits the consumer only temporarily while it is in progress and only before it has achieved its ultimate objective: the elimination and shutdown of competitors or a tacit or open agreement upon a common and stable price which will be high enough to cover costs even while operating far below capacity. The social costs of this type of competition are to be found in the fact that commodities which could have been produced are not produced because they will not sell at the higher oligopolistic price. With prices remaining considerably above costs the oligopolist is assured of a "free" income.

Attempts to overcome the potential instability of oligopolistic market positions may take a variety of forms of price fixing or price administration, the details of which need not concern us here. Price leadership, price discrimination, and basing point pricing with identical delivered prices and the more informal price adjustments which are known under the name of "cat and mouse" monopoly are all familiar illustrations of this search for stability. Price administration and price fixing are of course old phenomena. They are perhaps as old as the institution of trade itself. We need only recall the medieval prohibitions of "forestalling" and "engrossing" and Luther's indictment of large trading companies in Germany for various trading and "usury" practices and their apparently successful collusion with political authorities.¹ Later, the author of *The Wealth of Nations* himself pointed out that "whoever imagines . . . that masters rarely combine, is as ignorant of the world as of the subject. . . . We seldom, indeed, hear of this combination, because it is the usual, and . . . the natural state of things."²

¹ For evidence, see the documents and reports relating to two early monopoly investigations (by the Diet of Worms (1521) and of Nuremberg (1522-23) in *Introduction to Contemporary Civilization in the West* (New York, Columbia University Press, 1946), Vol. 1, pp. 364-73.

² Adam Smith, *Wealth of Nations op. cit.*, pp. 66-67.

That price fixing either "spontaneously" or under the pressure of larger companies does not cease as a result of legal prohibitions is indicated by the indictment and successful prosecution (in 1961) of twenty-nine corporations and forty-four executives for illegal price fixing and bid-rigging in the electrical appliance industry in the United States.¹ While price fixing leads to overcharging of the buyer, price discrimination whether practiced openly or under the guise of identical delivered prices through freight absorption and basing-point systems assures the absence of price competition at the point of delivery. As such it makes for wasteful crosshauling and prevents the most economical and decentralized location of industrial production in reasonable proximity to its markets. Instead, it contributes to and accelerates the unregulated agglomeration and concentration of population in industrial and urban centers in which life becomes increasingly costly in terms of congestion, pollution and commuting expenses, and wasteful in terms of fatigue, strain and stress. Furthermore, when there is power to control supply and therefore price, the pressure which forces producers under competitive conditions to reduce the margin between cost prices and product prices is absent or reduced to a minimum. Under these conditions, lower costs of production will not be passed on either to the consumer in the form of lower prices, or to the worker in the form of higher wages.

Only the development of political and countervailing power has mitigated to some extent the "combination of masters" in modern business enterprise. Without the emergence of such power outside the framework of demand and supply oligopoly would have produced a new serfdom for the great majority of the population.

In so far as existing schemes of price control are based upon the ability to control and restrict production, their very existence is put in jeopardy by technological innovations, new products, and by an expansion of capacity. Hence we observe the peculiar reluctance to expand production which varies with the anticipated elasticity of demand or the oligopolist's notion of the shape of the demand curve for his products. It is probably

¹ *The New York Times*, February 7, 1961, p. 1, and February 8, 1961, p. 1.

safe to assume that most oligopolists underestimate the elasticity of their demand and hence underestimate the additional returns which might accrue to them as a result of an expansion of output.

It is, therefore, not surprising that oligopolistic agreements and combinations, often extending over more than one country, delayed and prevented the expansion of production of essential war materials and equipment during the initial stages of the transition from peace-time to war-time production in the United States during World War II. "Looking back over ten months of defense effort," wrote the Assistant Attorney General in charge of the Anti-Trust Division of the U.S. Department of Justice in his *Annual Report to Congress* in 1942, "we can now see how much the defense effort has been hampered by the attitude of powerful private groups dominating basic industries who have feared to expand their production because expansion would endanger their future control of industry. These groups have been afraid to develop new production themselves. They have even been afraid to let others come into the field. They have concealed shortages by optimistic predictions of supplies, and talked of production facilities which do not exist. Anti-trust investigations during the past year have shown that there is not an organized basic industry in the United States which has not been restricting production by some device or other in order to avoid what they call "the ruinous over-production after the war."¹ Congressional investigations of the American war program have brought to light a wealth of evidence leading to the same conclusion.² These facts should not be dismissed lightly because they point to one of the most important obstacles which delayed the transition from peace to war production of the market economies of the Allied powers during the last war.

¹ *Annual Report of the Assistant Attorney General Thurman Arnold* (Mimeographed) p. 1. See also T. W. Arnold, *Democracy and Free Enterprise* (Norman, Okla.: University of Oklahoma Press, 1942), pp. 11-26. For a detailed presentation of evidence of how monopolistic interests hampered the defense effort see J. F. Stone, *Business as Usual: The First Year of Defence* (New York, Modern Age, 1941).

² C. D. Edwards, "Economic and Political Aspects of International Cartels", Senate Committee Print, *Monograph No. 1* (78th Congress, 2nd Session) (Washington, D.C., U.S. Government Printing Office, 1944), pp. 58-64.

Equally detrimental in their effects upon economic preparedness and security are international cartel and licensing agreements based upon patents, especially if some of the large national corporations entering into agreements are not even independent business concerns but are instruments in the hands of governments. All this was brought into sharp relief after the outbreak of the second World War. In particular, it was discovered that patent licensing agreements between American, British and German firms producing important strategic materials (such as beryllium, tungsten, carbide, plastic glass, optical equipment, etc.) provided for regular exchanges of technical information as well as for the division of world markets into non-competitive zones. As a result, each firm enjoyed a privileged and protected position in its own territory and, in return, agreed not to sell its products in the markets of its foreign partner to the agreement. That these private agreements may have had far-reaching effects upon war production in the United States and Great Britain, and indeed conflicted with the declared foreign policy of these countries, is indicated strongly by the evidence presented to various Congressional Committees.¹

Thus, patent agreements between American and German firms were found to have been responsible for shortages and for the insufficient development of essential war materials in the United States; after the outbreak of the war in Europe in 1939 American interests concerned with such agreements are known to have been reminded by their German partners that the latter's sales territory included Canada. The particular German company involved in this instance requested that no information which came from Germany under the contract would be given to Canada and that no instruments, built under licence, would knowingly be supplied to Germany's enemies. The American company which was a party to the contract is said to have given such assurance in accordance with the terms of the

¹W. H. Hamilton, *Patents and Free Enterprise*, TNEC Monograph 31 (Washington U.S. Government Printing Office, 1941), pp. 103-108; see also U.S. Senate, *Investigation of the National Defense Program* Additional Report, No. 480, Part 7, May 26, 1942 (Washington; U.S. Government Printing Office), pp. 27-42.

agreement. Moreover, as late as January 1941, one American company refused, apparently because of fear of a civil damage suit for breach of contract, to sell certain types of ammunition to the British Purchasing Commission because of its cartel agreement with a German firm.¹

However, no matter how stable the regime of "administered" prices and how widespread the willingness to live and let live, it is nevertheless open to "disturbances" at any time. Oligopolistic equilibria are inherently unstable because they are being undermined by forces of their own making such as excess capacity and additional profits which any expansion of output would make possible owing to the fact that they are operating under decreasing costs. Once the spell is broken, the expansion of output may feed upon itself and be promoted and accelerated by anticipations and repeated credit transactions. Nothing needs to be said about this periodic cumulative increase of output except that it may reach such proportions in modern industrial societies as to exceed the capacity to consume. This in turn sets the stage for the adoption of socially harmful practices which shall occupy us in the following section.

Planned Obsolescence and Social Costs

In the world of oligopoly any violation of the price agreement becomes an unpopular act.² Indeed to be accused of competition by price cutting is often considered equivalent to being slandered in the world of the oligopolist. According to the textbooks, competition tends to be channelled into non-price competition such as attractive credit arrangements, pleasant surroundings and personal services of various kinds. What the textbooks usually fail to mention are the various forms of competition in "disservices" such as frequent changes in design and planned obsolescence designed to accelerate the sale of

¹ Cf. A. Krock, "The Cartels as Parts of a German War Plan," *The New York Times*, March 27, 1942. For the most complete picture of the role which international patent agreements played as a source of shortages and in the delay of American war production see G. Reimann, *Patents for Hitler* (New York, The Vanguard Press, 1942).

² Even this was seen clearly by Adam Smith: "To violate this combination is everywhere a most unpopular action and a sort of reproach to a master among his neighbours and equals." *op. cit.*, p. 67.

commodities. Admittedly these practices are surrounded by secrecy and have not yet been fully explored. The by now classical illustration of a deliberate reduction in the quality and ability of consumers' goods for the sole purpose of increasing sales is the proposal of a company engineer of the General Electric Company to reduce

"the life of flashlight lamps from the old basis on which one lamp outlasts three batteries to a point where the life of the lamp and the life of the battery under service conditions would be approximately equal. Some time ago the battery manufacturers went part way with us on this and accepted lamps of two battery lives instead of three. This has worked out very satisfactorily.

"I think you will be interested in the attached analysis . . . covering the various points involved in going to the one battery-life basis. . . . If this were done we estimate that it would result in increasing our flashlight business approximately 60 percent. We can see no logical reason either from our view point or that of the battery manufacturer why such a change should not be made at this time."¹

It is fair to assume that there have been many oligopolistic firms who have failed to see any reason why they should not reduce the quality and average "life expectancy" of their products if by doing so they could increase the volume of their sales. In fact, such reduction of quality and planned obsolescence of both the physical serviceability and the desirability of consumer's goods is the aim and effect of many sales promotional activities. For instance, the commercial promotion of styles and fashions has the effect of reducing and even destroying the economic usefulness of durable and semi-durable goods long before they have ceased to be serviceable. By thus artificially shortening the cycle of obsolescence for many goods, styles and fashions and their commercial promotion contribute to

¹ See memorandum from the files of the General Electric Company reported by the Assistant Attorney General to the Senate Committee on Patents. *Hearings*, 77th Congress, 2nd Session, Part I, p. 630. See also C. D. Edwards, *op. cit.*, p. 16.

substantial losses in modern society. This conclusion is not weakened by the fact that the development of new styles and fashions may play upon the human desire for variety and that it apparently meets with the approval of the consumer. For the important thing is not that sales and fashion promotion find some response in human nature but rather that the social costs of these forms of oligopolistic competition are substantial especially if viewed in terms of the benefits obtainable from the resources invested. Indeed, the economies resulting from the simplification of styles and the reduction of the number of trademarks in wartime supports the conclusion that business enterprise has gone far beyond the optimum point in the promotion of brands and fashions. In the automobile industry, for example, the policy of "degrading" a durable consumer's good by the periodic introduction of new designs has given rise to intermittent periods of peak production and employment and intervening periods of partial utilization of existing equipment with a high percentage of enforced idleness of workers and specialized capital equipment. Both the obsolescence of desirability and the obsolescence of quality seem to have undergone rapid development since Veblen first spoke of sabotage and the conscientious withdrawal of efficiency in modern industry. Automobiles, automotive part, tires, home appliances from washing machines to television sets, and floor coverings, draperies and furniture have been increasingly the object of complaints on the ground of deliberate quality deterioration. Independent testing agencies, such as the Consumers' Union and Consumers' Research, have reported on the declining tread mileage of tires of various makes and of the declining capacity of automobile body work to withstand corrosion and other types of damage that mar the appearance of a car. While automobile engines often remain serviceable for a considerable period of time, various automotive parts such as mufflers and exhaust systems frequently have a reduced lifespan notwithstanding the fact that the technical processes of lead and ceramic coating which would extend their serviceability over the life of the car are available to the manufacturer at only slightly higher cost. Similarly, television

sets are reported to have declined in quality over the years although it is technically possible to build sets that would last for close to a decade without major repairs. Instead, replacements and repairs of television sets are said to have become more frequent and more costly.

The principle of planned obsolescence is applicable even in such a field as residential housing where the product has long been supposed to provide customers' satisfaction over a long period of time.

"Houses satisfy too many families for too long a time; the industry must help homebuyers learn the virtue of trading up to a bigger, better, more beautiful house every few years. Take a tip . . . from the auto industry. Find housing's equivalent of a pinch of chromium and a dash of tail-fin and you'd have to beat off the buyers with clubs.

"The idea has interesting possibilities. It would, for example, relieve the industry of the troublesome responsibility of building houses to last a lifetime. For who would want to live in the same old house for a lifetime? And it should be a simple matter for clever merchandisers to convince those who worry about keeping up with the mortgage payments that it's much more important to keep up with the Joneses."¹

It is not suggested that this apparent trend toward built-in obsolescence has as yet affected all fields of merchandise or, for that matter, that industries are maintaining laboratories occupied with deliberate product deterioration. Nor is it argued that the technically superior product is necessarily economically the superior or more desirable product. However, it is suggested that product and quality designs and the deliberate spacing of the lifespan of different parts in such a fashion that the need for replacement and repair is increased, are commercially profitable in oligopolistic market structures. The social costs of these practices are opportunity costs or economies

¹Quoted without comment from 'Engineering News-Record' by *Consumer Reports* June 1960, p. 30. For further evidence on planned obsolescence see Vance Packard, *The Waste Makers* (New York, David McKay Company, 1960) particularly chs. 6-12.

not realized. They are partly reflected in unnecessary repair costs and earlier replacement of durable goods.

How far this quality deterioration has actually spread in contemporary oligopolistic business enterprise cannot be demonstrated with certainty. While an industry with excess capacity and high overhead charges has much to gain from an accelerated obsolescence, it is equally possible for an oligopolist to "undercut" his competitors and offer the more durable product that is technically and economically within reach. However, will he have the incentive to maintain quality and technical standards that curtail sales and profits? The production of appliances which would actually live up to the promise of a guarantee for the life of the owner is not exactly the royal road to the maintenance of earnings for the oligopolist. In any event the temptation is great if not overwhelming even in this field to conform to what Veblen liked to call the peace of mutual moderation in modern oligopolistic business enterprise.

Sales Promotion and High Pressure Sales Publicity

Oligopoly, duplication and excess capacity are at the root of what are known as sales promotion and high pressure sales publicity.¹ At the same time the growth and "success" of

¹ Little reflection is required to demonstrate that the increasing volume and scope of sales promotion is an index of the presence and growing ubiquity of oligopoly in contemporary market structures. Under conditions of perfect competition the individual seller is faced with an infinitely elastic demand or sales curve for homogeneous commodities. In other words he can sell as much as he has to offer, or wants to sell. Since he can dispose of his entire output at the market price, the individual seller (and producer) has no inducement to spend money on sales promotion. However, if the fixed and specialized productive capacity of individual producers and sellers is such as to permit them to produce more than the market will take at the market price (that is, if they produce at increasing returns) or if consumers can be convinced of the superior qualities (whether real or imagined) of individual products (that is, if the elasticity of demand at the market price of their product can be reduced), then entrepreneurs will find it profitable to invest in sales promotion. In fact, under conditions of oligopoly it is not only profitable but essential for the individual entrepreneur to engage in various kinds of sales promotional activities. For, under these conditions the commercial survival of each competitor depends upon his ability to increase the demand for his particular product and to make this demand as inelastic as possible. To this end, the seller must convince the consumer of the special qualities of his products as compared with those of his competitors. If the entrepreneur's survival depends upon his ability to create a demand for his "differentiated" commodity, he will hardly abstain from making exaggerated

sales promotion as an institution in modern business enterprise is greatly facilitated by the affluence of a society which is reaping the benefits of modern technology and large-scale production. Sales promotion fits perfectly into a high consumption economy in which the rapid improvements of the industrial arts and the relative affluence of large sections of consumers invite and encourage a high pressure sales publicity. Indeed, the more sales promotional activities spread the more they become a necessity for all concerned. Sales promotion is itself an industry operated by highly specialized agencies which act as middlemen between the business concern and the advertising medium such as newspapers, weekly magazines, radio stations and television networks. Some 3000 such advertising agencies, in addition to roughly 1800 smaller firms, hold the advertising accounts of the major concerns. It goes without saying that these agencies which work on a commission basis of up to fifteen percent are interested in extending the number and size of their accounts. They use all their skills of persuasion to convince manufacturers and distributors to engage their services and to prove that "it pays to advertise." Since these experts in persuasion practice with respect to their clients what they promise to achieve with regard to the ultimate consumer, namely, to transform the latter into customers, it is not difficult to see that they may induce their clients to carry "their advertising expenditure past the point at which it ceases to be profitable."¹ In other words, it cannot be taken for granted that advertising outlays and profits are indeed as closely correlated as the professional sales promoter tries to prove.² Actually, there is no way of determining the private returns obtainable from sales promotional campaigns. Not only is it impossible to know where and who the marginal consumers are who have not yet been induced to buy the advertised product,

or even misleading claims as to the "superiority" of his particular article or brand. Only under a regime of oligopoly could the commercial promotion and manipulation of consumers' demand have assumed the key role which it now occupies in the American economy.

¹A. S. J. Baster, *Advertising Reconsidered* (London., P. S. King and Son, Ltd., 1935), pp. 86-87.

²For some early evidence on this point see H. Smith, "The Imputation of Advertising Costs," *The Economic Journal*, XLV (1935) pp. 691-92.

but even more important, sales promotional activities always involve the risk of provoking retaliatory action by other sellers which may either wholly or partially neutralize the effect of the campaign. In other instances, sales promotion by one seller may have the effect of increasing the sales also of competitors and thus may benefit the whole industry. In order to arrive at a balanced appraisal of sales promotional activities in contemporary society it is essential to realize that sales promotion informs and attempts to persuade and that persuasion is not necessarily manipulation. In fact, insofar as sales promotion provides information by telling the consumer of available opportunities it tends to increase rather than decrease the competitive elements in market structures. For these reasons it would be desirable to elaborate earlier distinctions between "constructive" (informative) and "combative" (aggressive) advertising.¹ However, it is by no means certain that these conceptual distinctions will enable us to identify with precision the "informative" and the "aggressive" elements in a concrete sales promotional campaign.²

For the purpose of discussion let us accept, therefore, the thesis that the aim of sales promotion is to sell and that it is possible to increase sales. Veblen suggested that sales can probably be increased indefinitely but only at increasing costs.³ As soon as this commonsense qualification is accepted it becomes meaningful to discuss the social costs of sales promotion. The determination of these costs is considerably more complex than is realized by the defenders of sales promotion who assert that it enables efficient producers to enlarge their scale of operations and hence makes for lower costs and lower prices. Apart from the fact that the economies of large-scale production are available without high pressure salesmanship, sales promotional activities are the result rather than the cause of

¹ See A. Marshall, *Industry and Trade* (London, 1919) pp. 304-07 and A. C. Pigou, *The Economics of Welfare*, (London, The Macmillan Company, 4 ed., 1932), p. 196.

² If the terms had not come to be used without distinction we would suggest to reserve "advertising" for the provision of information and sales promotion for the manipulative elements in modern salesmanship.

³ T. Veblen, *Absentee Ownership and Business Enterprise in Recent Times*, (New York, The Viking Press, 1923), p. 304.

large-scale production. Producers first realize the advantages of large-scale production and then, after expanding and over-expanding productive capacity, resort to methods of high pressure selling in order to keep overhead costs at a minimum. Furthermore, it can hardly be denied that less efficient producers are also engaged in high pressure salesmanship and may thereby take customers away from those more efficient producers who may be for one reason or another less efficient promoters. There is even, as Pigou pointed out, "some slight ground for believing that firms of low productive efficiency tend to indulge in advertisement to a greater extent than their productively more efficient rivals."¹ To the extent to which less efficient producers with the aid of sales promotion are able to stay in business and perhaps even to enlarge their markets and thus the scale of their production, sales promotional activities represent a clear economic loss from the point of view of the economy as a whole. In this connection it is important to note also that sales promotional efforts of one producer are likely to result in an encroachment upon the markets of other producers who may be forced to contract their scale of production and consequently be compelled to produce at higher unit costs. Indeed to the extent that the sales promotional efforts of competing producers and sellers neutralize one another they will fail to bring about any substantial change in the relative position and the volume of sales of each competitor. For, clearly "if each of two rivals makes equal efforts to attract the favor of the public away from the other, the total result is the same as it would have been if neither had made any effort at all."² Obviously, inasmuch as competing sales promotional campaigns cancel one another, they represent a social loss which is shifted to, and borne by the consumer in the form of higher prices.

The result of the cumulative growth of sales promotion is a steady increase of the total costs of selling. No matter how high total domestic expenditures may rise, the costs of

¹"For, clearly, they have greater inducements to expenditure on devices, such as special packages, designed to obviate comparison of the bulk of commodity offered by them and by other producers at a given price." See Pigou, *Economics of Welfare*, *op. cit.*, p. 199.

²*Ibid.*, p. 198.

selling have risen with it and stand roughly at two to three percent of such expenditures in 1960. The relative magnitude of these expenditures per family in the United States is indicated by the fact that they are almost double the expenditures per family for primary and secondary education. Not only have the costs of salesmanship been increasing in many lines of merchandising while the costs of manufacturing have been declining but the relative costs of promoting the sales of the nation's civilian output has been rising if we consider that increasing percentages of the nation's total output tend to be used for defense and government accounts where sales promotion plays a less important, if indeed, any role. Of course, the relative importance of sales promotion as a factor of the total distribution costs varies widely from industry to industry. In some industries the rising costs of salesmanship have become a major overhead charge. For trade-marked or patented consumers' goods such as electric household appliances and flour, advertising costs account for as much as 30 to 50 percent of the total distribution costs. In fact, trade-marked consumers' goods such as cereals, coffee, cigarettes, beer, to name only a few, carry the heaviest selling and distribution costs as a percentage of total net sales.

Available data do not permit a clear-cut distinction between the quota of sales promotion and the costs of manufacturing proper. This becomes clear as soon as it is realized that the commercial promotion of brands, trademarks, saleable containers and disposable packaging are integral parts of sales promotion which must be charged to the costs of selling or to what Veblen called the creation of saleable appearances.¹

The Psycho-Cultural Impact of Sales Promotion

The effects of sales promotion and high pressure sales publicity are not confined to the increased costs of selling which the consumer has to bear. They go far beyond these tangible "economic" aspects; indeed, they affect every phase of our existence as individuals. Sales promotion today influences

¹ Veblen, *Absentee Ownership*, *op. cit.*, p. 300.

the structure of the human personality and tends even to impoverish contemporary society quite apart from the fact that high pressure sales publicity has contributed to make the economy what it is: an economy that is oriented primarily toward the satisfaction of private wants frequently at the price of neglecting public purposes and needs. Admittedly not all types of advertising have these repercussions which traditional economic analysis has usually excluded from its considerations.¹ If these broader implications of sales promotion are discussed within the context of social costs this is due to the fact that we cannot permit essentially arbitrary lines of demarcation to determine the delimitation of the consequences of an institution that is rapidly becoming one of the keystones in affluent societies.

The aim of sales promotion is to sell by fixing the consumers' attention on the special characteristics, whether real or imagined, of commodities with a view to maintaining or increasing sales without endangering the earning capacity of the concern. This can be accomplished in a variety of ways and by the use of various techniques. "One type of advertising and salesmanship relies wholly on ideomotor responses in the victim, insinuating or hammering into his consciousness the idea which, once there, determines his choice and action often without any critical weighting in the light of all the possibilities and all the interests of a rationally unified self."² While some advertisements may offer the consumer information about the positive characteristics and qualities of the commodities offered, sales publicity has assumed increasingly the form of a deliberate attack on the consumers' susceptibilities and credulity. Advertising and particularly high pressure salesmanship "use against him (the buyer) laws of psychology with which he is unfamiliar and therefore against which he cannot defend himself, which frighten or flatter or disarm him—all of these have nothing to do with

¹ Among the economists who have dealt with some of the broader implications of advertising are T. Veblen, J. M. Clark, J. A. Schumpeter, E. Chamberlin and J. K. Galbraith.

² J. M. Clark, "Economics and Modern Psychology," (1918) reprinted in *Preface to Social Economics*, *op. cit.*, pp. 106-107.

his knowledge. They are not informative; they are manipulative."¹

More specifically, sales promotion endeavors to direct human desires into particular channels by transforming such desires into effective wants which will induce the consumer to commit part of his present or future earning power to specific purchases. In short, sales publicity is concerned with the transformation of consumers into customers for specific commodities. In order to achieve this aim the advertiser appeals not only to the consumer's awareness but tries to penetrate into his subconscious. In fact, commercial advertising like political propaganda endeavors to contact the subconscious by "the technique of creating favorable and unfavorable associations which are the more effective the less rational they are. We find the same evasions and reticences and the same trick of producing opinion by reiterated assertion that is successful precisely to the extent to which it avoids rational argument and the danger of awakening the critical faculties of the people."² Admittedly there are limits beyond which these techniques will not prove effective. But within these limits there is much scope for the systematic creation of illusions. To this effect, the professional sales promoter has made increasing use, as Veblen was one of the first to emphasize, of trained "experts and experimenters in applied psychology, with a workmanlike bent in the direction of what may be called creative psychiatry. Their day's work will necessarily run on the creative guidance of habit and bias, by recourse to shock effects, tropismatic

¹ E. Chamberlin *The Theory of Monopolistic Competition* (Cambridge, Harvard University Press, 1948), pp. 119-120. Another serious student of the matter comes to similar conclusions: "... advertisements are not written to help people make a reasoned choice of commodities, they are written with the object of inducing them to buy particular things, and they naturally exaggerate the uses and merits not only of the commodity but of a particular make of the commodity. Moreover, the vast majority of advertisements do not confine themselves to pointing out the uses of commodities; they make the appeal not to the reason but to the emotions of the consumer. Suggestion, reiteration, attractive illustration—these are all devices to induce him to buy the article without making comparisons and calculations. They certainly do not assist his judgment as to the relative satisfactions to be obtained from different commodities or as to the relative satisfactions to be obtained from commodities and leisure." D. Braithwaite, "The Economic Effects of Advertisement," *Economic Journal*, 1928, vol. XXXVIII, pp. 19-20.

² Schumpeter, *Capitalism, Socialism and Democracy*, *op. cit.*, p. 263.

reactions, animal orientation, forced movements, fixation of ideas, verbal intoxication."¹ What accounts for the success of these activities is the fact that human desires and wants are much less autonomous and more susceptible to manipulation than utilitarianism was ever prepared to admit. In fact, the consumer brings to the market not specific wants but general desires and requirements. In other words, he is conscious of a general need for shoes, clothing or food. It is the aim of the sales promoter to focus the consumers' attention on particular kinds of shoes, clothing or food. In this way, wants for specific commodities are developed and as far as possible expanded. By absorbing the suggestions of his environment the consumer, in a continuous interaction of impulse and response, develops the specific wants which make him the customer and user of particular commodities. In short, wants are not given but are "variables" which become under the pressure of sales promotion and sales publicity, the object of deliberate manipulation for commercial purposes. In his effort to transform consumers into effective and profitable customers the sales promoter plays on a variety of human emotions, sensibilities and such ubiquitous traits as the fear of losing personal prestige, the closely related sense of shame² and the anxiety of mortal disease. The particular methods used by sales promotion to arouse these sensibilities and customs vary all the way from the fixation of ideas and desires by endless repetition and verbal intoxication, to hypnotic suggestion, the creation of images of authority and daydreams. Indeed, it is no exaggeration to say that the consumer in the affluent society lives "in a conti-

¹ Veblen, *Absentee Ownership*, *op. cit.*, p. 307 n.

² Veblen emphasized with particular insistence that the fear of losing prestige rather than personal vanity plays a dominant role in these matters. The solicitude for instance of personal prestige is particularly pronounced in the period of adolescence which in some persons may never be overcome. "Cosmetic pigments and preposterous garments are applied to the person with a view to avoid falling short of the blamelessly best, to avoid unfavorable notice rather than to achieve notoriety, to 'keep up with the times' rather than set the pace. And it is to this fear of derogatory notoriety that the expert advertisers of these ways and means of fabricated beauty address themselves and adapt the flow of their intoxicating verbiage. . . . It is also known to ethnologists that practices of a similar nature and of somewhat the same aesthetic value among the peoples of the lower cultures—as, e.g., tattooing and scarification, toothfiling, nose-boring, lip-buttons—rest directly and unequivocally on the fear of losing prestige." *Ibid.*, pp. 310-11.

nuous stage of siege from dawn until bedtime. Nearly everything he sees, hears, touches, tastes and smells is an attempt to sell him something . . . to break through his protective shell the advertiser must continuously shock, tease, tickle or irritate him, or wear him down by the drip-drip-drip or Chinese water torture method of endless repetition."¹

What happens to the human personality under this continuous impact of sales promotional appeals and manipulation? Veblen, in a much neglected footnote in his later writings suggested that the systematic arousing of the sensibilities of shame and fear would end ultimately in mental imbalance and disease. Indeed, for Veblen the creation of illusions by the experts and experimenters in the methods of applied psychology and creative psychiatry amounted to "a trading on that range of human infirmities which blossom in devout observances and bear fruit in the psychopathic wards."² In short, Veblen foresaw that the creation of illusions and the promotion of the feelings of shame, fear and anxiety could seriously affect mental health and the human personality. This is not the place to enter into a detailed discussion of the psychological mechanisms that seem to bring about this outcome. Suffice it to state that an individual whose desires and values are increasingly the object of commercial persuasion and manipulation is psychologically in a most vulnerable position. He may respond positively to the signals he receives from the expert in sales promotion and gain the approval of others by conforming to the standards of the majority. The fact remains, however, that "his" views and wants are "manufactured" and not his own. Particularly his image of himself is an "idealized" image which is continuously imposed upon him from the outside.³

To live up to this idealized and "outer-directed" self not only places the consumer under continuous stress and tension but in the end estranges him from his actual or real self. His

¹ Quoted from *Fortune* by D. Bell, *Work and its Discontent* (Boston, Beacon Press, 1956), p. 32.

² T. Veblen, *Absentee Ownership*, *op. cit.*, p. 307 n.

³ On the concept of "idealized image" see K. Horney, *Neurosis and Human Growth: the Struggle toward Self-Realization* (New York, W. W. Norton, 1950), p.

endeavors to actualize an ideal and outer-directed self not only isolates the individual from himself but, in the end, also from others. Sales promotion must thus be regarded as a major factor in creating the typical neurosis of our time: the detached and isolated personality. This personality still is related to the outside world by adhering to the outer-directed standards of consumption, but it is a receptive kind of a person anxious to conform by living up to the dictates of his society as formulated by sales promotion. In this process not only his wants but his preferences and his behavior are being shaped by what the individual perceives as the standards and expectations of others and of the market. Hence the production of effective and profitable customers actually induces the consumer to experience himself not as what he could potentially be: an individual, but as what he actually has become: a cog in the wheel of a large and impersonal machine indifferent to his fate. When man finally reaches this awareness and realizes what is essentially a loss of identity his feelings of personal futility and despair may well lead to the couch of the psychoanalyst or the psychiatric ward.¹

Sales promotion tends to influence the personality structure of man in modern society in still other ways. High pressure sales publicity is the instrumentality through which the consumer is shaped in accordance with the requirements of mass production and the dictates of excess capacity. That is to say, by playing on the human propensity toward variety and the expansibility of desires sales promotion must of necessity emphasize the values of lavishness and the virtues of extravagance. It must stress display and conspicuous consumption for the sake of ostentation. In the end it will not refrain from lending its support to planned obsolescence and the creation of artificial novelties in appearance, design, style, color and fashion.

¹For a further substantiation of these conclusions and particularly of such key concepts as ideal self, isolation and outer-directed or market orientations see the writings of K. Horney, E. Fromm, H. S. Sullivan and R. May. For a systematic development of these and related ideas of a concept of man as a common denominator concept in social analysis, see the author's *Toward a Science of Man in Society: A Positive Approach to the Integration of Social Knowledge* (The Hague, Martinus Nijhoff, 1961).

Thus, high pressure salesmanship serves to promote systematically and cumulatively private desires and wants to an extent which was formerly considered neither possible nor admissible. In a word, sales promotion has become the strategic instrument in the substitution of the ethics of self-indulgence and prodigality for the ethics of parsimony and frugality.

It may be argued that the Protestant ethic is out of place in an age of affluence and that mass production and excess capacity call for the consumption-oriented individual. But this argument overlooks two things. It fails to take into consideration the fact that the promotion of private wants and private affluence and the production of less essential goods go hand in hand with the neglect of essential public services and collective needs. Moreover, the argument ignores the fact that by raising our individual preferences for present consumption and our propensity to consume, sales promotion encourages large sections of the population to mortgage future incomes and to go into debt at a rate which may easily bring them to the verge of bankruptcy.¹ Indeed it has been argued that by creating the personality type of the compulsive consumer who acquires whatever he wants on the instalment plan, sales publicity has succeeded in replacing the old whip of the subsistence wage by a relentless drive for goods no matter how trivial and unessential and by a compulsive desire for a higher standard of living.² More important perhaps, certain forms of sales promotion tend to accelerate and carry to its logical conclusion what Tawney called the tendency of the acquisitive society to dissolve moral principles into simple choices of alternative courses of action. By placing private goals and not social ends into the center of human awareness as guides to action, the choices of

¹ "A survey by insurance companies revealed that the average American family was about three months away from bankruptcy" (and that after two decades of unparalleled prosperity). Packard, *op. cit.*, p. 154. A preliminary report of the *American Bar Association* expressed its concern over a 400 percent increase of bankruptcy filings in the last ten years (1950-1960) and the fact that about 90 percent of the total number of bankruptcies are now (1960) filed on behalf of individuals with no assets to be distributed to the creditor. Report of the Consumer Bankruptcy Committee, Subcommittee to the Section of Corporation Banking and Business Law of the *American Bar Association*, February 1961, p. 2. (Mimeographed).

² Bell, *op. cit.*, p. 31.

the acquisitive entrepreneur and the acquisitive consumer tend to become choices of expediency.¹ The more or less clearly defined private goal of maximum utility and maximum profit not only simplifies the moral problem but, to some extent at least, relieves the individual of moral choices and discrimination. While this relaxation of the code of ethics is true in general in any acquisitive society it is likely to be carried to extremes by sales promotion and the "creation of profitable customers". In order to channel general desires into specific preferences sales promotion and sales publicity uses a variety of techniques such as exaggerated claims, purchased testimonials, suppression of evidence that has a negative bearing on the promoted product, the support of half-truths and even manifestly false claims, the promotion of drugs that are not fully tested, or the deliberate deterioration of the quality of the product. While the majority of people may discount the falsehoods and deceptions committed by sales publicity, a substantial number of persons may be completely taken in by the half-truths and exaggerated claims spread in this manner. However, the point is not that the majority may discount the deception but that the moral value of truth is increasingly subverted if a generally accepted institution such as sales promotion is widely believed to live on exaggerated claims and half-truths. Indeed, if it is true that "the bulk of advertising consists of lies, spiced with half-truths"² and if such a key industry as sales promotion earns a considerable margin of profits by manipulation and even by deception, nobody—and least of all the younger generation—can be blamed for believing that it is not only possible but morally permissible to try to get something for nothing by making use of exaggerated claims and half-truths in their own activities. It requires no elaborate analysis to see that no lasting society and certainly no democratic society can be built upon such a foundation. "Deliberate and cynical falsehood does not merely convert truth; it challenges the idea which is at the heart of popular

¹R. H. Twanney, *The Acquisitive Society*. New York, Harcourt, Brace and Company 1920, pp. 30-31.

²I. Kristol, High, Low, and Modern, *Encounter*, No. 83 (August 1960), p. 39.

government: that the recognition of truth is not only a human but a civic obligation."¹

We are thus led to the conclusion that the manipulation of the human personality which exploits human infirmities and stimulates compulsive and irrational patterns of behavior by the use of half-truths and deception is fundamentally a denial of the integrity of the individual. The fact that this manipulation also invades our privacy through the medium of entertainment and undermines our freedom of decision and moreover runs counter to our long-professed ideals and code of ethics adds further to the moral dilemma created by sales promotion. We do not deny that ideals and moral codes can and must change under the impact of new social conditions. Only extreme cultural relativists fail to see that moral standards not only change but can easily degenerate and become destructive of social life and hence of the lives of individuals.

This conclusion finds additional support if we consider the serious effects of commercial television and radio as mass media for the diffusion of the advertisers' message. These effects can be understood only in the light of the economics of the so-called rating system by which advertisers judge the profitability or lack of profitability of different programs through surveys of the size of the audience. For obviously, the larger the number of people viewing or hearing a program, the lower the costs per message per 1000 viewers or listeners. Hence the lower the rating (i.e., the lower the number of people viewing a particular television program), the higher the cost per message per 1000 viewers. Thus, programs with the highest ratings will not only have the greatest attraction for the sales promoter and advertiser but such programs will most easily attract sponsors. As a result, the entertainment and television industry tends to produce and develop these programs to the neglect and exclusion of others with lower ratings and hence higher costs per message per 1000 viewers. Programs which appeal to a great number of people (let us say, boxing,

¹ *Ibid.*, p. 39. The same conclusion applies with equal force to a good deal of popular journalism which uses the small as well as the big political bias, and to political propaganda in general.

wrestling matches, or Wild West and gangster stories) may thus crowd out programs of unquestionably higher cultural and entertainment values such as the serious theater, the concert or other entertainments which conform to the standards and tastes of a modern civilized society. While it may be commercially "sound" to appeal to television audiences through the dream-land of the Western movie or any of the other escape trivialities of present-day television entertainment, it cannot be seriously denied that the control of television entertainment by sales promotion is not only a lost opportunity but sets the stage for a serious cultural impoverishment. Instead of the artist or the educator it is the sales promoter who tends to influence our sensibilities while our cultural needs remain unsatisfied. The outcome of this truly circular process are the trivialities, the illusions, the escapism and the brutalities which subvert our youth and which fail to satisfy any but the most superficial and shallow needs of an adult audience in our affluent society. In short, the control of television and radio by advertising, the practice of deception, the deliberate multiplication of human wants, the acceleration of obsolescence and the manipulative attitude in general are not only economically wasteful but socially degenerative and destructive.

We cannot conclude this chapter without an observation on the doctrine of consumers' sovereignty which has dominated and still dominates much of the basic philosophy of economists. In an age in which the commercial promotion of sales and the creation of profitable customers has become a generally accepted institution the doctrine of consumers' sovereignty loses what little validity it may have had in the past. Indeed, to maintain it as a fiction or a theoretical assumption under contemporary conditions can serve no purpose other than that of a distortion. For all theoretical and practical purposes it would be more relevant to reverse the assertion of the doctrine of consumers' sovereignty: not consumption but production plays the active role, consumption adjusts itself passively or is deliberately "adjusted" by producers' and sellers' action, to the innovation initiated by the technical personnel of business enterprise. Similarly, investment may be said to

proceed quite independently of savings. Indeed, investors may go ahead in force and impose their investment decisions in excess of voluntary savings through the imposition of higher prices, higher profits and even higher consumption (as far as the investors themselves are concerned) while at the same time forcing everyone else to consume less or to save less. In the light of these considerations it must be evident that the doctrine of consumers' sovereignty assumes more and more the character of a myth and a dogma.¹

¹ See also Galbraith's discussion of the paramount position of production in *The Affluent Society*, *op. cit.*, chs. IX and X.

CHAPTER THIRTEEN

THE RETARDATION OF SCIENCE AND THE SOCIAL COSTS RESULTING FROM "MISLOCATION" AND OVERCONCENTRATION

THE PRECEDING discussion has gone considerably beyond our earlier treatment of the social costs of business enterprise. And yet even this extended analysis does not provide a complete account of the total range of social costs. Thus, no specific attempt has been made to trace the social costs in such fields as banking, insurance, investment finance, and real estate. The social costs bound up with the artificial maintenance of small-scale production in many fields of economic activities and the social losses caused by the multiplicity of brands and the lack of standardization of commodities have only been touched upon. There is reason to believe that a more complete study would bring to light considerable additional evidence of social costs.

There are, however, two specific instances of social costs which cannot be neglected in this study. These are the social costs resulting from the organization of scientific research under a system of business enterprise and those reflected in the "mislocation" of industrial production and the concentration of population in already congested areas. While we cannot deal comprehensively with these social costs within the context of the present study we shall indicate the general direction in which research and analysis might be fruitful.

The Retardation of Science

It may seem incongruous to speak of the retardation of science at a time which is witnessing the greatest scientific progress in the physical sciences. And yet, a moment's reflection will make it clear that the development of nuclear energy and the exploration of outer space does not conform to the conditions characteristic of the organization of scientific research in a

market economy. It was not private enterprise or an independent research organization that was able and willing to spend two billion dollars for the development of nuclear fission. And it is again government funds which finance the program of space research that is presently under way in the United States. Both the magnitude of the expense and the uncertainty of the results place this and similar types of basic scientific research outside the scope of private endeavor. The successful solution in governmental laboratories of the theoretical and practical problems raised by nuclear and space research are an indication rather of the growing importance of the state in scientific research. Indeed, in addition to maintaining their own research laboratories governments everywhere play a dominant role even in industrial research.¹ These developments together with the pace of technological advance in the Soviet Union which organizes its scientific research activities under central and governmentally financed auspices raise the question of whether the present organization of scientific research and the application of its results do not in effect constitute a wasteful and costly duplication of competitive research which gives rise to retardation and restriction of potential technical efficiency.²

We have previously pointed out that we do not regard business enterprise as fundamenally hostile to industrial research and technological improvement. Research and development have a direct bearing on productive efficiency and market costs and as such are, of course, in the forefront of business considerations. Moreover, technical change has become increasingly the "safe" competitive weapon of the oligopolist by which he endeavors to increase his share of the market. It takes the financial resources and the market power of the

¹ Estimates for Great Britain place the share of government contributions to scientific and engineering research and development in British manufacturing industry at more than 70 percent or £220 million out of a total outlay of £300 million (for the financial year 1955-56). Department of Scientific and Industrial Research, *Estimate of Resources devoted to Scientific and Engineering Research and Development in British Manufacturing Industry*, 1955, quoted from Andrew Shonfield, *A Deadlock on the Left*, *Encounter*, vol. XII, No. 3, September, 1959, p. 14.

² For an early expression of opinion on this question see T. Veblen, *The Engineers and the Price System*, New York, The Viking Press, 1921, Ch. 1.

large-scale oligopolistic producer to engage in research and development activities which, almost as a by-product, also tend to reduce costs and increase productivity.¹ Insofar as scientific research can be expected to enhance the market position of business enterprise it is an integral part of the oligopolistic struggle. Indeed, business enterprise is conscious of this role and spends considerable sums on research and development.

While it is true that business enterprise appreciates the significance of research it tends to evaluate its importance and to allocate funds to it in essentially the same manner in which all questions of business investment are decided. As a result, industrial research as a rule emphasizes only those phases of scientific research that promise to yield substantial private returns. That is to say, industrial research concerns itself primarily, if not exclusively, with research problems which can be expected to be privately appropriable. In other words, only those problems will be attacked from the solution of which reasonable profits can be expected. As a result, scientific research in the physical, chemical and engineering sciences which may be said to have a most direct bearing upon production and productive efficiency will experience a one-sided development whereas research in other fields which have no direct bearing upon private costs of production will tend to be neglected. Industry does not spend considerable sums on research dealing with the prevention of social costs; scientific inquiries into the requirements of public or even industrial health are not likely to attract the attention of private enterprise. Although it may be sound business practice to treat research in the same manner as advertising and to appraise its economic worthwhileness in terms of the potential surplus of private returns over costs, this does not mean that the competitive calculus is necessarily the best criterion for the determination of the relative outlays for research or for its over-all organization.

Indeed, the unsuitability of the market calculus as a satisfactory criterion for the determination of the relative worthwhileness of research outlays and the organization of science in general becomes evident as soon as it is realized that scientific

¹ Galbraith, *American Capitalism*, *op. cit.*, Ch. 7.

research is usually not only extremely costly but that its results are highly uncertain and can be applied only after considerable delays. The more uncertain and time-consuming the results of research and the greater the probable time-lag between investment in research and the application of its results the greater the reluctance of private enterprise to invest its funds. And yet, the particular research project under consideration may be very worthwhile in the light of the potential long-run and social benefits which can be expected therefrom.

Because of the neglect of important areas of research it has always been necessary to supplement industrial research by extensive research activities under public auspices. Indeed, various government and public agencies as well as universities and independent research institutions have long been engaged in various phases of scientific work. Government research is mostly concerned with scientific inquiries serving such national and public purposes as national defense, agriculture, public health and public administration.¹

Increasingly during the last two decades the Federal Government or its agencies have supported and financed research conducted in quasi-independent research organizations, universities and even private concerns. While there is no complete inventory of government research and development work it is estimated that a total of 160,000 tasks are being performed in the physical sciences alone in as many as 9,000 research installations involving a total of eight billion dollars of Federal funds out of a total outlay of twelve billion dollars.²

The third type of research is conducted in universities and independent research foundations. In contrast with business and government research most of the scientific work done in

¹ The U.S. Government, for example, maintains both fact finding agencies and scientific research divisions for the natural sciences, technology, economics and virtually all aspects of the social sciences. The following is a detailed list of subjects covered by federal research before the second World War: Physics, chemistry, metallurgy, engineering for the production of war materials and weapons, radio, telephony, telegraphy, ship construction and propulsion, aeronautics, optics, ballistics, construction of highways, bridges, fortifications and drydocks, geology, geodesy, mineral technology, weather forecasting, biological problems of agriculture, conservation of resources, flood control, public health, and practically every aspect of economics.

² According to a staff report of the U.S. Senate Subcommittee on Government Operations, *The New York Times*, April 25, 1961, p. 13.

universities and independent foundation may be said to be "pure" research not directed toward the immediate solution of practical problems. This type of research is the basis of all applied research inasmuch as it "leads to new knowledge . . . [and] creates the fund from which the practical applications of knowledge must be drawn."¹

At first sight the threefold division of labor between private concerns, public agencies and universities and research foundations appears to reflect merely the different degrees of appropriability of the results of applied and pure research and as such seems to be a perfectly logical arrangement. Actually, however, the conduct of research on three different levels conflicts with the intrinsic interdependence which exists between scientific problems in any given field of knowledge. Moreover, the present "mixed" system of research, like the "mixed" system of transportation discussed in Chapter 11 suffers from the absence of any serious coordination and doubtless involves a high degree of duplication. In fact, it is likely that research into related problems is going on at all three levels at the same time. Indeed, there is little if indeed any coordination either within and between the laboratories of private concerns, public or private agencies or the research done at universities. This is true even for the Federal Government's research activities. "At the present time no complete inventory exists of the Federal Government's program in research and development, much less that of the nation as a whole."² As a result there are no satisfactory answers to such questions as to who is doing what, where and under whose sponsorship and at what expense. Even more important is the fact that without an index of current scientific work information cannot flow promptly and some, if not much of the value of scientific research is in danger of being dissipated.

As far as industrial research is concerned, considerations of competition and profits have long made it impossible to establish any coordination between the work under way in the

¹ V. Bush, *Science, the Endless Frontier* (Washington, D.C., Government Printing Office, 1945), pp. 13-14.

² *The New York Times*, April 25, 1951, p. 13.

laboratories of different concerns. As a matter of fact, industrial research tends to be shrouded in secrecy; there can be little if any exchange of information regarding the problems under investigation and their practical results. Consequently, there is no safeguard against costly and unnecessary duplication and the same problem may actually be investigated in a number of laboratories of different competing firms at the same time.

This conclusion applies with even greater force to the general method of conducting scientific research. For instance, the results of industrial research may be of the greatest importance for the scientific work under way in the laboratories of public agencies and universities and vice-versa. Similarly, government research in such fields as nuclear physics and chemistry, aerodynamics, telegraphy and construction of highways is bound to be of practical interest and value to industry. The whole situation was well summarized by a French scientist in terms which have not lost their relevance in the light of the previously quoted references to current conditions in America.

“Government agencies traditionally work in extravagant isolation in systematically watertight compartments. Parallel research work on the same question is frequently carried on in the laboratories of different branches (in itself an excellent idea), but the branches (and this is by no means excellent) ignore each other almost completely. Research workers of the army exhaust themselves on problems already solved by the navy or the air force. Technicians of the army and those of the navy arrive at different solutions of the same problem and proceed to apply their results without ever subjecting them to comparative tests so that both branches might avail themselves of the best apparatus or methods.

“Research work in universities is characterized by a fair degree of anarchy resulting from the tradition of total freedom, of unbridled individualism, which prevails in the university laboratories. . . . The truth is that scientists all too often incline to total anarchy as a doctrine. The stories of how Archimedes discovered his immortal principle while getting out of his bath, and how Newton discovered the law

of gravitation when a falling apple chanced to strike the tip of his nose, have played havoc in the minds of scientists. They have given seductive but fallacious arguments to those who proclaim that discovery is the child of imagination alone, that research rebels against all organization, and that all endeavor to give a rational form to scientific work is a bureaucratic effort serving only to hinder a scientist's freedom of mind and consequently the process of discovery itself. This disastrous doctrine is not yet through with its mischief . . . scientific research in the universities has until now completely escaped all the efficacious compulsions of organized freedom."¹

Extreme secrecy, duplication, lack of coordination, absence of provision for the exchange of data and results achieved are all inherent in the normal organization of research under present conditions. As a result, hundreds and even thousands of scientists may be engaged in parallel research activities, using the same methods in different laboratories equipped with expensive apparatus and precision instruments. Instead of setting up general plans of research drawn up jointly by different scientists and carried out in such a manner that the various phases of one project are attacked in different laboratories using different methods of approach, scientific research tends to be organized in such a way that highly skilled and scarce scientific resources are used in parallel research conducted in numerous private and public laboratories employing more or less similar methods of approach.

These inefficiencies in the organization of science can have only one effect: a substantial proportion of the money and effort devoted to research is wasted and the progress of science is retarded.² Only a national science policy would make it

¹ Henry Langier, "How Science can win the War," *Free World*, 1941, vol. 1, No. 1, p. 59. For the conditions of scientific research in pre-war England see D. Hall, et. al., *The Frustration of Science*, (London, George Allen and Unwin, Ltd., 1935) and J. D. Bernal, *The Social Function of Science*, (London, George Routledge and Sons, Ltd., 1939), ch. 3.

² Bernal estimated (in 1939) that the average loss of efficiency due to lack of organization, and duplication is certainly fifty percent and may actually reach ninety percent. *Ibid.*, p. 120.

possible to utilize scientific resources in a more rational way not only by providing an over-all organization for scientific work but also by determining the relative urgency and importance of different problems to be investigated and by allocating the necessary funds to different research agencies in accordance with the relative importance of their respective work. In the absence of such a program and without the creation of a central agency which would formulate and execute such a national science policy, the organization of scientific research is bound to remain inefficient and incapable of producing maximum economic and social returns.

In addition to the general inefficiency of the over-all organization of science and research there are three additional factors which tend to retard research and its application quite apart from the effects of the patent system: (a) the inability of small producers to conduct research and apply its results; (b) the impact of technical innovations upon existing capital investment; (c) the effects of depressions upon research.

Small Business and Scientific Research: Most industrial research is conducted in the laboratories of large concerns. In fact, the bulk of industrial research is carried out under the auspices of a few large firms. Why is this so? Is there no need for technological improvements within the small firm? Do the majority of small firms lack the incentive to engage in research that may lead to cost-reducing innovations including new products? The answer is simply, as we have indicated before, that small business cannot afford the cost and uncertainties involved in scientific research and the application of its results. There is considerable room for technical improvement in small business. The small producer even has an incentive to introduce such improvements; he can add the costs of research to his costs of production and thereby reduce his income tax, and the patent law provides protection against any use of the invention by competitors. If the small concern does not engage in scientific research it is due to the fact that the cost of research and the risk of its being unsuccessful act as a strong deterrent to engaging in this type of activity. As a result the small manufacturer is increasingly and hopelessly

outdistanced by his larger competitors and industrial research of considerable usefulness is neglected or retarded.

The situation is even more problematical in agriculture. For, agricultural research "must be undertaken on a very large and expensive scale, and the risks of failure are considerably greater. Consequently, practically no farmers ever engage in research and only the wealthiest landowners occasionally do so."¹ In the United States agricultural experiments stations have more or less filled this gap and undertake research on a variety of agricultural problems.

The Impact of Innovations on Existing Capital Investments

Turning from the neglect of scientific research in small-scale manufacturing and agriculture to the impact of technological innovations on large concerns one discovers another factor which tends to retard scientific progress. Large-scale producers can certainly afford the costs and risks of unsuccessful research. They have all the facilities for protecting the discoveries and innovations of their laboratories by means of patents and effective patent litigation. *Prima facie* the oligopolist would seem to have the greatest interest in putting into practice all cost-reducing innovations provided the prospective costs of operation of the new machine are lower than the prospective total costs of continuing the use of the old machine. However, a cost-reducing innovation has the effect of making existing specialized equipment obsolescent, that is to say its capital value is affected or destroyed. It has been shown that a periodic destruction of the value of existing capital equipment by innovations following each other in rapid succession is not only a threat to the private investment but is likely to create substantial social losses. Large-scale producers who operate with a large proportion of fixed investment, and especially oligopolists are able to avoid these social losses by a more gradual introduction of technical change. In fact, they could pay an amount equal to the capitalized losses involved in the costs of obsolescence for whatever new patented knowledge may affect the value of their fixed

¹ *Ibid.*, p. 137.

equipment. This circumstance constitutes the economic basis for a possible delay in the application of innovations.

It is true that to the extent to which these practices lead to a more gradual introduction of technical change they counteract serious social losses. And it is, of course equally true that not each new invention and patent is immediately ready for practical application in production. However, there is considerable danger that the same attitude which induces large concerns to protect existing equipment by delaying the application of patents may be carried to the point where the patent is shelved altogether, thus hindering technological advance and the realization of the social benefits of science.

The tendency to retard the application of technical knowledge has an interesting parallel in the opposition of labor to the introduction of labor-saving devices in general and in the emergence of anti-scientific attitudes in times of depression. By shifting the burden of adjustment (i.e. the social costs) caused by technological advances upon economically weaker groups in society business enterprise tends to generate forces of reaction which effectively retard technical progress.

Depressions and Research

Depressions also have a tendency to retard scientific and technological progress. In times of depressions low prices and low profits have the effect of discouraging the application of innovations as long as a further decline in effective demand is to be expected. Similarly, low wage rates during depressions have a retarding influence on the application of science because it is profitable to substitute labor for capital. Furthermore, depressions tend to force business and governments to reduce their appropriations for the conduct of research with the result that the progress of science is slowed down.

In summary then it can be said that the inability of small business to conduct research and apply its results, the impact of technological innovations on existing capital equipment, and the impact of depressions all seriously affect the incentive to invest in and to apply the results of, scientific research in industry. As a consequence the necessary introduction of new equipment is

held back and the rate of growth is reduced below the level which existing technical knowledge would make possible. Although the available empirical evidence is fragmentary and not easily subject to unambiguous interpretation it is at least significant that private surveys of machine tools and other equipment used in American factories seem to indicate a slow increase in the average age of such capital equipment and in the American industrial plant generally. In 1949 less than one half of the machine tools used by manufacturers of industrial equipment was over ten years old: in 1958 two-thirds of the machine tools were over ten years old; and nineteen percent were found to be over twenty years old.¹ If comparative studies should reveal that the average age of capital equipment is not only lower but is declining in other industrial economies we would have isolated one of the most potent reasons for their more rapid economic growth.²

"Mislocation" and Overconcentration in Urban Centers

Some of the social costs resulting from congestion and overconcentration of economic activities have been discussed in the chapters on air and water pollution. Pollution is, as we have indicated, largely the result of uncontrolled expansion and overconcentration of industrial activities in and around urban centers. We have discussed some of the technical and physical criteria which might serve as a basis for the determination of how far the process of concentration of productive activities may be carried without serious damage to the health and welfare of the community. In this chapter we are concerned with the problems of industrial location and urban congestion as

¹ According to President Kennedy's speech before the National Industrial Conference Board, February 13, 1961. *The New York Times*, February 14, 1961 p. 22.

² For obvious reasons connected with the reconstruction effort the most spectacular example seems to be Post-War Germany where the proportion of capital equipment and plant under five years of age grew from one-sixth of the total in 1938 to two-fifths in 1947. *Ibid.*, Data for the Soviet Union are not available. It is significant, however, that the central allocation and technical direction, the reported utilization of thirty percent of gross receipts for research and training and the reported cost-consciousness which often is said to lead to the selection and application of the "best" technique are all conducive to a lowering of the average age of existing plant and equipment. See M. Gardner Clark, Economics and Technology in Soviet Steel, in *Study of the Soviet Economy*.

another illustration of an open conflict between the interests of the private producer and those of society. The determination of industrial location in terms of private costs and private returns leaves out of account not only a number of important social costs created by the entrepreneur's choice of location but also fails to provide an adequate long-run solution of the problem of industrial location from the point of view of the community.

It is not necessary to present a comprehensive analysis of the factors which determine the location and concentration of industrial activities. In accordance with traditional economic theory let us assume that the entrepreneur possesses all the information required to make deliberate calculations of prospective costs and returns at different locations and that he selects that location at which his prospective net returns are at a maximum. It can easily be shown that such a determination of industrial location in terms of private costs and private returns fails to take into account important social costs and potential social benefits of plant location. As far as the social costs are concerned the regional concentration of industry in areas that are already developed and offer various advantages such as the presence of skilled labor, initially lower unit costs of housing, transportation, sanitation and services, may later be offset by considerable social costs. Among these are not merely rising transport costs due to necessary trans-shipment of goods to their markets but "over-rapid depletion of the resources in one region . . . paralleled by inadequate utilization in another."¹ Moreover, under the impact of the establishment of new plants and the development of new industries, the growth of urban communities is likely to proceed in a highly chaotic manner, leading to unplanned expansion and congestion of cities. In the past the tendency of existing urban centers to attract new investments regardless of the additional costs of air and water pollution and the necessity of expanding such urban facilities as water reservoirs, hospitals, sewage

¹National Resources Planning Board, *National Resources Development*, Report for 1942, January 1942, (U.S. Government Printing Office, Washington, D.C.) p. 63.

systems and schools, have made our urban centers the congested places which they are today. More specifically, this polarization of industrial activities has necessitated the extension of costly urban and suburban transit facilities which, in turn, force workers to spend considerable time commuting to and from their homes in varying degrees of discomfort and at a price of fatigue and a considerable loss of working efficiency.¹

Of even greater importance is the fact that the geographical concentration of industrial production makes an area highly vulnerable to change in economic conditions. Thus, even a minor decline in demand for the products of its highly specialized industries may create considerable hardship. In addition to the vulnerability to economic change, geographical concentration of industrial production exposes the area to enemy attacks. Indeed, "the possession of industries which are strategically well placed is worth large numbers of aircraft, warships, tanks and artillery when the balance of military preparedness is weighed up between the nations."² The development of nuclear weapons has further accentuated the need for a pattern of industrial location far different from that which tends to emerge from entrepreneurial calculations in terms of private costs and returns.

The concentration of industrial production in a few geographical areas may, moreover, create and accentuate inequalities in the economic and cultural development of different areas within the country—a tendency which may be further accelerated if vested interests in the industrial regions are able, by means of special price policies and the manipulation of freight rates, to prevent the shift of industrial production to industrially less developed and lower cost areas.

As an illustration of some of the foregoing observations it is

¹See *Royal Commission on the Distribution of the Industrial Population*, Report January 1940 (H. M. Stationary Office, London, 1940) (Cmd 6153), p. 97.

²"Political and Economic Planning," *Report on the Location of Industry*, a survey of present trends in Great Britain affecting industrial location and regional economic development, with proposals for future policy (P. E. P., London, March 1939), p. 178.

of considerable interest to contrast the pattern of industrial location which tends to emerge from the unregulated competitive process with the policy of industrial location of a planned economy. One of the social objectives of economic planning in the Soviet Union has been decentralization of industrial production for military reasons and the systematic economic development of backward areas. Ever since the inauguration of the first Five-Year Plan, it has been Russia's policy "to accelerate the development of the poorer and more backward parts of the Union and even to shift the industrial center of gravity toward these raw materials producing regions."¹ This process which, according to M. Dobb, was particularly marked under the third Five-Year Plan and which involves "a planning of development in the direction of a greater balance in each of the main areas between primary production, finishing plant and metal using industries,"² is said to have the net effect of "transport economising since it brings production nearer to its raw materials and by securing greater specialization and a better balance between the various stages of production in each region saves unnecessary cross-hauls of semi-finished product."³ A similar decentralization is under way for consumers' industries "to the extent of making each of the main regions virtually self-supporting. . . ."⁴

It is significant that the necessity of public control of land use and of industrial location in the national interest rather than in accordance with the personal interests of real estate owners and entrepreneurs is recognized in both Great Britain and the United States. The determination of the location of industries in terms of prospective private costs and private returns neglects not only social costs but also a wide variety of potential social benefits among which the contribution to the country's defensive power and the cultural and economic development of "backward"

¹ M. Dobb, *Soviet Economy and the War* (London, George Routledge & Son, Ltd., 1942), p. 45.

² *Ibid.*, p. 51.

³ *Ibid.*, p. 53.

⁴ *Ibid.*, p. 55.

regions play a major role. Present attempts to decentralize industrial production may serve as an illustration and an indirect measure of the neglect of these broader social benefits just as the enormous outlays for slum clearance and "urban renewal" in practically all urban centers are an indication of some of the social costs of uncontrolled expansion.

Basically, the mislocation and concentration of productive activities and the resulting congestion of urban communities is another illustration of circular causation in social affairs. The whole procedure is an undirected cumulative process in which every consecutive step tends to contribute to a costly over-intensive utilization of urban land regardless of human needs and human requirements. Once this process without design is under way, the stage is set for a trend toward over-concentration. What appears to be profitable in terms of private costs and private returns is actually a wasteful agglomeration of industries without regard to the social costs caused thereby. Indeed if these industries had to pay the social costs caused by their concentrating in urban centers it might well turn out that at least some of the much-taken-for-granted economies of large-scale production and many of its apparent advantages would be partly if not wholly offset by the tangible and intangible social costs of over-concentration. This is not a denial of the economies of scale; nor is it a denial of the important positive effects of an orderly process of urbanization. What is suggested is that the tendency of determining the location of industries solely in terms of prospective costs and returns carries with it a complete disregard of the actual social costs of urbanization which must be paid sooner or later in terms of the irrationalities of congestion and the heavy costs of slum clearance and city rehabilitation and redevelopment. Any investigation of the implications of city expansion in terms of physical growth correlations would make it abundantly clear that any over-concentration of industrial activities carries with it such social costs as air and water pollution as well as unavoidable expenditures for large-scale sanitation, sewage disposal, hospitals, education, transportation, police and other community services, without which social existence in urban centers is

bound to give rise to social disorganization, demoralization and dehumanization of life on a large scale.¹

Business enterprise and the competitive market calculus lead to a locational pattern of production, work and residence and an intensity of urban land utilization which can only be described as "mislocation". This "mislocation" and the resulting urban congestion are the inevitable outcome of the competitive calculus which permits and expects the private owner of land to intensify the utilization of a given unit as long as his marginal costs are at least offset by an equal amount of monetary returns, regardless of the social costs which the intensification of use may cause to other persons or to the community.

It is neither possible nor perhaps necessary to spell out the practical implications of these considerations for the development process in the less developed countries. Suffice it to state merely that the cumulative character of all social processes and the neglect of social costs and social benefits call for regional planning of the development process by means of long-range development programs formulated in terms of comprehensive systems of social accounting. The development of substantive criteria of such a system of accounting and minimum standards is one of the most urgent tasks of the social sciences.

¹For a recent study of these consequences of uncontrolled urbanization in historical perspective see Lewis Mumford, *The City in History* (New York, Harcourt, Brace and Company, 1961).

CHAPTER FOURTEEN

SUMMARY AND IMPLICATIONS

THE main results of our investigation can be summarized briefly as follows: each of the preceding chapters has shown that productive activities tend to give rise to a wide variety of social costs which are not reflected in entrepreneurial outlays. The detailed analysis of these social costs has shown their heterogeneous origin and character. Whereas some of the social costs of business enterprise can be traced to specific productive activities (or neglect of preventive measures) in particular industries, other social losses arise in the operation of the economic process as a result of profit incentives and motivations under the conditions of business enterprise.

A substantial proportion of these social costs are reflected in direct monetary expenditures either by private individuals or by public authorities. The fact that some of these costs are ultimately reflected in private monetary losses and public expenditures emphasizes their "economic" character even in the narrow sense in which the term is used in traditional economic analysis. Other social costs, as for example the detrimental effects on aesthetic and recreational values and partly also the impairment of human health, are of a less tangible character and cannot be fully evaluated in monetary terms or market prices.

Summary

It would serve no useful purpose to attempt a detailed summary of the variety of social costs discussed in the preceding chapters. What may be helpful, however, is to list briefly the major types of social costs which arise in the course of various private productive activities. Thus, the harmful effects of air and water pollution are important social costs

which may be said to have taken the place of the contagious diseases and epidemics still prevalent in the underdeveloped parts of the world. Any large-scale industrialization which fails to prevent the social costs of air and water pollution will sooner or later expose the population in the emerging industrial centers of the world to a situation in which air and water, which have usually been considered to be free gifts of nature, are transformed into active, i.e. scarce resources. That such an impoverishment is not a remote possibility but indeed an acute danger even in some of the less developed and industrializing countries is well illustrated by the steadily intensifying problem of air pollution in Calcutta.

In addition to air and water pollution significant social losses arise in the exploitation of both renewable (flow) and non-renewable (stock) resources or natural wealth. As in the case of air and water pollution the social losses arising in connection with the competitive exploitation of renewable resources result from the fact that the competitive process offers no guarantee that minimum technical standards will be observed. As a result the process of exploitation may become cumulative and may actually lead to an irreversible destruction of the renewable flow resource. In the case of the exploitation of non-renewable stock resources where limits of irreversibility do not exist it can be shown that their competitive exploitation tends to give rise to unnecessary capital investments, higher operating costs and incomplete recovery of available reserves. The underdeveloped world is not immune to the emergence of these social losses; on the contrary, there is considerable danger that unless the necessary safeguards and institutional arrangements are provided the social costs from these sources are likely to increase as the natural wealth of these countries becomes increasingly subject to competitive exploitation.

The social losses caused by industrial accidents and occupational diseases are among the oldest and best understood social costs of business enterprise. These human costs have increasingly found recognition in social and protective legislation. At least in principle the need for their prevention or

minimization is more or less generally accepted. Nevertheless, as we have seen, the acceptance of the principle that the human costs of occupational diseases and industrial accidents are true costs of production does not offer any guarantee that existing institutional arrangements are either actually preventing these costs or are translating them adequately into entrepreneurial outlays. Indeed, compensation payments have not kept abreast of rising costs and prices and coverage of employees is as yet incomplete and lacks a minimum of uniformity. Moreover, according to the Chairman of the New York State Workmen's Compensation Scheme the whole system has fallen back into "legal jousting, litigation and the slow, costly court process" which it was originally set up to eliminate. According to this authority, rehabilitation and restoration of the health of the injured person tends to be neglected and overlooked altogether in an interminable and costly process of hearings.¹

Thereafter we identified the social costs connected with technological change and unemployment and those arising from the duplication of capital facilities and excess capacity particularly in such fields as transportation, retailing and industrial research. Finally, we analyzed the social costs of cut-throat competition, planned obsolescence and sales promotion, and discussed the social losses resulting from the retardation of science and technology and the overconcentration and "mislocation" of economic activities in a few industrial centers. Admittedly, these social costs raise more complex issues than those dealt with in the preceding chapters of our study. The emergence of these social costs has to be related to the structure and functioning of business enterprise. They pervade the entire economic process and their avoidance would call for the most far-reaching measures of social legislation and structural reform. While many of these social costs can be expressed in monetary terms others, such as the psychological effects on the health and efficiency of the individual and the cultural impoverishment resulting from the operation of various types of sales promotional acti-

¹*The New York Times*, June 6, 1961. p. 33.

vities, are highly qualitative in character and must be evaluated as such.

Our analysis of the emergence of social costs under conditions of business enterprise has refuted the optimistic view that the interaction and legal adjustment of conflicting interests protect both the individual and society against the burden of social costs. Thus it is often argued that the attempt on the part of individual producers to shift part of the costs of production to the shoulders of third persons is bound to meet with the decided opposition of the latter. Their resistance, or rather the interaction of the conflicting interests, is said to produce not only a more or less equitable adjustment but is likely to reduce the magnitude of the social costs to a minimum. Such reasoning fails to consider a number of important factors. In the first place, some of the social costs, such as damage to human health, for example, may remain hidden for considerable periods of time during which the persons affected are unaware of the losses they sustain. In other cases, such as the greater frequency and severity of floods resulting from soil erosion, the social losses are catastrophic in character and appear to be the result of *force majeure*, although actually they are caused or at least aggravated by the productive activities of entrepreneurs. Moreover, some damages, although substantial if viewed in their totality, affect a great number of persons, with each individual sustaining only a relatively small loss which may not seem to warrant defensive action. In still other cases the injured person may be unable, financially or otherwise, to take appropriate defensive steps or may find it difficult to prove damages. As noted before, this is of considerable importance inasmuch as "judicial precedent requires the demonstration of specific damage rather than general damage and further requires quantitative estimates of the amount of damage experienced by specified individuals."¹ And even if such evidence is available and damage can be proven effective prevention of damages by means of an injunction can be secured only if it

¹ See National Resources Committee, *Water Pollution in the United States* (Washington, U.S. Government Printing Office, 1939), p. 67.

can be shown that practicable means of prevention exist.¹ Another reason why social costs are often caused with impunity by private producers is the fact that those individuals upon whose shoulders such costs are shifted may not have the necessary economic power and general foresight to resist the highly organized business units responsible for such losses.² Indeed, business organizations for which the prevention of social losses would be particularly costly, may find it more profitable to fight any suggested regulatory legislation than to take remedial action.

Finally, there are those social losses which are intrinsically connected with the operation of the market economy as a whole, such as, for example, the competitive depletion of energy resources under the "rule of capture", and the tendency to shift the overhead costs of labor to the individual worker in times of depression or after the introduction of technical improvements. Obviously there can be no defense against these social losses except through political and social reform. To repeat, there is no basis for the belief that existing social legislation or regulation designed to prevent social costs offers any guarantee that these costs of production will be adequately assessed against entrepreneurial outlays. Indeed, the system of business enterprise must be regarded as an economy of unpaid costs, "unpaid" insofar as a substantial proportion of the actual costs of production remain unaccounted for in entrepreneurial outlays; instead this part of the costs of production is shifted to, and ultimately borne by third persons or by the community at large.

Several estimates have been advanced in the preceding chapters in order to indicate the possible magnitude of specific social costs in monetary terms. No attempt has been made, however, to utilize these estimates as a basis for the calculation of the sum total of the social costs of business enterprise. Several factors militate against such a calculation at the present time. In the first place, none of these estimates are based upon any

¹ *Ibid.*, p. 68.

² S. von Ciriacy-Wantrup, *Land Conservation and Social Planning, Plan Age* (April, 1939), p. 111.

systematic study of the social losses of modern production; almost all available figures are fragmentary in character and must be viewed rather as indicative of methods which may be useful for a more adequate determination of the social costs of production. However, no matter how inadequate these monetary estimates of social costs may be they leave no doubt that the social costs of business enterprise are substantial. It is reasonable to assume that these social costs are likely to increase in importance and magnitude as further industrialization and urbanization become the standard pattern of economic development without at the same time assuring the maintenance of minimum standards of safety and social efficiency.

Social Costs and Equilibrium Analysis

In order to set forth the broader implications of social costs let us return once more to our original thesis. As pointed out in the first chapter, both the origin and the development of economic science can be fully understood only in the light of the philosophical presuppositions of the seventeenth and eighteenth centuries. The essence of these presuppositions was seen to be the explicit belief in the existence of a beneficial and rational order to things in social affairs—a belief which can be traced back to the political thinkers of the age who in this respect shared the thought patterns of the natural sciences. In harmony with their general social philosophy and the prevailing anti-mercantilistic aspirations of their time, the political economists of the eighteenth century visualized this “natural” order of things in economic life as a system of natural liberty based upon private property and free enterprise. The Physiocrats and Adam Smith considered it as their task to correlate the detailed phenomena of economic life within a coherent conceptual system in such a manner as to reveal the orderly character of the economic process under competitive conditions and to demonstrate its beneficial results for society as a whole.

This belief in the existence of an essentially rational order of things in social affairs to be discovered by systematic research

has shaped the scientific procedures of one generation of economists after another. For fundamentally it is this belief which accounts for the teleological search for levels of equilibrium and the neglect of the less harmonious aspects of economic life. The search for levels of equilibrium in terms of market values has in turn continued to shape the scope of economic investigation. Indeed, it was perhaps inevitable that classical and neo-classical economists, in their search for the hidden orderliness of economic processes, should have concentrated their attention upon those phenomena which could be shown to further the equilibrating tendencies and to serve the beneficial purpose originally imputed to the system as a whole. These philosophical presuppositions and the related search for levels of equilibrium also accounted for assumptions of perfect competition and perfect mobility of the factors of production which underlie traditional price analysis. They are responsible for the original preoccupation with static analysis and the neglect of dynamic changes as well as the assumption of rational human conduct. These assumptions of economic theory not only serve the legitimate purpose of simplifying the complex reality of economic life for purposes of theoretical study but are designed to eliminate the less congenial aspects of reality from the sphere of economic inquiry—those aspects, namely, which it would be impossible to construe as contributing to the assumed efficiency of the economic process under a system of business enterprise. This is true not only with respect to such explicit assumptions as that of rational human behavior,¹ perfect mobility of factors of production and perfect competition (in classical economics); it applies equally and above all to the implicit assumption that the economic can be separated from the so-called non-economic and that exchange values provide an adequate measure of the former. It is this implicit assumption

¹This assumption has the effect and purpose of making human behavior, an autonomous and therefore highly indeterminate and possibly disturbing factor, sufficiently determinate so as to make it an integral part of the conceptual system of economic theory. At the same time, the assumption of economic rationality provides an apparently objective basis and justification for the elimination of non-rational behavior as "non-economic" from the field of economic analysis.

which explains the acceptance of entrepreneurial outlays as an adequate and significant measure of the true total costs of production and which provides the basis for the tacit recognition of market prices and private returns as relevant criteria for the assessment of the benefits and costs of investments.

It is this preoccupation with the search for levels of equilibrium and the implicit identification of entrepreneurial outlays as the true costs of production which accounts for the relative neglect in neo-classical theory, until recently, of the phenomena of social costs. At best, as we have indicated, these costs are regarded as minor disturbances or so-called "externalities" which can safely be omitted from the main body of economic analysis. In the light of our discussion of the variety and the increasing range of social costs in modern industrial society it must be evident that the traditional implicit identification of entrepreneurial outlays with the actual costs of production is untenable and misleading. It is untenable because it can be shown that the social costs which are shifted to other persons or to society as a whole are not only substantial but that such shifts are typical and regular occurrences which can be obviated, if at all, only by an elaborate system of technical regulations and social legislation. The identification is misleading since it is bound to support a biased interpretation of the social efficiency of the allocation process in a system of business enterprise. As soon as one passes beyond the traditional abstractions of neo-classical price analysis and begins to consider the neglected aspects of social costs unpaid by the entrepreneur it becomes evident that the social efficiency of private investment criteria, and hence the alleged beneficial outcome of the allocation process under conditions of private enterprise, is largely an illusion. For, if entrepreneurial outlays fail to measure the actual total costs of production because part of the latter tend to be shifted to the shoulders of others, then the traditional cost-benefit calculus is not simply misleading but actually serves as an institutionalized cloak for large-scale spoilation which exceeds everything which the early utopian socialists and even their Marxian successors had in mind when they denounced the exploitation of man by man under the emerging system of business enterprise.

Furthermore, the phenomena of social costs which have been the subject of analysis in the preceding chapters seriously undermine the relevance and validity of the basic framework of equilibrium analysis. The image of self-correcting forces and balances may have an actual empirical counterpart in certain processes of the physical universe where the concept of equilibrium was first developed. As far as social processes, and particularly production and distribution are concerned, the notions of equilibrium and self-correction are relevant only for a narrowly circumscribed set of largely hypothetical circumstances. The actual dynamic processes of economic development and expansion seem to follow a pattern of cumulative or circular causation which is neither "orderly" nor indeed socially efficient or beneficial. On the contrary, they may easily become self-sustaining, moving further in the direction of the initial impulse and may produce far-reaching and socially harmful effects. Thus economic activities which tend to give rise to air and water pollution or which make the exploitation and depletion of renewable flow resources irreversible or which result in the "mislocation" of industries and congestion of population in urban areas are all of this circular and cumulative character. These and other activities can be socially destructive if not arrested in time by appropriate and deliberate counter-measures. As we have shown in considerable detail the destructiveness of socio-economic processes increases as they give rise to violations of minimum technical safety standards or exceed maximum permissible limits which it would be possible to define with considerable precision.

Obviously, if entrepreneurial outlays do not include and hence do not reflect important social losses they not only fail as a measure of total costs, but production may take place at total costs in excess of total benefits. What the firm minimizes are not total or average costs but entrepreneurial outlays which leave out of account the social costs borne by society at large or by third persons.

It is important to consider in this context the fact that the institution of sales promotion in modern industrial societies undermines and refutes the doctrine of consumers' sovereignty

and rational conduct and that the price mechanism does not and cannot register the relative importance and existence of social benefits which tend to diffuse themselves throughout society.¹ For clearly, if production sets the stage for what the consumer is made to want, if the latter's demand is subject to manipulation by sellers and producers, and if furthermore important private returns neither reflect nor measure the presence and importance of social utilities, then, quite apart from the existence of social costs, the allocation of resources in accordance with investment criteria based upon the market test cannot be said to give rise to social efficiency in any meaningful sense of this somewhat ambiguous term.² What are maximized are not private utilities or "aggregate satisfaction" in any comprehensible sense of the term but at best only exchange values or exchangeable utilities whose monetary value moreover has been influenced or even "manipulated" by persons with a direct commercial interest in the result of consumers' preferences and total demand. Indeed, if strictly adhered to, the principle of allocation in accordance with the investment criteria provided by the market would make any social existence impossible. For most public or social services could not be provided for the majority of people because they are unable or do not want to pay their full costs.

In short, the familiar formal conclusions of traditional price theory in support of the essential rationality and self-correction of the economic process under conditions of business enterprise do not stand the test of scientific analysis. Whatever superficial plausibility they may have had in the past and may still command can be accounted for only in terms of the basic presuppositions which shaped the early evolution of classical political economy and which have continued to color the basic assumptions of neo-classical equilibrium analysis. Indeed, the partly tacit and partly explicit presuppositions concerning the hidden and

¹ The concept "external economies" is too narrow and inadequate to cover the social benefits of public services and overhead investments such as education, sanitation, roads, irrigation, flood control, administration. See K. Wm. Kapp, *Hindu Culture, Economic Development and Economic Planning*, *op. cit.*, ch. 9.

² On the ambiguity of the term and concept of social efficiency See J. K. Galbraith, *American Capitalism* (Boston, Houghton Mifflin, 1952), Ch. 2.

automatic social efficiency and "orderliness" of the system of natural liberty which gave rise to the search for levels of equilibrium have determined the whole process of concept formation in economics as a discipline. There is not a basic concept of neo-classical economics which does not in one way or another reflect and at the same time serve the purpose of demonstrating the alleged social efficiency of the market economy. It is not without interest, especially in view of the positive suggestions regarding the scope of economic science to be discussed in Chapter 15, to indicate briefly how well these fundamental concepts are adapted to and serve the traditional search for equilibrium and self-correction. For example, no elaborate analysis is required to show that wealth is conceived entirely in terms of appropriable, i.e. exchangeable utilities which are measured in terms of market prices. To be exact, the modern concept of wealth hinges upon the meaning of utility which points to those qualities of goods and services which can be taken into exclusive possession and as such are subject to measurement in terms of exchange values. Goods and services without these qualities are without utility according to value theory and consequently are not considered as wealth. As a matter of fact, utility is not merely a function of physical and economic appropriability and technical exchange ability but is also dependent upon effective demand. In other words, commodities for which there is no demand are said to be without utility, i.e. they are not wealth.

Similarly, production and productive labor are conceived in the same narrow manner as the concept of wealth. In fact, the concept of production has always been dependent upon the meaning of wealth. If earlier economists disagreed about the "productiveness" of certain human activities, their controversy can be understood only in the light of their different interpretations of wealth. Adam Smith regarded the labor of doctors, lawyers and domestic servants as unproductive because he conceived of wealth in an exclusively material sense. Unlike his predecessors who operated with an even narrower concept of wealth either in terms of gold and silver (Mercantilists); or in terms of the produce of the earth (Physiocrats), Adam

Smith considered as wealth all "permanent objects or vendible commodities". Thus, he included capital equipment and consumption goods but excluded services from his concept of wealth. If today wealth is equivalent to exchangeable utilities in effective demand production becomes simply the creation of utilities for which there is a demand. "Labour is, in fact, productive when it satisfies a demand—when people are willing to pay for it."¹ That is to say, no matter how useful, how important or essential goods and services may be, if they are not exchangeable and consequently not measurable in terms of dollars and cents they are not wealth and their creation, for example under government auspices, is "unproductive" according to the terminology and conceptual system of value theory. Indeed, if strictly interpreted the definition of wealth and production in terms of exchangeable utilities and with reference to effective demand restricts the validity and meaning of these concepts to a market economy. Labor in an economic system in which the categories of market, exchange and demand do not exist, as for example in the manorial economy, would be unproductive in terms of current concepts of production and wealth.

Similarly, the notion of economy, or what amounts to the same thing, the concept of economic efficiency, is conceived in a manner which makes it applicable only to a market economy: it is identified *per definitionem* with economizing in terms of private costs and returns, i.e. in terms of exchange values. No wonder, therefore, that this delimitation of concepts and basic categories has been carried to its logical conclusion by the assertion that the free market and the competitive calculus are the prerequisites for the achievement of economy and economic rationality and that any other form of economic organization is incapable of allocating resources for the attainment of competing ends in a rational manner.

It must be admitted that with the help of these concepts and explicit and implicit assumptions value theory has succeeded in coordinating a substantial number of detailed economic

¹ L. M. Frazer, *Economic Thought and Language* (London, E. and C. Blake Ltd., 1937), p. 179.

phenomena into a coherent whole, thus lending support to the assumed beneficial orderliness of the economic process under conditions of business enterprise. Given its aims, assumptions, and basic concepts, the theoretical conclusions of modern neo-classical economics in support of the system of "natural liberty" follow tautologically. Value theory was thus bound to become a "methodology" or a "technique of thinking" to use an expression of Schumpeter.¹ Once an economist has accepted these aims, concepts and assumptions and has mastered the "technique of thinking" it is extremely difficult if not impossible for him to realize the philosophical presuppositions and hence the limitations of the conceptual system of value theory.² Having accustomed himself to the "methodology" he tends to classify all phenomena of economic reality into the traditional scheme of logical categories³ and from then on even the most penetrating deductions and the most earnest desire for objectivity cannot produce anything but the normative conclusions in support of laissez faire and against a positive regulation and control of the economic process by public authorities. Indeed, it has been argued that only a fallacious interpretation of the basic propositions and conclusions of value theory can justify any other course of public policy than that of non-interference with economic life.⁴ In fact, it is this narrow efficiency of the scheme, to borrow a phrase in which A. N. Whitehead refers to physical science, which was the very cause of its supreme methodological success.⁵

In characterizing many of the deductions of traditional price theory as rationalizations, partly of unexamined presuppositions concerning the nature of the social process and partly of an implicit social philosophy, we support the thesis that neo-classical equilibrium theory plays a normative

¹ See J. A. Schumpeter's Introduction to Enrico Barone, *Grundzüge der Theoretischen Nationalökonomie* (Bonn, Kurt Schröder Verlag, 1927), p. 7.

² G. Myrdal, *Das Politische Element in der Nationalökonomischen Doktrinenbildung*, (Berlin, Dunker and Humblot 1932), p. 34.

³ *Ibid.*, p. 34.

⁴ Cf. G. Sutton, The Relation between Economic Theory and Economic Policy, *The Economic Journal*, Vol. 47, 1937, p. 51.

⁵ A. N. Whitehead, *Science and the Modern World* (New York, The Macmillan Company, 1925), p. 26.

political or even apologetic role. This apologetic normative character of economic theory is not necessarily the result of a deliberate attitude on the part of the individual scholar. Nor indeed do we imply any subjective dishonesty or violation of the canons of scientific objectivity. In order to be normative-apologetic it is not necessary for the individual scientist to violate the rules of scientific objectivity and subjective honesty. To repeat, the apologetic normative element of economic theory is not so much the result of a deliberately assumed attitude but is rather inherent in the philosophical presuppositions and the imputation of rational order and efficiency to economic processes under conditions of business enterprise. The political element is hidden in the basic assumptions and concepts of neo-classical value and price theory. This finds its most typical expression in the delimitation of the scope of economic analysis. Indeed, if the economist's impartiality is challenged he is likely to protest his scientific objectivity and neutrality and to assert that he is speaking from a "purely economic" point of view. It will not occur to him that it is precisely this "purely economic" point of view which introduces the normative-apologetic element into his theoretical conclusions and practical judgments. As a matter of fact, these theoretical conclusions which are advanced as solutions of practical problems of economic policy but which do not make explicit their political premises tend to account for the fact that the conceptual models of modern cost-price analysis perpetuate the old illegitimate union between economic analysis and political economic liberalism. These conclusions represent a strange mixture of scientific analysis and value judgments arrived at by way of a rationalization of preconceived socio-political ideals.¹ This proclivity to draw political conclusions and to deal with concrete political problems without political premises also accounts for the almost proverbial tension which exists between static equilibrium theory and economic policy and tends to make the former increasingly irrelevant

¹ For a more elaborate analysis of the normative-apologetic character of economic science see G. Myrdal, *Das Politische Element*, *op. cit.* esp. ch. 1. See also B. Wootton, *Lament for Economics* (London, George Allen and Unwin, 1938), pp. 132-182.

for the comprehension and solution of the urgent practical problems of the underdeveloped world.

In more than one instance, individual economists have been able to use their "pure" economic conclusions for what looks either like an objective critique or the advocacy on presumably purely scientific grounds of various forms of government action. Although it is probably true that there is no economic theory without a grain of social philosophy since the choice of data in the social sciences is never a matter of pure knowledge but reflects always some pre-scientific notion,¹ the dangers of this lack of explicit separation are too obvious to require elaboration. Indeed, economic science may on occasion be degraded to the level of partisan journalism. Insofar as professional economists are not sufficiently conscious of their political premises and biases and offer advice as if their conclusions were arrived at on perfectly neutral grounds, they are likely to provoke a steadily growing distrust of economics in those responsible for the formulation of economic policy.

In advancing the foregoing observations it is not intended to detract from the positive contributions and liberating force of classical economics. In their time, the classical economists opposed a system of mercantilist regulations which had greatly contributed to laying the foundation of the national economies of Western Europe and thereby supported the process of economic development. However, during the eighteenth and nineteenth centuries mercantilism had become an obstacle to the full utilization of the productive forces made possible by the new knowledge accumulated by the natural sciences. By introducing into the study of social affairs the rationalistic concepts of natural order and by positing that competition was the "natural law" of such an order, classical economists were able to supply "the necessary framework of ideas to meet the need of a new social philosophy adapted to the early days of the industrial revolution."² Moreover, in their struggle against the shackles of mercantilism they gave expression to the prevailing

¹ Otto von Mehning, "Some Problems of Methodology in Modern Economic Theory", *American Economic Review*, vol. 34, March 1944, p. 94.

² L. K. Frank, *The Principle of Disorder and Incongruity in Economic Affairs*, *Political Science Quarterly*, vol. 47, 1932, p. 52.

aspirations and ideals of the emerging middle classes. Thus classical economics served the positive purpose of promoting a development which in its historical setting must be regarded as progressive both as far as the process of production and its scientific analysis were concerned.¹ Furthermore, by introducing the concept of natural order into the study of economic and social affairs and by combining it later with the individualistic doctrines of utilitarianism, the classical economists protected economic science against the specifically German philosophy of society which in its romantic and organic versions conceived of the state as a metaphysical superorganism to which the individual was subordinated and bound by various kinds of duties. Today, however, it has become increasingly evident that neither German state metaphysics nor the preconceptions of a beneficent natural order and harmony of interests in political affairs provide an adequate philosophical foundation for economic science. On the contrary, these philosophical presuppositions of political economy have become the most obstructive obstacles to the scientific understanding and interpretation of social reality. At the same time, it appears that modern price theory has almost reached the point where not much additional knowledge can be obtained from its present abstractions. Indeed, with the help of mathematical methods modern economists seem to have squeezed out every possible ounce of information from their assumptions and much of what modern firm analysis has achieved appears to be limited to the mechanistic refinement and elaboration in algebraic terms of old conclusions without throwing much, if any, new light upon the problems under discussion. Moreover, a good deal of value and price theory shows a tendency towards a self-sealing system which has a way of almost automatically discounting evidence which might bear adversely on the doctrine. This exhaustion by analysis of the possible content and meaning of its assumptions and its "self-sealing" character seems to make modern welfare and equilibrium economics a perfect illustration

¹ See G. Myrdal, *Das Politische Element*, *op. cit.*, p. 85.

of A. N. Whitehead's dictum that "systems, scientific and philosophic, come and go. Each method of limited understanding is at length exhausted. In its prime each system is a triumphant success; in its decay it is an obstructive nuisance. The transitions to new fruitfulness of understanding are achieved by recurrence to the utmost depth of intuition for the refreshment of imagination."¹ It is the purpose of the following chapter to indicate, on the basis of these critical conclusions, some of the steps which must be taken in order to achieve a new and more fruitful understanding of economic reality.

¹A. N. Whitehead, *Adventures in Ideas* (New York, The Macmillan Company, 1948), pp. 203-204.

CHAPTER FIFTEEN

TOWARD A NEW SCIENCE OF POLITICAL ECONOMY

Return to Philosophy

WHITEHEAD'S statement that "if science is not to degenerate into a medley of *ad hoc* hypotheses, it must become philosophical, and must enter upon a thorough criticism of its own foundations"¹ applies with equal force to economics. Indeed, in order to make the maximum contribution to the contemporary problems of economic growth and development, economic theory has to bring its basic methodological presuppositions into line with the present state of philosophical insight. This requires above all the abandonment of the belief in automatic self-correcting tendencies toward equilibrium and social efficiency² and the recognition of cumulative tendencies toward "disequilibrium" and even stagnation in social affairs. The shift of parts of the costs of production to the shoulders of third persons and the community is one important instance of such cumulative or circular causation. Instead of either ignoring these costs altogether or treating them as "externalities" serious economic analysis will have to make these phenomena and the related social returns the object of empirical and theoretical studies. In fact, for purposes of decision-making and the formulation of socio-economic policies it is much more important to explore processes of circular causation with their potential wastes and inefficiencies than to continue the traditional search for levels or equilibrium. This is not

¹ A. N. Whitehead, *Science and the Modern World* (New York, The Macmillan Company, 1925), p. 25.

² Even J. M. Keynes did not abandon this search for levels of equilibrium. His demonstration that there are tendencies which may produce equilibrium below full employment, uses traditional tools of analysis and fails to include many of the broader aspects of economic life dealt with in the present study. Nevertheless Keynes must be credited with having destroyed beyond repair the classical belief in a natural balance between consumption and production.

to suggest that the search for levels of equilibrium and the teleological imputation of efficiency in the economic process should be replaced by an equally teleological imputation of cumulative disorder in social affairs. Such a procedure would be as futile as the search for levels of equilibrium. What is required at the present juncture in the development of social science is a framework of analysis which has room for the study of circular causation and which makes possible the discovery of the "causes" of disorder and stagnation in concrete cases under different forms of socio-cultural organization.

The suggestion that the basic premises of economic analysis be brought into accord with modern views raises once more the question as to the tasks and purposes of social analysis. What are the fundamental aims of social inquiry? At the risk of repeating the obvious let us state first that the aims and objectives of social science are *not* to act as the servant of any prevailing form of economic organization. To serve as a form of apologetics can only have the effect of undermining the status of a discipline in the long run. Nor can it be the purpose of economic analysis to provide norms for what "ought to be done" except on the basis of clearly postulated political premises and social value judgments. Indeed, a normative system of economics without political premises and with every economist offering advice on what ought to be done in the field of economic policy would mean the end of economic science.

In fact the only legitimate aim of economic analysis is to provide an unbiased and critical comprehension and interpretation of the socio-economic process. Such an interpretation requires above all that our basic concepts and categories should be formulated in a manner which makes them relevant for the study of economic systems. That is to say economic analysis must transcend what has been called "the horizon of contemporary society."¹ While this was perhaps not possible during the nineteenth century, it can be achieved now since it has become evident

¹M. Horkheimer, *The Social Function of Philosophy, Studies in Philosophy and Social Science*, VIII, (1939), p. 329.

that laissez faire is an inadequate principle for the organization of economic and social life. More specifically, the task of economic science is to provide theoretical frameworks which can actually be used for the explanation of the effects¹ of decisions (plans) both of individuals and governments under conditions of dynamic change—that is to say, under conditions where simultaneous changes of significant variables over time are fully taken into consideration. In other words, the aim of economic science is to establish theoretical frameworks which show the possible relationships which connect the many variables of economic reality, thereby enabling individuals and governments to make reasoned choices in full understanding of the probable consequences of their action. Indeed, the most important task of economic science is the exploration of the repercussions of alternative measures of public control and economic planning. In this way the discipline will be able to help formulate valid criteria for public decisions and public administration. For there must be no doubt that economic science is above all a science of social or political economy, i.e. a system of knowledge designed to enable governments and administrators of public affairs to develop and apply the criteria and the techniques of public policy and public administration which are called for by the physical and cultural requirements of civilized human existence. For this reason it will be necessary to establish a much greater collaboration between the social scientist and technically competent experts in such fields as agriculture, engineering, public health, city planning and public administration than the traditional economist has been prepared to admit.

If the primary aim of economic analysis is the comprehension of the repercussions of individual and collective decisions and the elaboration of theoretical frameworks in terms of which it becomes possible to explain the consequences of human action, the concept of social causation assumes once more a role of major importance for the economist. For upon our *concept* of causation depends the *method*

¹“Repercussions” would be a better word; see Ragnar Frisch, *Repercussion Studies at Oslo*, *American Economic Review*, XXXVIII, (June 1948), pp. 367-372.

used in discovering causal relationships. If the causal connection between social phenomena is conceived as a *necessary* relationship as was the case in static or mechanical analysis in the past, the discovery of causal connections would indeed seem to call for mechanical models and mathematical constructs. If, however, the causal relationship between the variables in the social system is seen not as a necessary but rather as a possible or probable relationship between a great many variables where expectations constitute often the most important link, it is essential to conceive of social causation as an empirical correlation which calls for measurement in terms of coefficients of greater or lower probability, observation, fact-finding, case studies and statistical extrapolation. It must be considered as a hopeful sign that a reconsideration of the meaning of causality seems to be under way both in the natural and the social sciences.¹

The Broadening of the Scope of Economic Investigation

One of the most important effects of a reconsideration of the philosophical presuppositions of economics would be the realization of the need for a broadening of the scope of economic analysis. Instead of defining its scope in terms of exchange values and using the latter as the criterion of what belongs to the subject-matter of economic science it will be necessary to follow J. M. Clark's dictum that "it is unscientific to exclude any evidence relevant to the problem in hand."² Indeed, scientific method implies comprehensiveness "even if it involves some sacrifice of other qualities for which science likes to strive."³ Once this realization becomes a general attitude systematically cultivated in graduate schools, economists will gradually free themselves from the "all-too-prevalent methodological fanaticism which prefers the accurate but superficial to the approximate but fundamental,

¹See Selected Bibliography in R. M. MacIver, *Social Causation* (Boston, Ginn and Co., 1942), pp. 395-400. See also K. William Kapp, *Toward a Science of Man Society*, *op. cit.*

²J. M. Clark, *The Socializing of Theoretical Economics*, in *Preface to Social Economics*, *op. cit.*, p. 5.

³*Ibid.*, p. 5.

and which makes adaptability to its special technique of investigation, rather than importance, the standard for the selection of problems and the delimitation of the scope of its inquiry."¹

In fact any attempt to delimit the scope of economic analysis is likely to yield only a distorted picture of the manifold problems with which economic science actually has to deal. It is not surprising, therefore, that most previous attempts to define the subject matter of economic science have failed to convey an adequate idea of the actual scope of economic analysis. Many of these attempts, especially those based upon earlier concepts of wealth yielded definitions of economic science which were too narrow and left out important economic problems.² However, even if a clear-cut delimitation of the scope of economic science were possible it would still be unnecessary. For it could not possibly provide any help to the individual scientist in the discovery and deduction of specific conclusions. Just as the chemist cannot draw any scientific conclusions from the definition of chemistry as a science so the definition of the subject matter of economics cannot be decisive as a scientific argument for or against particular conclusions.³ It is, therefore, quite true to say that the only concept with the precise definition of which the economist need not concern himself is that of economic science.⁴

In fact a delimitation of the scope of economic science is not only unnecessary but actually harmful. This becomes especially clear if we consider the declared objectives of some of the attempts made in the past to define the subject matter of economic science. Thus it has been pointed out, for example, that a definition of the subject matter of economic science is

¹J. Viner "The Utility Concept in Value Theory and its Critics", *Journal of Political Economy*, XXXIII, 1925, p. 659.

²For an account of the numerous, now more or less abandoned definitions of economic science see A. Ammon, *Objekt und Grundbegriffe der Theoretischen Nationalökonomie* (Leipzig, Franz Deudicke, 1927), 2 Aufl., and L. Robbins, *An Essay on the Nature and Significance of Economic Science*, (London, Macmillan and Company, 1940), Chapt. 1-2.

³G. Myrdal, *Das Politische Element*, *op. cit.*, p. 236. See also O. Neurath, *Empirische Soziologie, Der Wissenschaftliche Gehalt der Geschichte und Nationalökonomie* (Wien, Julius Springer, 1931), p. 72.

⁴G. Myrdal, *Das Politische Element*, *op. cit.*, p. 236.

necessary in order not to leave it to the individual economist to formulate his own ideas on the subject.¹ Robbins is even more outspoken in this respect; he proceeds "with an easy conscience" to the description of the general subject matter of economic science in order to prevent "the preoccupation with the irrelevant—the multiplication of activities having little or no connection with the solution of problems strictly germane to his [the economist's] subject."² Apart from the somewhat overconfident belief that it is possible to define once and for all the "relevant" and the "irrelevant", irrespective of the particular nature of the problem under discussion, any segregation of the "relevant" from the "irrelevant" is problematical. In the first place, it tends to make economics a closed system of thought by providing a seemingly objective reason which makes it possible to brand all arguments directed against specific theoretical conclusions as having been derived from allegedly "irrelevant" or "non-economic" data and observations. Secondly, the specifically Robbinsian definition of the subject matter of economics in terms which do not transcend the horizon of a market economy, permits the drawing of the "scientific" conclusion that any alternative form of economic organization would be incompatible with the principles of a rational utilization of scarce means for the attainment of competing ends. In other words, the definition of economic science in terms of price analysis is an attempt to give scientific dignity to what has been called not inappropriately "the undignified farce of sharp-shooting at Marxism with toy Austrian pop-guns from behind a non-existing methodological wall."³ Thirdly, the endeavor to delimit the subject matter of economics and of other social sciences has so far led only to the multiplication of artificial boundaries between the social disciplines and their compartmentalization. The resulting specialization and fragmentation of social inquiry tends to obstruct and defeat the search for knowledge and truth by restricting the scope and

¹ A. Ammon, *op. cit.*, p. 4.

² L. Robbins, *op. cit.*, p. 3.

³ R. W. Souter, "The Nature and Significance of Economic Science in Recent Discussions," *Quarterly Journal of Economics*, vol. 47, May, 1933, p. 411.

horizon of scholarly investigations. This is the road to futility in social inquiry which must be concerned with the analysis of a fundamentally interdependent socio-economic and political reality.

Indeed, scientific method in social and economic research calls for the progressive elimination of all boundaries which past generations of scholars have created for scholastical, pedagogical and other reasons. The ultimate aim is not merely "collaboration" but the closest possible integration and ultimate synthesis of the social sciences.¹ Until this aim has been attained the individual scholar can only endeavor to press beyond the present boundaries of economic science and explore as fully as possible new developments in psychology, sociology, politics, law, history and ethics with a view to assimilating to his own reasoning whatever these social sciences can contribute to a better understanding of economic problems.

The only boundary line which must not be abandoned but which should in fact be strengthened is that which lies between scientific interpretation and rationalization or the use of reason in support of preconceived ideas. To draw this distinction between science and pseudo-science or dilettant speculation is the task of a social science thoroughly aware of the issues of epistemology in general and of the sociology and psychology of knowledge in particular.² These are of course issues of intellectual honesty and professional integrity which need not be elaborated upon here.

The foregoing observations should not be interpreted as a complete rejection of Robbin's formal definition of economics as "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses."³ This definition, while pointing to important characteristics of

¹ For a positive approach to the integration of social knowledge in terms of the common denominator concepts of culture and man see the author's recent study, *"Toward a Science of Man in Society"* *op. cit.*

² On this subject see F. H. Blum, *Some Contributions of Dynamic Psychology to the Sociology of Knowledge*, in *Actes du Quatrième Congrès Mondial de Sociologie*. Milan Stresa 8—15 September, 1959, vol IV.

³ L. Robbins, *op. cit.*, p. 16.

the economic problem, such as the existence of scarcity, ignores the substantive problems of adapting means to ends and ends to means in far from static "institutional" environments understood as more or less generally accepted frameworks of political and social arrangements. There can be no comprehension and adequate interpretation of the economic problem and the economic process except when the latter is seen in relation to the institutional framework of which it is an integral part. This is of particular significance in the study of economic growth and institutional change in the underdeveloped world where solutions of economic problems are sought under institutional conditions which differ qualitatively from those either implicitly or explicitly assumed in Western economic analysis. It is not so much the lack of entrepreneurial and wage incentives but rather the institutionalized obstacles of hierarchy, caste and religion as well as inadequate and inefficient administration which block the way to or delay, the full use of economic resources. A substantive definition of the nature of the economic problem would have to view it within the context of changing human (i.e. socio-cultural) relations where scarce means are adapted to *individual as well as public* needs and requirements and where the latter are in turn selected, or adapted to socially available resources. Such a substantive definition of the scope of economics leaves no doubt about the fact that economists are concerned primarily with problems of social action and social choice rather than with individual behavior seen as a formal relationship between (individual) ends and scarce means under conditions of scarcity.¹

Indeed the really important problems of economics are questions of collective decision-making which cannot be dealt with in terms of a calculus deductively derived from a formal concept of individual rationality under hypothetically assumed

¹ An earlier and still useful definition partly along the above lines is the following: "Economics [is] the study of the changing patterns of cultural relations which deal with the creation and disposal of scarce material goods and services by individuals and groups in the light of their private and public ends." A. G. Gruchy, *Modern Economic Thought*, (New York, Prentice-Hall, Inc. 1947), p. 552. See also K. Polanyi, "The Economy as Instituted Process" in, K. Polanyi, et al. (eds.) *Trade and Market in the Early Empires*, (Glencoe, Ill. The Free Press, 1957), pp. 243-70.

and transparent conditions. Those who either argue that "where politics and ethics come in by the window, economics goes out by the door"¹ or who maintain that the problem of institutions and questions of public purposes must be left to the statesman condemn economics to impotence when it comes to the elaboration of criteria for the formulation of public policies.² The time may not be far off when the economist will have to establish the closest possible cooperation with technical experts in engineering, public health and other fields of technology in order to identify and define social costs and social benefits which the market system tends to ignore.³

The Reformulation of Basic Concepts

While it is true that individual economists have attempted to reformulate some of the basic categories of economic thought for their own specific work, these attempts have been confined largely to the fields of public finance and economic growth. It may well be that many of these concepts will ultimately be integrated into a new system of economic analysis. So far, however, this broadening of the scope of economic analysis has not taken place. Traditional definitions of wealth and production, of productiveness and efficiency in terms of market values or exchangeable utilities in effective demand, have not merely "failed to keep pace with the facts of production"⁴ but are among the most important obstacles to an understanding of the socio-economic issues of the twentieth century. For, indeed, as long as wealth and production are defined in terms of exchangeable utilities in effective demand, the creation of social benefits in the form of goods and services yielding no exchangeable returns must be considered as "unproductive". Unproductive, in the language

¹H. S. Ellis, "The Economic Way of Thinking", *The American Economic Review*, XL, (March, 1950), pp. 4-5.

²On this subject see B. W. Allin, *Is Group Choice a Part of Economics?* *Quarterly Journal of Economics*, LIII (August, 1953), pp. 362-79.

³For a fuller treatment of this thesis with particular emphasis on the need for objective standards of human requirements see the author's *Hindu Culture, Economic Development and Economic Planning op. cit.*, ch. 9.

⁴J. M. Clark, "Economics and Modern Psychology" in *Preface to Social Economics, op. cit.*, p. 138.

of contemporary economic science means unremunerative and not "worth while".¹ By this test the creation of social benefits such as the elimination of illiteracy or the maintenance of public health through sanitation is "unproductive." No matter how desirable these social benefits may be, from the standpoint of orthodox economic theory the allocation of scarce resources to these purposes must be considered as unproductive or even wasteful. In contrast, the control of supply by oligopolists and the creation of artificial scarcities may enter into the social accounts in the form of higher exchange values and hence as economically productive creations of marketable values. Under these circumstances it is not surprising that traditional economic theory tends to be not only of limited value but often irrelevant for the formulation of criteria for public investments. It is no longer doubtful that the full and efficient utilization of resources and manpower cannot be secured on the basis of such obviously inadequate and contradictory conceptualizations.

The primary purpose of a reformulation of the classical and neo-classical concept of wealth and productivity is to broaden the meaning of these concepts and to include the phenomena of social costs and social returns within the range of economic analysis. Instead of conceiving wealth and production merely in terms of exchangeable utilities, the new concepts of wealth and production will have to be defined in such a manner as to include non-pecuniary values. Indeed, wealth does not consist simply of commodities which are traded in markets; it includes goods and services that are socially necessary and serviceable irrespective of whether they can be exchanged and evaluated in terms of exchange-values. And correspondingly, production refers to the creation of everything that is considered useful and important from the standpoint of the nation whether exchangeable or not exchangeable, privately appropriable or socially beneficial. Similarly, as already pointed out, the principle of economy (in the sense of "economizing") will have to be conceived in a more inclusive manner than has hitherto been the case. Instead of defining "economizing" merely in terms

¹ This is another instance where apparently neutral definitions and innocent methodological classifications carry far-reaching normative implications.

of exchange-values it is necessary to formulate the principle of economy (and the concept of efficiency) in a manner designed to take account of social costs and social returns. In other words, if the concepts of "economy" and "economic optimum" are to have any place in economic discussions they must be formulated in terms of estimates of total gains and losses (including social opportunities foregone). By thus enlarging the meaning of wealth, production, and "economizing" through the inclusion of social costs and social returns, it will be possible to overcome the present arbitrary and normative designation as unproductive of activities which create qualitative, non-exchangeable or social utilities.

Such a broadening of the fundamental concepts of economics would also open the way for a theory of public finance. Indeed, taxation and public spending are concerned with the process of adjusting scarce means to competing ends. The determination of budgets is a process of decision-making in which the selection of different public goals and the extent of their gratification are determined. In other words, budget-making is a process of social choice par excellence which settles not only the scope and magnitude of the public sector but, by its determination of revenue resources and public purposes, also decides questions of the tax burden, the allocation of public revenues, and the distribution (or incidence) of public benefits including public services in kind.

The various types of public revenues are of course costs of production. They represent either those costs which are required to remedy the social damages caused by business enterprise or outlays which are required for the production of goods and services which would be produced by no one if the State did not undertake to provide them. More specifically, public revenues may be either of the nature of consumption outlays designed to produce goods and services of immediate utility, or investment outlays for the construction of durable goods such as improved means of transportation, or better housing and medical care yielding social benefits over a period of time. In either case, as far as its economic implications are concerned, taxation has to be looked upon,

as Sismondi suggested more than a century ago¹ and as Beveridge has subsequently pointed out, "as a means of reducing private expenditure on consumption and thereby freeing real resources for other uses."²

There remains the problem of the incidence of taxes or the question of the final impact which the collection and allocation of public revenues to different public purposes has upon the distribution of income and output. Just as the individual calculus throws little if any light on the actual determination of social priorities, the traditional welfare calculus fails to take account of those redistributive effects which accrue to the taxpayer as a result of the social returns which are derived either from remedying or preventing social costs or those which arise from the "free" public services in kind provided by the public sector. The provision of these services represents the most important change in the distribution of output (or income in kind) which can be traced only by means of a more comprehensive framework of analysis than that provided by traditional welfare and equilibrium economics.

By thus widening their basic concepts and by incorporating social costs and social returns in their theoretical framework economists would at last acknowledge the fact that no fundamental difference exists between private and social costs of production and that exchangeable utilities and social benefits are identical insofar as the production of both has to draw upon scarce resources and requires social action in the sense of choices. These costs and benefits differ only in terms of their measurability. It is at this point that we finally come upon the most important concepts of the new science of economics, namely that of social value and social choice.

Social Value and Social Choice

If modern economic science is to concern itself with social costs and social benefits, it will not be sufficient

¹ J. C. L. Simonde de Sismondi, *Nouveaux Principes d'Economie Politique*, vol. I, p. 142.

² W. H. Beveridge, *Full Employment in a Free Society* (New York, W. W. Norton and Co., 1945), p. 149.

merely to trace and classify these largely neglected aspects of socio-economic reality in general terms. Nor will it be adequate to present quantitative estimates (in monetary terms) of social costs. No matter how important such estimates may be as a first approach to an appraisal of social costs, the final determination of their relative magnitude and significance is likely to be a matter of social evaluation and social value (in the sense of value to society).¹ If it is further realized that the magnitude and relative importance of social returns is not subject to measurement in terms of exchange values but requires some kind of social estimate, it becomes clear that the concept of social value is likely to be one of the most important categories of any system of economic thought willing to explore the nature and repercussions of governmental action and economic policy making.

Formal equilibrium analysis seems to have little to offer toward a solution of this central problem of economic theory. Subjective value theory recognizes only the individual as capable of feeling "pain and pleasure" and hence able to establish preference scales with respect to different commodities and alternative courses of action. This evidently accounts for the fact that "scarcely a breath (of the idea of social value) penetrates to the rarefied atmosphere of technical discussions of the theory of value and distribution."² And yet, only "if we can develop a concept of economic value and valuation with reference to society as a whole, independent of market valuations and capable of scientific application to concrete cases, we shall

¹In using this qualifying term we want to emphasize that our concept of social value has nothing in common with the notion of "social value" developed by J. B. Clark and E. R. A. Seligman and later by B. M. Anderson. These economists, especially in their earlier writings, endeavored to prove that it is society as such which puts values on commodities and that prices in capitalist exchange economies are genuine social values reflecting the value of the commodities to all members of society. The logical and terminological confusion and the strange apologetic purpose of this American doctrine of social value has been demonstrated especially by earlier discussions, e.g. J. A. Schumpeter, *On the Concept of Social Value*, *Quarterly Journal of Economics*, Vol. XXIII, 1909, pp. 216-217, 222 ff. See also F. Wieser, *Natural Value* (6th ed.) (New York, Macmillan and Co., 1893) pp. 52-53; and E. Böhm-Bawerk, *Grundzüge der Theorie des wirtschaftlichen Güterwertes*, *Conrads Jahrbücher*, N.F., Vol. 13, 1886, p. 478.

²J. M. Clark, "Toward a Concept of Social Value" in *Preface to Social Economics*, *op. cit.*, p. 53.

have an intellectual instrument that will pierce the insulation [of economic theory] and establish a connection with the ideas that are making things happen."¹

It is sometimes suggested that the problems of social value and social evaluation call for a study of social preferences through the collection of data concerning past and present public expenditure patterns. Doubtless such studies of expenditure patterns make it possible to draw conclusions as to the relative importance which governments have actually attributed in the past to such public services as education, external and internal security, sanitation, transportation and communication, medical care, housing, etc. However, such positivistic studies can at best reveal only *ex post facto* social priorities as they existed at a point in time under a given distribution of power and counterpower between different groups. Hence, such studies can hardly claim any objective validity other than that which may be attributed to the historically existing distribution of power in society. It becomes relevant, therefore, to inquire whether social values and the process of social evaluation can be placed on an objective basis. Are there any criteria for the determination of social values in a more or less objective fashion and in terms which would command the consent and agreement of reasonable persons. It must be clear that we are interested here in the substantive determination of social values and social welfare and not in the construction of social utility or demand curves or for that matter in collective indifference curves designed to represent formally marginal social rates of substitution. It is always possible to develop such a formal apparatus especially if one is not concerned with the question of the relevance of these tools of formal analysis for practical, i.e. substantive purposes.

In the light of our repeated references to the need and possibility of developing and using objective standards it will hardly come as a surprise if we answer the above question affirmatively. Minimum standards (such as maximum permissible limits of concentration of pollutants in the air and water, rates of utilization short of the point of irreversible exhaustion of flow resources,

¹*Ibid.*, p. 54.

minimum standards of sanitation, education and medical care, standards of land utilization which incorporate our technical knowledge concerning the proper use of land which maintains soil fertility without setting the stage for erosion, water-logging, salinization and a higher incidence of malaria, to name only a few, are of such a nature as to command widespread agreement at least if the implications of their violation are made clear. It is possible to attach priorities to the maintenance of these minimum standards or at least to establish some reasonable agreement as to the absolute necessity of adhering to such standards. Similarly, the location and size of large multipurpose projects as well as many of the subsidiary works are in reality guided by social and technical considerations such as the availability of raw materials, nearness to markets, access to transport facilities and the presence of energy resources. The principle of social economy demands, moreover, that investments be made in such a fashion as to overcome the cumulative tendencies toward inequality and regional backwardness. These investments must therefore take place in open violation of the market test and in harmony with technical and social criteria. If some individuals or small groups in a society either fail to be convinced or refuse to be convinced by these social evaluations it is legitimate and reasonable for organized society to overrule the wishes or interests of these groups in the common interest. For not to do so would have serious consequences for the maintenance of the life and health of all members of the society in question. This is not to say that the establishment of social priorities is a simple matter. What we do suggest is that in practice the process of social evaluation can be solved even if the standards of precision and refinement of formal utility analysis cannot be adhered to.

The substantive solution of the problem of social priorities would be greatly facilitated if it were possible to determine the relative costs of different social benefits. The difficulties in the way of the solution of this problem have been greatly exaggerated. It is not impossible, either in principle or in practice, to calculate the actual or real costs of social benefits. Even

without any statistical apparatus developed for, or adapted to, these purposes it has been possible to determine with a reasonable degree of precision the real costs of production of say the defense effort or of a battleship either in terms of the total manpower absorbed or in terms of alternative outputs (opportunity costs) in other (civilian) sectors of the economy had it not been considered necessary to allocate the resources to armaments and defense:

For example, it was estimated that the manpower requirements of the (1956) defense effort in the United States totalled between 6 and 7 million persons. The military aircraft, shipbuilding and electronics industries alone accounted for over one million full-time defense workers. On the basis of an average annual dollar output per worker, between 2 to 3 million workers were required to produce the military goods purchased by the Federal Government in 1955 in the amounts of 20 billion dollars. In addition there were more than 4 million persons either in the armed forces or employed by the Department of Defense. In 1955 about 2% of steel shipments, 3% of copper and 9% of aluminium shipments went into defense production.

Expressed in terms of opportunity labor costs, it was estimated that the costs of one destroyer is enough to provide new \$10,000 homes for 3,000 families. The price of one modern heavy bomber would provide hospital facilities for a population of over 125,000 people.¹

Admittedly these are rough estimates not based upon systematically collected and prepared data. Nevertheless, they indicate that it is feasible on the basis of an analysis of the general interdependence of the various sectors of the economy to arrive at an approximate social estimate of the costs of specific benefits in terms of their social opportunity costs. If these calculations could be based upon more accurately calculated input-output data or physical transformation co-efficients it

¹Quoted from G. W. Ensley, *Economic Consequences of Disarmament*, *The Commercial and Financial Chronicle*, August, 2, 1956.

would be possible to base the process of social evaluation and the determination of social values on a firm empirical basis. Such calculations would also make it possible to assess the relative scarcity of major resources under different assumptions concerning actual levels of output and thereby place the process of social evaluation on a rational basis.¹

The question may be raised as to whether the principle of differential or marginal valuation governs social or collective choices or whether the process of social evaluation is anti-marginal.² To the economist trained in formal utility analysis it would appear that there can be only one form of evaluation: namely in terms of a comparison of the differential (marginal) significance of different wants. However, this principle of differential valuation at the margin which is believed to be the form and the norm of all rational choice turns out upon closer analysis to have a less universal relevance than is usually believed, and does not seem to guide the process of social evaluation. For social choices are made not in terms of subjectively experienced deficiencies and wants but in terms of objective requirements or scientifically determined standards. The relative urgency of these requirements is not subjectively felt but objectively (i.e. often technically) established. Thus the maintenance of minimum standards of public health (whether in the field of sanitation, medical care or the prevention of air and water pollution) or indeed of any objectified standards (such as maintenance of soil fertility, prevention of floods, development of roads, public housing and educational

¹ It is curious to note that until recently no attempt seems to have been made in the Soviet Union to calculate the average or "socially necessary" labor inputs of different goods and services. With modern methods of calculation by computers and with the aid of input-output analysis it should be possible to solve even in practice what is theoretically a solvable problem. See O. Kantorovich, "On the Calculation of Production Inputs", *Problems of Economics*, May 1960, Vol. II, No. 1.

² For a further treatment of the thesis that the principle of equi-marginal satisfaction while formally correct is nevertheless substantively not relevant for the elucidation of social choices and social evaluation see F. Wieser, *Theorie der gesellschaftlichen Wirtschaft* (Grundriss der Sozialökonomik), pp. 421-22, and J. M. Clark, "Toward a Concept of Social Value" in *Preface to Social Economics*, *op. cit.*, p. 459. More recently see G. Weippert, Zur Problematik der Zielbestimmung in Wirtschaftspolitischen Konzeptionen, in H. J. Seraphim, (ed.) *Zur Grundlegung Wirtschaftspolitischer Konzeptionen*, *Schriften des Vereins fuer Sozialpolitik*, Neue Folge, Band 18 (Berlin, Dunker and Humblot, 1960), pp. 180-220.

facilities) derive their importance and priority from overruling considerations regarding the maintenance of human life and conditions of civilized existence. Each of these social objectives have to be considered *en bloc* and not in terms of differential layers of satisfaction. The maintenance of minimum standards of sanitation is so to speak an indivisible commodity or bundle of services which have to be satisfied if we do not want to invite the outbreak of epidemics. In fact, instead of trying to equalize differential satisfactions by satisfying some of these requirements only in part it will be necessary to satisfy minimum requirements of health and human efficiency even at the price of temporarily neglecting one or another alternative need. Indeed, a government which through its policy or system of administration fails to maintain these requirements or maintains them only partially is a government which is in effect sacrificing the life and survival of its people even though it may command the consent of a population kept in ignorance of its essential interests.

The final problem which remains to be considered concerns the relationship of individual preferences and social values and preference scales. More specifically does not the process of social evaluation of social costs and social benefits necessarily imply an evaluation of individual values and preferences? And is there not permanent danger of a conflict between individual and social judgments of well-being inasmuch as citizens will differ on such questions as to what value to place on certain social costs and returns, how to distribute the costs involved in preventive measures designed to minimize social costs and above all how far to expand the output of social returns accruing to all members of society? These are important issues which economic analysis can neither ignore nor shift to political science or sociology. Indeed, what concern us are not only problems of translating individual values into social values and of adjusting the former to the latter but also problems of incidence of costs and benefits. For purposes of purely formal analysis it may be sufficient to combine individual rates of substitution into total marginal rates of substitution, expressing the collective willingness of the group to spend a certain amount of the general

means of exchange for additional social benefits (such as prevention of social costs, education, defense, etc.). This approach would give us a "curve of total marginal substitution" which may be said to correspond "as closely as possible, under the conditions, to the familiar curve total of demand."¹ The intersection of this (fictitious) collective demand curve with the appropriate cost curve of these social benefits could be regarded as the point up to which output of social benefits could be expanded without creating a conflict between individual and collective choices.² However, any attempt to use these tools of formal analysis for practical purposes is likely to be blocked by the same difficulties which stand in the way of their being used in the practical problem of profit maximization by individual firms: namely, the difficulty of calculating marginal cost and marginal returns (or marginal) rates of substitution in the case under discussion. Consequently, much more is required than a formal approach to these problems. In fact, for all practical purposes it is of the greatest importance to develop and adopt more direct methods of discovering individual preferences with respect to social ends and of bringing them into harmony with public needs and requirements. Methods of discovering individual preferences will include an extensive use for public opinion polls and sample inquiries and the use and careful interpretation of the results of voting as outlined by H. R. Bowen.³ In fact, "it may be that through properly administered public opinion polls professional public officials can give us all the efficiency now claimed for authoritarian centralized administration, and yet have that administration at all times subject to the dictates of a more delicate barometer of the people's will than is provided by all the technologically obsolete paraphernalia of traditional democratic processes".⁴ The important task of bringing individual values and preferences

¹ H. R. Bowen, *Toward Social Economy*, (New York, Rinehart & Co., Inc., 1948), p. 178.

² It is hardly necessary to refine this apparatus of formal analysis further by the introduction of marginal rates of substitution, average cost per person and marginal cost per person. See *Ibid.*, pp. 178-179.

³ *Ibid.*, pp. 180-189.

⁴ G. A. Lundberg, *Can Science Save Us?* (New York, Longmans Green and Co., 1947), p. 39.

in line with the objectively established social requirements and minimum safety standards is clearly a matter of social education.

However, no matter how rational and effective our methods of social education may be, social values and collective decisions concerning social welfare are not likely to meet with everybody's acceptance. There remains room for conflict and it is therefore inevitable that social choices must include evaluation and rejection of individual preferences. For even in democratically organized societies the formulation of judgments of social well-being often rests upon a social evaluation of individual utilities. In fact, in a democracy the formulation of public policy depends upon the conception which the majority has of common purposes and common ultimate values and there are always elements of power exercised by dominating groups which participate in public decision-making. The preferences of minorities and groups without sufficient political influence are taken into account only via the slow processes of parliamentary compromise. The danger of conflict between individual and social preferences is therefore a real and permanent one for any society. Even the abolition of dominating groups and classes cannot do away with these conflicts and no appeal to rationality and public enlightenment can be expected to secure the degree of unanimity in matters of social and economic affairs which would be required in order to establish any true identity between individual and social preferences. Instead of ignoring or concealing the possibility of conflicts between individual and social values by a purely formal concept of total welfare conceived as the sum of utilities of all individuals or by some vague references to "the will of the people" or to "government by and for the people" it is more realistic to recognize the reality of conflicts and accept them, along with the Federalists and Karl Marx, as the typical characteristics of the political process.

Thus, with the elaboration of a theory of social value, economic science will have to pass far beyond the abstractions and formal solutions of neo-classical and modern welfare economics. Only by abandoning the philosophical premises of the seventeenth and eighteenth centuries; by reformulating and enlarging the

meaning of its basic concepts of wealth production; and by supplementing its study of market prices by a study of social value, will economic science finally achieve an impartial and critical comprehension of the economic process which will be relevant to any form of economic organization. By including social costs, social returns and social value within the range of its analysis, economic science would become "political economy" in a deeper and broader sense than even the classical economists conceived of the term. In short, economic science would then really be said to deal with the problem of social economy and would finally prove its status as a system of knowledge concerned with the study of the nature and causes of the wealth of nations.

APPENDICES

I

SOCIAL COSTS, NEO-CLASSICAL ECONOMICS AND ENVIRONMENTAL PLANNING*

Professor Beckerman describes my book on *The Social Costs of Private Enterprise* (1950) as a pioneering work which was not duly appreciated at the time it was published "because this was before the concern with the environment became fashionable"; however, he takes issue with "the whole tone" of my recent paper "Environmental disruption and social costs: A challenge to economics".¹

He feels that my challenge carries the critique too far because in his words, I want to start "from scratch" and favour a new beginning, a "rethinking" of economic theory; moreover I am criticized for the lack of examples; my use of the concept of social costs is said to be "antiquated and misleading"; with respect to the complexity of the causal chain and effects of pollution. Beckerman holds that economists have long been used to the treatment of conditions with numerous and interrelated variables; in addition, he states that economics does recognize complex feedback effects and operates with changes of co-efficients according to postulated time lags. Moreover, economists have developed new analytical tools; above all the logic of choice and optimization has reached such a level of generality (and by implication of general validity) that it can be applied to the new problems arising in connection with the environmental crisis and can form the basis for evaluations in monetary terms and decisions required for its abatement or control. Thus, according to Beckerman, economists have been able to handle the

* This paper was originally presented by K. William Kapp to the Symposium 'Political Economy of Environment: Problems of Method', held at the Maison des Sciences de l'Homme, Paris. 5-8 July 1971. It was a reply to Professor Wilfred Beckerman's paper 'Environmental Policy and the Challenge to Economic Theory'.

1. K.W. Kapp, "Environmental disruption and social costs: A challenge to economics" *Kyklos* 23 (4), 1970, pp. 833-848.

admittedly difficult problems of aggregating numerous disparate items in terms of the common denominator of money and we would do well to apply the principles of welfare economics to the treatment of the new environmental problems which are upon us.

I would regret it if it was the tone of my paper rather than the content and scope of my criticism which provoked Beckerman's objections. Nothing is further from my mind than to disrupt a rational dialogue by the *tone* of my observations. For I know only too well that there is no other way of advancing our knowledge than dispassionate analysis and rational criticism. For this reason I shall refrain from taking notice of Beckerman's remarks *ad hominem*.

Due to limitations of time and space I shall not be able to deal explicitly with all the points raised by Beckerman, but I hope that my reply will cover at least implicitly most of his specific objections. The major emphasis of my reply will be on what I consider to be the central issue raised: namely the question of the adequacy of evaluating environmental goals and values in terms of the individual's willingness to pay or accept compensation.

Beckerman believes that my book was not duly appreciated because it was written before the discussion of the disruption of the environment by economic activities became popular. I believe that that what was not appreciated was the association of social costs and business enterprise and the confrontation of economic theory with my empirical data and observations — *i.e.*, the great variety of losses borne by third persons and society as a whole. The main thrust of my conclusions was a critique of the practices of business enterprise and of the scope of our inherited economic theory with its concepts of market rationality and optimality. My central thesis was and has remained that the maximization of net income by micro-economic units is likely to reduce the income (or utility) of other economic units and of society at large and that the conventional measurements of the performance of the economy are unsatisfactory and indeed misleading. To my mind, traditional theoretical inquiry was neither guided nor supported by empirical observations and available data. I tried to show that micro-economic analysis ignored important relationships between the economy (wrongly viewed as a closed system) and the physical and social environment and that these intrinsic relationships gave rise to negative consequences of the economic process. It was and is my contention that the nature and scope of economic theory is too narrow. This res-

triction has affected economic theory at its foundation: *i.e.*, at the stage of concept formation (*e.g.*, costs and returns), in the choice of criteria of valuation and aggregation (in terms of money and exchange values) and hence in the delimitation of the scope of the inquiry. Not only the dynamic interconnection of the economy with the physical and social environment and the impact which the disruption of the environment has upon the producer (worker) and consumer but also the relationship between human wants and needs and their actual satisfaction have remained outside the scope and pre-occupation of economic theory. Human wants and preferences (all subjective concepts), are treated as "given" and the analytical apparatus is designed to develop an instrumental logic of choice and allocation under these given conditions within a closed system.

This traditional restriction of economic analysis is not only contrary to the empirical facts of the interdependence of the economy with the environment but also protects the analysis and its conclusions against its critics who present evidence of the negative impact of economic activities on human health and human development. In fact, the whole procedure "alienates" economic analysis from what I consider to be one of its most important objectives, namely the appraisal of the substantive rationality (Max Weber) of the use of society's scarce resources. Critics of the traditional approach from Marx and Veblen to Myrdal and more recently H. Albert and W.A. Weisskopf have pointed out that the restriction of the analysis is the result of specific analytical preconceptions as well as hidden value premises. In short, the critics have argued that the restriction of economic analysis reflects a subtle dogmatism on the part of its practitioners.²

In the light of this critical analysis it would appear that the for-

2. I shall not pursue these lines of thought here. They could be extended to show that what has happened is nothing less than that economic analysis and welfare economics in particular have permitted their value premises to determine not only their hypotheses but their notions of the nature and essential characteristics of the economic process. Their perspective of what constitutes rational choice under given conditions in a closed system has formed their ontology. Cf. H. Albert, "Die Problematik der ökonomischen Perspektive", *Zeitschrift für die gesamte Staatswissenschaften* 117, 1961, p.438 sq. On the problem of alienation" and economics in the sense of a dehumanization of economic analysis, see the important analysis by W.A. Weisskopf, *Alienation and Economics*, New York, 1971, and my observation in "Zum Problem der Enthumanisierung der 'reinen Theorie' und der gesellschaftlichen Realität", *Kyklos* 20 (1), 1967, pp. 307-330.

mal logic of choice and optimization in terms of market costs and market returns is somewhat less generally accepted and more vulnerable than Beckerman seems to assume. In fact, the formal logic of choice reveals its limitations in the light of a substantive concept of rationality which considers the actual degree of satisfaction of human needs and human requirements. As to Beckerman's suggestion that I want to start "from scratch", it seems to me that Beckerman fails to see that my critique is not quite as novel as he implies and that in fact both my book and my article must be seen within the context of a body of critical analysis which has been advanced over the last decades. I shall deal with this point by outlining a whole pattern of reaction of an entrenched community of scholars against its critics. One reaction is to ignore them by a conspiracy of silence of all those who have "invested" in the established body of doctrine and thus may be said to have a "vested interest" in it, to use a favourite term of Veblen. This period can last quite a long time.

However, when the accumulation of new empirical observations and data contradicting the conventional body of knowledge can no longer be passed over in silence, the relevance of the new evidence is likely to be questioned. After all, it comes from outside the realm of the traditional discourse; thus it may be said to be "non-economic" or "meta-economic" in character. The critics are considered as outsiders — sociologists or political scientists perhaps — who are not sufficiently familiar with what are admissible and relevant criteria with which to confront the conclusions derived from the closed model. At a later stage old concepts and assumptions will be refined in order to cope with the disturbing evidence within the traditional framework. This phase may be illustrated by the reaction of traditional astronomy prior to and during the Copernican revolution; the Ptolemaic astronomy accounted for discrepancies between its predictions and empirical observations by manipulating an ever increasing number of epicycles within its explanatory system. In short, it is the method of scholasticism — another of the devices of dogmatism.

Closely related to this phase are efforts to force the new evidence and data into old concepts despite the fact that the latter were originally designed to take account of different phenomena than those referred to by the critics. In other words, older concepts and new phenomena are reinterpreted in such a manner as to convince the community of scholars that no new approach is required and

that in fact new data and facts can be and indeed have always been taken care of. The current discussion of the environmental issue has reached this stage and Beckerman is certainly not alone in this endeavour to show that the conventional wisdom is quite capable of dealing with the phenomena of environmental disruption in its own fashion. Environmental problems are being forced today into the conceptual box of externalities first developed by Alfred Marshall. In my estimation this concept was not designed for, and is not adequate to deal with, the full range and pervasive character of the environmental and social repercussions set in motion by economic activities of producers or the goods produced and sold by them to consumers. I agree with those who have criticized the use of the concept of externalities as empty and incompatible with the logical structure of the static equilibrium theory.

At the same time the linguistics of the critics will be rejected and found wanting in precision and determinateness. Their terms and concepts will be found to be "too wide", "confusing", "misleading" and after a while even "antiquated". Since Beckerman has raised objections of this sort against the use of the term social costs and feels that I "may have missed something", I shall deal with the problem of concept formation in order to elucidate a few fundamental points. Of course, conceptual precision is desirable and terms and concepts should not be misleading. Objections raised against terms and concepts should be met. However, let us not overlook that new ideas and concepts do not emerge immediately with the intellectual precision which may be desirable. In fact at an early stage of analysis some degree of openness of concepts may be actually useful. Ideas and concepts need to be elaborated and become more precise only as the analysis of substantive problems proceeds.³

However, it is a logical error to make concepts more precise and determinate than warranted by the empirical data to which they refer. Myrdal has reminded us that statistical convenience and measurement must *not* be permitted to set limits to concept formations and thus to exclude relevant elements. This has happened in the case of many economic concepts such as capital and investment. Furthermore, an element of inescapable indeterminacy may remain either due to the lack of homogeneity of the facts or of people's valuations or due to a lack of accurate knowledge about causal interrelationships. This applies to social costs as well as to such concepts as unemploy-

3. C. Wright Mills, *The Sociological Imagination*, New York, 1959, p.125.

ment, underdevelopment, monopoly, etc. In short "to define the concept more precisely than is justifiable is logically faulty."⁴ Finally, concepts in the social sciences are not the product of measurement as in physics where concepts are, as a rule, the by-product of observations and actual measurements. Social concepts are, as a rule, constructs, or abstractions or deliberate accentuations. As such they should define the empirical instances to which they refer. Our concepts are chosen and constructed for specific purposes; their relevance and usefulness are to be judged in terms of their effectiveness as instruments designed to grasp social facts even if some of these facts lie outside the scope of the traditional boundaries erected arbitrarily by the discipline. They reflect our perspective and thus help us to perceive novel and hitherto neglected aspects of reality. In this sense they may and indeed will reflect our value premises; the important thing is that these value premises be stated openly and are not hidden as in many endeavours to define concepts in an alleged "value free" manner, which conceal the hidden value premises of the investigator. The concept of social costs does not leave the reader in any doubt in this respect.⁵

In conclusion let me say that it is quite understandable that many economists defend the traditional perspective, assumptions, concepts and the narrow scope of micro-economic analysis. But this cannot last indefinitely, particularly if we remain committed to the notion that scientific inquiry has to do with a confrontation of theories and empirical observations. When empirical data and new facts become incompatible with, or can no longer be accounted for by established theories, the time has come for the formulation of new concepts, new modes of thought and procedures. This is the time of "scientific revolutions". In the history of science and in the history of the

4. G. Myrdal, "Value loaded concepts", in: H. Hegelland (ed.), *Money, Growth And Methodology*, Lund, 1961, p.285.

5. Beckerman's summary judgment that the term social costs is misleading and antiquated may be evidence of the fact that he holds different views about concept formation or he may have misread the article he quoted, which is directed against Pigou's use of the term "social costs". This article points out correctly that my use of the term is identical to what the authors call "uncompensated social costs", a term not quite unsimilar to my own suggestion to speak of "unpaid costs". The predilection to render the term social costs innocuous by using it to designate the total costs reminds one of an earlier episode in the history of economic analysis when some neo-classical economists tended to identify market prices as "social value" in the sense of value to society. Schumpeter set an end to this apologetic reinterpretation of terms and concepts. Cf. J.A. Schumpeter, "On the concept of social value", *Quarterly Journal of Economics*, 23, 1909, p. 213-232.

social sciences there have been radical reformulations of concepts as well as new modes of thought and new procedures.⁶ However they did not start from the beginning. Who would want to assert that Copernicus, Newton, Einstein or for that matter Marx, Walras, Veblen or Keynes started from a *tabula rasa*. But they faced the crisis of their disciplines by doing more than merely refining old concepts or forcing new data into old moulds. I believe that economics faces such a crisis today largely as a result of the environmental disruption but also because of its inability to come to terms with the development problem in less developed countries and because of the failure of Keynesian and monetary methods to maintain economic stability and prevent inflation.

Beckerman complains that I cite no examples. In the following I shall show that his own propositions, which reflect the procedures and normative conclusions of welfare economics, provide examples and illustrations of what I am criticizing. For Beckerman, together with others, assumes that no fundamental revision of economics is required in order to come to terms with the environmental crisis. While he admits that there are still numerous unsolved theoretical and practical problems raised by pollution and its abatement, he is convinced that welfare economics is equipped for dealing with the problem of pollution policy. In fact he feels that there is nothing to take its place as if this — if it were true — proved the adequacy of what we are offered. According to Beckerman, the disposal of pollutants imposes external costs in the form of water treatment downstream and “the economist will come to the conclusion, on the basis of elementary economics, that there is too much polluting effluent flowing into the stream . . . The economist will then consider what is the best means of reducing the pollution to a level that, in terms of welfare theory, would represent the optimum.”⁷ Beckerman and others are convinced that the standard tools and procedures of economics and the logic and criteria of choice including the aggregation of numerous (environmental) disparate items

6. T.S. Kuhn, *The Structure of Scientific Revolutions*, Chicago, Ill. — London, 1962, Cf. also, by the same author “Logic of discovery or psychology of research” and “Reflections on my critics”, in: I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*, Cambridge, Mass., 1970, pp. 1-23 and pp. 231-278.
7. Beckerman oversimplifies the problem when he suggests that economists can arrive at the conclusion that there is “too much” pollution. Elementary economics teaches nothing about pollution nor about the negative effects of pollution or the benefits of abatement.

in terms of money and willingness to pay can be used as criteria "for evaluating things according to their equivalence at the margin — *i.e.*, how much money one would accept in order to be indifferent between having the previous number of units of some 'good' and one less unit". In short it is believed that economists are on solid grounds and have the basic approach to a solution, if not the final answer, to the determination and evaluation of environmental values (including goals and preferences) and the formulation of the appropriate instruments of control and environmental planning.

Beckerman's open acceptance of the compensation principle (willingness to pay or accept money) as a criteria of evaluation has at least the merit of leaving no doubt about the common denominator to be used for the evaluation of environmental costs and benefits in contrast to statements which speak of "balancing" advantages of each activity and the physical and aesthetic discomfort created thereby or suggest, in general terms, that the improvement (of the quality of the environment) must be worth the costs of abatement without specifying how the "worth" of the improvement is to be valued.⁸

It is my contention that this treatment of the pollution problem within the conceptual framework of the formal theory of choice is logically defective and operationally ineffective. While it may be possible to express the costs of abatement and anti-pollution measures in monetary terms, I fail to see how the "worth" of the improvement can be evaluated adequately in monetary terms by the willingness of an individual or a group of individuals to pay for environmental amenities or to accept compensation for tolerating environmental disamenities such as polluted air or water. There are, as far as I can see, three distinct reasons which speak against the use of the compensation principle (apart from the practical difficulties of establishing the willingness to pay).

First, what a person or firm is willing to pay for clean air or recreation facilities or to accept as compensation for tolerating injuries to his health caused by pollution depends upon their income or their *ability* to pay. If incomes are unequally distributed (as they are), and if this inequality of distribution results among other things from unequal exchanges between unequal economic units in dominating and dominated positions (as it does), the result-

8. Cf. *Annual Report of the Council of Economic Advisers* (to the President of the United States), Washington, DC., 1971, pp. 114-122.

ing ability and willingness to pay are as arbitrary as the price and wage structure of which they are the outcome.⁹ The problematical character of such attempts to evaluate environmental goals becomes evident when it is suggested to determine the losses caused by the pollution of a lake in terms of the additional transportation costs of people seeking recreation facilities to reach the nearest lake not yet polluted, or to measure the value of improved environmental facilities (such as recreational facilities, parks, a marina for pleasure boats or a public park in a poor section of a large city) in terms of the willingness and hence ability to pay as reflected in money spent for admission, or the purchase of fishing and recreation equipment,¹⁰ or in terms of the hypothetical hourly income of those seeking recreation. In all these cases, the use of willingness to pay as the criterion of quantifying and evaluating the quality of the environment has the insidious effect of reinterpreting original human needs and requirements into a desire for money and of evaluating the relative importance of such needs in terms of criteria which reflect the existing inequalities and distortions in the price, wage and income structure. "The basically questionable point of departure consists in the fact that original physical needs for rest, clean air, non-polluted water and health as well as the inviolability of the individual are being interpreted in an untenable way as desires or preferences for money income. . . . These fundamental human requirements must not be articulated, nor are they to be satisfied through the market mechanism. Their reinterpretation and (evaluation) in terms of a desire for money within the context of the price system falsifies the original need and at the same time the core of the problem of decision-making. Health, opportunities for recreation in parks, clean water or aesthetically satisfying environmental conditions are objectives

9. Beckerman himself admits that it makes no sense to evaluate the life of a person by asking him "how much money he would accept, if he died, in order to be as well off as if he were still alive" (*sic*). To my mind methods of individual self-evaluation of life and health (e.g., discounting future earnings, legal compensation claimed or received in liability cases, willingness to pay for insurances, etc.) make not much more sense. See C. Senior, *A Model For Quantifying Risk: A Cost Effectiveness Study Of Industrial Safety*, Nuffield, 1971, pp.8-9 (mimeo).
10. On the ground that "a logical basis for determining the probable recreation benefits to be derived from the proposed improvement is the concept that the value of these benefits bears a reasonable percentage relationship to the amount of money voluntarily invested by boat owners to obtain them", cf. US Secretary of the Army, 89th Congress, Second Session IIB, Cross Village Harbour, Mich. - Washington, DC, 1966, p. 31, quoted from D. Weiss, *Infrastrukturplanung*, Berlin, Deutsches Institut für Entwicklungspolitik, Jan. 1971.

which today are not pursued primarily with regard to their actual contributions to GNP. In many instances, it will be possible to realize these goals only by actually foregoing a short and medium term increase in GNP in its present statistical computation."¹¹ The logical and practical result of using willingness to pay as a criterion would be that public parks or clean air in the ghetto sections of a large city would yield a lower benefit-cost-ratio than the marina for top management personnel. A mode of reasoning which leads to or indirectly supports such an outcome reveals its hidden, basically unequalitarian value judgements inherent in the compensation principle as a criterion of evaluating the "worth" of environmental goals.¹²

Second, apart from income inequalities which undermine the validity of the compensation principle there is the individual's inability to ascertain the full range of short and long run benefits of environmental improvements or, for that matter, of the full impact of environmental disruption upon his health and his well-being. It is today generally recognized that environmental pollution and the disruption of the environment are the results of a complex interaction of the economic system with physical and biological systems which have their own specific regularities. Moreover, pollutants from different sources act upon one another and what counts are not only the effects of particular effluents and toxic materials but the total toxological situation. The causation and the effects of pollution are far from being transparent to the individual. Those who have studied these complex causal relationships know that environmental disruption can easily become cumulative with pervasive and dispropor-

11. *Ibid.*, pp. 68-70. Translated by the author.

12. Actually, welfare economists would probably shy away from the logic of their procedures by falling back upon their own personal value judgements, in which case society may again be poorly served in so far as these personal valuations may diverge from those which society may place upon environmental values through the political process. For in this case we would be faced with personal idiosyncrasies and potentially arbitrary judgements which would enter through the back door into the evaluation process. For economists and technocrats would then prepare environmental projects and policies which reflect market valuations "corrected" by their own views and values. Such projects and policies prepared by experts would still have to be ratified by political decision-makers. Some of the latter would like nothing better than this procedure which would enable them to present their decisions as being based upon the advice of "experts". In fact this is exactly the model of policy making by experts which J. Habermas has criticised; see his *Technik und Wissenschaft als Ideologie*, Frankfurt, 1968, p. 125 (cf. also H.P. Widmaier and O. Roloff, "Zur Kritik der quantitativen Wirtschaftspolitik", in: E. Dürer, *Neue Ansätze der Wirtschaftspolitik*, Berlin, 1971).

portionate effects per unit of additional pollutants.¹³ To ask the individual what he is willing to pay for the improvement of the quality of the environment or what amount of compensation he is willing to accept to tolerate current or even higher levels of pollution constitutes therefore an inadequate and ineffective and indeed a highly problematical basis for evaluating judgements concerning the "amount" of value of alternative environmental goals. The practical consequences of making the content and extent of the control of environmental quality dependent upon individual willingness to pay could at best lead to piecemeal measures and an ineffective formal sub-optimization if it does not become the pretext for endless delays or a policy of doing too little too late.

The third reason which speaks against the compensation principle is to be found in the fact that it does not lead to the systematic search (by R and D expenditures) for alternative non- or less-polluting technologies.¹⁴ To suggest that environmental improvements are economically worthwhile only if the "worth" of the improvement (as measured by the compensation principle) exceeds or equals the cost of the improvement says nothing about the techniques to be employed or to be developed. It sidetracks this important issue and leaves it to the pollutor to develop anti-pollution techniques only in accordance with his private cost benefit calculations. This has not been adequate in the past and may turn out to have disastrous consequences with disproportionately increasing environment disruption.

In conclusion, let me make explicit the basic elements of the approach I have used in dealing with the admittedly difficult problem of evaluation. Negatively speaking I feel the environmental issue forces us to abandon the traditional assertion that values and value judgements are beyond scientific inquiry and have to be accepted as given. In economic discourse this has meant that we have accepted individual valuations, prices and income as given. Instead I suggest

13. It is hardly convincing to argue, as Beckerman does, that economics is capable of dealing with these complex causal interrelationships and interdependencies because it has long dealt with economic systems with numerous and interrelated variables. Nor is the more recent recognition of feedback effects and time lags, or for that matter of multipliers and accelerators in traditional macro-economics of any help. Economists who do not study the causal chain which gives rise to pollution and its impact on human health are ill-equipped to deal with the elaboration of environmental plans and projects and to judge their effectiveness and relative worth.
14. This is not to say that the pollution problem will be solved simply by the introduction of different technologies.

that it is possible and necessary to follow an empirical or pragmatic approach to the study of value. Such an approach is based upon a critical analysis of the consequences of accepting criteria such as market values and an examination of the question of whether monetary values are appropriate for the evaluation of the characteristics of the environment. In the case under consideration the evaluative judgement must correspond to these characteristics as they affect human health and human life without arbitrarily excluding anybody (whether due to the fact that he is unaware of the consequences of pollution or is unable to pay or even prefers a polluted environment to the maintenance of minimum environmental standards). I have endeavoured to show that monetary criteria (willingness to pay, compensation principle, etc.) are in this sense not appropriate because they do not evaluate the characteristics which define the quality of the environment and its potentially negative impact on human health, human well-being and human survival. This has nothing to do with Hegelian essences (as Beckerman seems to fear) but with the nature and quality of the environment, i.e. its characteristics. Therefore the "amount" of its value needs to be quantified and evaluated in terms of criteria that express or measure its effects on human health. These can only be environmental standards for all concerned without exclusion. Such standards are not beyond reach; in fact they are available or could be developed. They will have to be objective or objectified criteria reflecting our current knowledge and are subject, at the same time, to change in the light of new knowledge and new experiences.

To repeat, the basic issue under discussion is not whether evaluations, i.e., judgements as to the presence and "amount" of environmental values, can be made in terms of willingness to pay but whether these criteria are cognitively responsible.¹⁵ I have tried to show that monetary criteria are not cognitively responsible. The use of monetary criteria would have the effect of making environmental planning ineffective and would give rise at best to a piecemeal approach which will not overcome the sub-optimization which has characterized the

15. Pepper speaks of evaluative criteria in discourse as becoming "responsible" by their attachment to the evaluative criteria which operate outside of discourse. Where this attachment does not hold, or cannot be made out, the evaluative criterion is cognitively irresponsible, i.e., it is not true to the empirical fact of the matter. Quantitative standards must be correlated in an appropriate way with the defining characteristics of the (qualitative) definitions. C. Pepper, *The Sources Of Value*, Berkeley, Calif., 1958, pp.277-279.

outcome of the market system in the past. Today and with respect to the current debate of environmental policies they seem to be rather an expression of an attempt to force the not-so-new facts of environmental disruption once more into existing theoretical frameworks and conceptual boxes which have served our discipline as instruments to play down the significance of the phenomena of unpaid social costs by making them appear more harmless than they are.

This is not the place to set forth an alternative approach to the evaluation of environmental goals and environmental planning. Nevertheless, since Beckerman insists that the critic must show that there is a better instrument than that which he criticizes — a view which I do not share — I shall formulate a few generalizations in the hope that these sketchy observations may suffice to indicate at least the general direction in which a more effective approach to evaluating environmental values and environmental planning may lead us. Above all it would be necessary to recognize the systems character of the environmental problem and to admit that environmental relations differ radically and in kind from market relationships. Furthermore, the elaboration and acceptance of environmental goals call for a collective or social choice with a direct participation and expression of preferences by all members of society, even those outside the market and without reference to effective demand. Lastly, we need systematic cost effectiveness studies for alternative goals and projects together with the appropriate implementation, rules and procedures. This is merely another way of saying that economic theory will have to draw the consequences from the fact that formal rationality concepts leave out of account a whole series of fundamental human needs, of which environmental requirements have been recognized rather late. In order to satisfy these human needs and to arrive at a substantive rationality in the utilization of society's scarce resources, these requirements will have been defined as objectively as our present knowledge permits and evaluated by means of a deliberate collective, *i.e.*, political decision in comparison to other public goals to be pursued. This means that we shall have to face the task of introducing, to an increasing degree, politically formulated norms into the socio-economic process. In short we face the task of operating with objective substantive and socially acceptable criteria which have been politically sanctioned. This formulation of goals will be appropriate and necessary in all those instances in which the market fails to generate an effective demand and does not

maintain environmental standards but actually contributes to their degradation.

K. Wm. K.
July 1971

II

RECYCLING IN CONTEMPORARY CHINA

Introduction

As compared with prerevolutionary conditions, contemporary China offers a number of striking contrasts. It is no longer a country of abject misery with periodic famines and epidemics, with recurrent natural catastrophes resulting either from drought or the flooding of its major river systems and without medical care in rural areas. Chinese policies seem to have been successful in protecting and even improving the natural and social environment and in maintaining a connection between economic development and the satisfaction of essential human needs. This is no small achievement, particularly if we compare China's performance with conditions in other less developed countries, including those which at the UN Conference on Human Environment (Stockholm, 1972) voiced their concern about suggestions that greater attention be paid to the disruption of their environment. Some countries were outspoken in their refusal to sacrifice rapid industrial growth to environmental protection, apparently in the belief that their natural environment was still able to absorb considerable amounts of pollutants. In fact, these countries insisted on giving priority to rapid industrialization without paying major, or any, attention to the ecological consequences and health hazards of development-policies.

China seems to have chosen a different road. The Chinese leadership is aware of the fact that the development of productive forces in many industrial countries has gone hand in hand with the emergence of social costs and cumulatively destructive forces. For this reason, they seem to be determined not to repeat the 'mistakes' which the industrial countries have committed in the past and which would sooner or later call for costly clean-up operations of land, air and water resources. As a result, China offers the picture of a coun-

*Condensed and revised version of a paper presented by K. William Kapp at the *Symposium on Recycling* held at the Gottlieb Duttweiler-Institute, Zürich-Rüschlikon, 28-30 November 1973. Reprinted from *Kyklos*, Vol. XXVII (1974).

try which attempts to pursue simultaneously a policy of economic development and environmental protection and improvement.

I am not suggesting that China is an environmental paradise or that it has solved its environmental problems. Nor am I arguing that she has avoided all social costs of economic development. However, the Chinese leadership is not only conscious of the environmental hazards of expanding production indiscriminately but has taken positive steps to cope with the possibly harmful effects of economic growth; moreover, they seem to have developed specific strategies and, above all, succeeded in mobilizing grassroot participation on a scale which goes far beyond anything existing in other developing and developed countries. Of course, China is only at the beginning of its industrialization, and what the future holds is still uncertain. However, and this seems to me the crux of the matter, Communist China has taken positive steps to cope with the environmental disruption, not only during the last three years, but almost from the very beginning of its systematic efforts to plan its agricultural and industrial future. For this and other reasons, which cannot be discussed here in great detail, I am prepared to argue that China's environmental prospects are better than those of most developing and even of industrialized countries, some of which are just beginning to realize the short-sightedness of their past neglect of social costs and are forced today – partly by public opinion and partly out of economic necessity – to start, however reluctantly, costly 'clean-up' operations of their physical and social environment.¹

Traditional Agriculture as a 'Recycling' and an Energy Producing Economy.

Traditional agriculture in China has always been a 'recycling' economy in the wider sense of the term. Poverty has forced China's population to frugality out of necessity, and the 're-use' of waste and sewage materials is not an altogether new phenomenon. As a predominantly agricultural economy the country has always prac-

1. For a fuller treatment of the thesis that China's environmental prospects are better than those of the industrial world and most developing countries, see the author's *Environmental Policies and Development Planning in Contemporary China and Other Essays* (Paris, La Haye: Mouton, 1974). I wish to add that this publication provides also a general background for the problems discussed in the present paper; the treatment of the general issues raised in Sections IV and VI follows closely the discussion of the earlier study.

tised the principle of the 'comprehensive' re-use of materials and human waste which has made it possible to provide the necessary food for the oldest and greatest agglomeration of people within a unified and relatively stable civilization which history has ever known. The role of this systematic recovery of organic waste in China's agriculture has a long history; it was well known to Western observers during the nineteenth century as can be seen from the following quotation of Victor Hugo's *Les Misérables*: 'No Chinese peasant goes to the city without carrying back, at the ends of his bamboo, two buckets of what we call filth.' Human excrements were not free goods in China and apparently no prejudice, as in other countries, stands in the way of the systematic re-use of human excreta.² Even today it is estimated that 'about 80% of all fertilizer used is organic — either animal or human wastes, mulches or green manure crops'.

In view of the current critical energy problem in the West, I may point out that Chinese wet-rice agriculture is a highly efficient producer of energy — indeed, much more efficient per unit of (human) energy put into the system in the form of calories (of food consumed by the farmer) than our Western systems of '*farming with petroleum*'. In fact, one calorie (of food) yields about 40 cal. in rice which, incidentally, accounts for the relatively small amount of land needed by the average Chinese farmer living in fertile regions and practising wet-rice agriculture.⁴ In contrast modern agriculture far from being an energy producing sector has become a major consumer of energy using today and more petroleum than any other single industry. 'There have been estimates that Chinese wet-rice agriculture could produce 53.5 BTU (British Thermal Unit) of energy for each BTU of human energy expended in farming it. For each unit of energy the *Chinese* wet-rice farmer expends, we get about one-fifth in return. On the basis of these two ratios, Chinese wet-rice agriculture is far more efficient than our own system'⁵ —

2. 'Energetic Chinese', *Ecologist*, Vol. 8, No.3 (1973) p. 290.

3. From J.B.R. Whitney, 'Ecology and environment control', *Academy of Political Science*, Proceeding 31 (March 1973) p. 97.

4. In fact, according to official calculations (Wu Hsueh-yieu, Chinese Department of Agriculture) a family of four living on good bottom land can support themselves on ½ acre of cultivated land; cited by Robert Rodale, publisher of *Organic Gardening and Farming and Environmental Action Bulletin*, quoted in 'Energetic Chinese', op. cit., p. 289.

5. Michael J. Perelman, 'Farming with petroleum', *Environment*, Vol. 14, No.8 (1972) p. 12.

that is if measured in terms of output per unit of energy instead of output per hour of farm labour or in terms of (market) value of output per dollar input.

China's Efforts to Improve the Use of Waste Materials in Agriculture

Of course, Chinese policy makers are well aware of the fact that the use of untreated human excreta in agriculture has serious limitations. Human (and animal) excrements may lead to the contamination of surface and underground water and the spreading of serious parasitic diseases (e.g., shistosomiasis in tropical climates),⁶ moreover, excreta are inadequate to meet the rising requirements for fertilizer in Chinese agriculture. Since 1958 China has shown a highly critical attitude toward the traditional use of human excrements as manure, and of sewage water for the irrigation of rice fields. Scientific research in the epidemiological departments in 18 major cities and municipalities has been carried out since the Scientific Planning Committee of the State Council ordered such studies to be undertaken in 1958.⁷ The results of these studies indicated that 'under certain responsible conditions' the self-purification of sewage water could be greatly increased and oxygen consumption, floating matter and bacterial content in sewage water could be greatly reduced after five days; the breeding of mosquito larvae was also reduced. It should be noted that this type of research which led to the drawing up of 'Health Regulations in the Utilization of Sewage Water for Irrigation'⁸ goes back to the late fifties, i.e., to a time when other less developed countries were hardly concerned with the pollution of water and its purification for irrigation purposes.

Today, Peking possesses more than a dozen sewage treatment and disposal plants in which high pressure pumps deliver waste water at a

6. According to doctors at Peking's Anti-Imperialist Hospital shistosomiasis is China's most serious health problem; this disease is taking the place of malaria as the most important parasitic disease in many countries with tropical climates. Salley Reston, 'Report from Red China', *The New York Times*, eds. (Avon, N.Y., 1972, p. 311) and 'Shistosomiasis and leishmaniasis', *Life Science Research Report*, Vol. 3, No. 2 (1971), Stanford Research Institute, Menlo Park, Calif., quoted by Frank P. Sebastian, 'Waste treatment in China: ancient traditions and high technology', *Ambio*, Vol. 1, No. 6 (1972) p. 210.
7. Wang Te-P'u, *et al.*, 'China's major scientific and technical achievements in community hygiene in the past decade', *People's Health*, Vol. 1, No. 10 (1959) JPRS 2745, p.25.
8. *ibid.*, p.26.

rate of 3 tons per second to a 6 metre deep sedimentation basin where dirt and residue carried in the water settle to the bottom. After sterilization the water is channelled to farmlands for irrigation. These processing plants are said to carry out constant analysis with a view to identifying poisonous matter exceeding specific safety limits. If such matter is found and the source identified, the plant is ordered to stop draining its waste water and/or to take appropriate preventive action. Waste water containing acid from the Peking Petro-Chemical Works undergoes a bio-chemical process which makes it possible to use it for irrigation and for raising fish and ducks.⁹ The same source also states that Peking has 48 garbage disposal yards using a high fermentation (compostation) process which kills bacteria and makes it possible to use rubbish as fertilizer. Other cities (Changchu and Shanghai) initiated canal projects and a pipeline scheme of up to 30 km length using 90 per cent of the sewage water and pumping 300,000 tons of sewage daily to irrigate paddy fields and farmlands.

As far as shistosomiasis is concerned China has taken measures to eliminate the snail vectors and to sterilize human excrement by compostation before its being processed into pellets prior to its use as fertilizer. China has also organized systematic surveys of larval parasites in water and particularly with a view to preventing and treating shistosomiasis in man and cattle.¹⁰ These preventive measures are part of China's systematic effort to improve water supply and community hygiene and the quality of the social and physical environment in rural areas.

I am not suggesting that the improvement of the ancient custom of 'recycling' human and animal wastes by the application of modern techniques will be adequate for meeting China's long-run requirements. Her increasing food requirements will call for considerable supplementation of organic waste products by chemical fertilizers both from internal sources and imports. China's estimated

9. John Sigurdson, 'Recycling that pays', *Läkartidningen*, Vol. 69, No.23 (1972) pp.2837 ff.

10. For a detailed description of some of the control techniques applied to snail control in combination with agricultural production see, Lois Wong Chi's review of *Fun Zhi Shistosomiasis Shou Chai* (Prevention and Control of Shistosomiasis, Handbook) compiled by the Revolutionary Committee of Shanghai, Shistosomiasis Research Institute, second edn. (Shanghai: People's Press, 1971) in *Science*, Vol. 179, pp. 1118-9.

needs for chemical fertilizers (35 million tons in 1971) still far exceeds its domestic production (14 million tons in 1971).¹¹

'Turning the Harmful into the Beneficial' as a Guiding Principle of China's Anti-Pollution Policies

Chinese experts would have no difficulties in accepting the view that man can neither create nor destroy matter or energy, i.e., the first law of thermodynamics or the principle of the conservation of energy. Indeed, the Chinese come close to accepting what has come to be known as the 'material balance approach' and the related view that man's economic activities neither produce nor consume matter energy. While most economists would admit that there is a qualitative difference between what goes into the economic process and what comes out of it, some unorthodox economists today 'would say that what goes into the economic process represents valuable resources and what is thrown out of it is valueless waste',¹² the Chinese seem to take the position that there is no valueless waste.

In making one product, resources are partially transformed into this product and the rest becomes 'waste' . . . From the metaphysical point of view, waste cannot be got rid of. On the contrary, the materialist dialectical view holds that what is waste and what is not waste are relative terms. There is nothing in the world that is absolute waste. 'Waste' under one condition may be valueless; under different ones waste material left from one product can become a good material for another product.¹³

This way of looking upon waste is one of the guiding principles for China's policy of the multipurpose use of resources; it supports and explains current campaigns in favour of recovering and re-using waste materials or, as it is called in the Chinese literature, 'Turning the harmful into the beneficial'.

Of course, this comprehensive use of materials may be interpreted as a carry-over of the old and persistent attitude of frugality borne out of the necessity of making the maximum use of scarce

11. Estimates by Chou En-Lai; see Frank P. Sebastian, 'Waste treatment in China: ancient traditions and high technology', *Ambio*, Vol. 1, No.6 (1972) p. 212.

12. Nickolas Georgescu-Roegen, *The Entropy Law and the Economic Problem*, Dept. of Economics, University of Alabama, 1970, p. 3.

13. 'Multipurpose use: important policy for industrial production' (by the Writing Group of the Tientsin Revolutionary Committee), *Peking Review*, No.6 (1971) p.7.

resources under conditions of poverty.¹⁴ However, the present insistence on the recovery and re-use of waste materials goes far beyond anything China has undertaken in the past. In fact, the recovery and re-use of the 'three wastes' (i.e., waste liquid, waste gas and waste slag) is being advocated as a method of transforming waste into wealth and as an important means of diversifying and increasing output. More than this: The principle of the comprehensive use of waste is in fact regarded as a necessity of socialist development; while it serves, above all, the protection of the social and physical environment and thus of human health rather than the recovery of materials which have economic value, it is also a means of changing the traditional division of labour and the specialization of work. In short, it is simultaneously an anti-pollution measure, a method of increasing production, an approach to diversifying and re-locating industry and an improvement of urban and rural sanitation. It is multipurpose in this comprehensive sense.

Recycling in Industry

As far as the recovery and re-use of waste materials in industry is concerned, China uses both labour-intensive and highly modern capital-intensive techniques. Labour-intensive methods play an important role in connection with remedial measures after pollution has occurred, such as large-scale dredging operations and the cleaning-up of polluted streams, rivers and lakes affected by the discharge of untreated industrial waste materials and the collection of human and animal waste not used for fertilizing fields. In some instances, substantial quantities of waste materials have been recovered and are being re-used such as oil, chemicals, slag waste, etc. Such waste materials are said to have yielded thousands of tons of fertilizer.

In little more than a year Shanghai has recovered gases and slag, several hundred tons of dye-stuff, 8,000 tons of oils and thousands of tons of chemicals. In addition, some 10,000 tons of metal were recovered. Waste slag made 200,000 tons of cement. Paper, electroplating and leather industry wastes yielded hundreds of thousands

14. As early as 1958 (i.e., during the 'Great Leap' period) and probably earlier, Mao called for a struggle against 'waste' at all levels. 'Every co-operative, every shop, every office, every school and every military unit must seriously conduct its own anti-wastefulness campaign and will continue to do so once every year.' Jerome Ch'en (ed.), *Mao Papers* (Oxford, 1970) p.61.

of tons of fertilizers and the processed waste water now irrigates 6,650 acres of farmlands.¹⁵

In recent years, China seems to have concentrated its major efforts on the *prevention* of water and air pollution. Much attention has been given to the construction of urban sewage systems and treatment facilities for the proper disposal of human waste in the more densely populated areas.¹⁶

With respect to air pollution, the Chinese approach calls for the installation of recovery and purification facilities in big and middle-sized factories¹⁷ and the elaboration, imposition and enforcement of rules on emission, the location of new and the relocation of old factories 'on the opposite side of the city from which the wind usually blows'.

As an illustration of the use of a *modern* recycling technology we may cite the case of the Peking Petro-Chemical Works which are reported to operate a waste water treatment plant (similar to advanced systems in Europe and the US) which is said to remove almost all contaminants except nitrogen from waste water.¹⁸ Reports from Kirin (North-western China) also support the thesis that China employs modern technology in her recycling practices. Thus, a plant (in Kirin) processes waste oil and lubricants on a large-scale basis as an economic process after it has originally been established on an *ad hoc* basis to overcome industrial bottlenecks through the collection and refining of waste oil. The Kirin Chemical Fertilizer Plant recovers a wide range of products among which are mercury, benzene, hexanol, hydrochloric acid; *et al.*, totalling some 25 different kinds of chemicals.¹⁹ Slag from iron plants is being used as ingredient for making cement.²⁰ Iron plants are reported to design and build ovens

15. Charles Snyder, 'Tomorrow's challenge', *Far Eastern Review*, (31 October 1970) p.43.

16. Leo A. Orleans and Richard P. Suttmeier, 'The Mao ethic and environmental quality', *Science*, Vol. 170, p.1174.

17. Wang Te-P'u et al., *op.cit.*, p.21.

18. Sebastian, *op. cit.*, p.113. See also *ibid.*, pp. 113-4 for further details of the use of modern recycling technology. This interest in utilizing modern technology in recycling is also confirmed by reports from Japan where the Nippon Steel Corporation received a request from China for technical guidance for equipment for the recovery of exhaust gases from converters enabling the recovery of carbon monoxide gas generated in the process of steel making and its re-use as fuel at steel mills. 'Peking requests NSC technology', *The Japan Economic Journal* (10 July 1973) p. 4.

19. Sebastian, *op. cit.*, p. 215.

20. Sigurdson, *op. cit.*, p. 2840.

in order to collect and make use of coal tar. Wheat and rice straw (formerly used for thatching of houses and huts) are being used as raw materials for paper mills.²¹

The recovery and re-use of materials may take place either in the factory in which the waste originates or in specialized industries or in separate small-scale plants or even in home industries. In this way the traditional division of labour and the lines of demarcation between industries are said to be changed.

A factory is divided into several sections, one raw material is used in many ways, a piece of machinery is used for many purposes, one worker is capable of many kinds of work apart from his specialization, and a factory can produce many things while engaging mainly in [the production of] one product. All this gets better results from limited manpower, equipment and resources.²²

From the numerous examples listed in the literature it appears that several patterns of recovering and re-using waste materials are in process of development: (1) A large plant operating its own small plant to process its waste material; (2) a large plant operating several small plants to process its waste materials (into raw material and consumer goods); (3) several large plants (e.g., in Shanghai) operating in co-operation one waste utilization plant using old, discarded, unused or rebuilt equipment turned over to them;²³ (4) neighbourhoods, cities and villages operating small-scale factories either processing scrap materials collected by retired workers, housewives and children or turning them over to other small and large-scale factories; and (5) plants specializing in acquiring waste products and making them available to specialized factories which turn them into useful products.

Of course, the available data on the recovery and re-use of materials are fragmentary and do not permit any definite conclusions as to the relative importance which the recovery of materials and recycling play in contemporary China. There are no over-all data on recycling for China as a whole, just as it would be difficult to ascertain, at the present time, the relative importance of recycling

21. *ibid.*, pp. 2840-1.

22. Chi Wei, 'Turning the harmful into the beneficial', *Peking Review* (28 January 1972) p.7.

23. 'Honan's Chung-chon city operates more than 200 small plants to make full use of its waste liquid, gas, and residue', *Chung-Kuo Hsin-wen* (9 November 1970), JPRS 52527 (3 March 1971).

in Switzerland or the United States. However, it is significant that the systematic re-use of materials has been accepted as a policy of environmental protection at a very early stage in China's planning for development and industrialization. In view of the emphasis placed upon the thesis that there is 'nothing in the world that is absolute waste' as well as the continuous campaign for the comprehensive use of materials I am inclined to conclude that recycling will remain one of the guiding principles of China's environmental policies. Viewed in this fashion, recycling may be regarded as part of a persistent search for alternative technologies²⁴ which are, ecologically speaking, less disruptive than those which have evolved under the influence of the entrepreneurial calculus in terms of market costs and returns.

Economists will inevitably raise the question of how far the recovery and re-use of materials can actually be carried. That is to say, how far is it 'economical' to transform waste materials into useful things; furthermore, are there not some harmful residual materials or indisposable wastes which cannot be recycled without negative effects for the environment or only at exorbitant costs? All these questions are being raised in the Chinese literature. The Chinese viewpoint may be summarized by the axiom 'that there are no wastes but only things that are left unused; there is nothing that cannot be used'.²⁵ Difficulties of transforming waste into its opposite are conceded to exist but are seen to be due to the comparatively backward state of techniques and of scientific know-how, lack of research, failure to apply correct methods of thinking and inadequate methods of mobilizing the grass root knowledge of worker-artisans actively engaged in production, and the diffusion of such know-how throughout society. For the Chinese 'there is no limit to people's ability to know and transform the objective world. Thus, there is no limit to utilizing the "three wastes" . . . there is no absolute waste which cannot be utilized. Continued scientific experi-

24. There is considerable evidence to the effect that the systematic development of new ecologically less-destructive technologies has an important place in China's environmental programme. Thus, while China's pesticides programmes have relied mainly on chemical methods, the use of biological methods of pest controls are in process of development and actually in operation. Cf. 'Combating insects harmful to rice', *Peking Review*, No.3 (1971).

25. Hua Ching-yuan, 'In multipurpose utilization of materials, it is necessary to promote what is beneficial and eliminate what is harmful', *Red Flag* (1971), and reprinted in *People's Daily* (7 September 1971) p.B2 (Peking Domestic Service, 1971, translated).

ments have yielded important material from remaining wastes'.²⁶ Evidently, the Chinese experts have not yet taken into consideration that some industrial residues cannot be recycled (e.g., radioactive materials) and have therefore failed to raise the question of how to dispose of the indisposable.

The Chinese Interpretation of the Causes of Environmental Disruption

It will hardly come as a surprise that the Chinese interpretation of the causes of environmental disruption puts considerable stress on the capitalist mode of production as the main cause of the environmental crisis. By 'capitalist mode of production' the Chinese understand not simply the existence of private ownership of the means of production but, above all, the resulting orientation of output and allocation, the choice of techniques and location of industries as well as distribution, all of which determine the relations between man and his social and natural environment in contemporary industrial economies. In short, it is this complex system of institutionalized economic and socio-political relationships and behaviour patterns which the Chinese marxist interpretation regards as the cause of environmental disruption.²⁷

This interpretation considers it as axiomatic that man's environment is continuously being transformed through the 'industrious labour' of man and the development of science and technology. However, in contrast to certain Western proposals of slowing down or even arresting economic growth, the Chinese differentiate be-

26. Chi Wei, op. cit., p. 7.

27. 'Under the capitalist system, because the capitalists seek enormous profits and because of severe anarchism in production, large quantities of waste, liquid gas and slag are allowed to pollute the air and rivers, drain into farm land, affect the people's health, damage marine resources and harm agricultural production. In the United States, Japan and many other capitalist countries, industrial wastes have become unsurmountable nuisances in society and unsolvable political problems for the ruling class, causing growing dissatisfaction and objection on the part of the working people.' Hua Ching-yuan, 'In multipurpose utilization of materials it is necessary to promote what is beneficial and eliminate what is harmful', *Red Flag*, and reprinted in *People's Daily* (7 September 1971) p. B2 (Peking Domestic Service, 6 September 1971, translated). At the Stockholm Conference this emphasis on the institutional causes as the main cause was further elaborated by pointing to 'monopoly capitalist groups which seek superprofits under serious anarchy in production' as the real culprits who 'discharge at will and in disregard of the fate of the people harmful substances that pollute and poison the environment', *Peking Review* (27 June 1972).

tween conditions in developed and underdeveloped countries. Whereas some highly industrialized countries have seriously polluted their own environment and frequently affected that of other countries even on a worldwide scale, 'the urgent need for the developing countries at present is to develop their national economy, to build a modern industry and a modern agriculture and achieve complete economic independence and, . . . to improve their environment step by step'.²⁸ This view found expression in China's 10 principles presented at the Stockholm Conference on the Declaration of the Human Environment:

The history of man has proved that the pace of development of production, science and technology always surpasses the rate of population growth. In the course of social progress and with the development of production, science and technology, mankind can create an ever greater amount of wealth to meet the needs of its own subsistence and development and is entirely capable of improving its environment ever more effectively. It is wholly groundless to hold a pessimistic view in respect to the relationship between population growth and environment conservation. Of course, the natural growth of population will bring new problems to the protection of the environment. But such problems can be solved if a government truly takes the interests of its people to heart and adopts such correct principles and measures as rational planning for the distribution of urban and rural population in the course of the development of the national economy, appropriate control of the urban population, greater effort to protect and improve city environment and popularization of family planning.²⁹

It may come as a surprise to Western readers that the prevention of social costs may have played a role in the theoretical and political struggle between the 'two lines' advocated by the followers of Mao Tse-tung and those of Liu Shao-chi respectively. Apparently, one of the issues in this struggle centred around the method of economic planning and the formulation of environmental policies. However, this is too broad a subject to be dealt with in this context.³⁰

28. Statement of China's Spokesman on the Draft Resolution at the Conference in Stockholm. *Peking Review* (27 June 1972).

29. *ibid.*

30. For a recent and sceptical appraisal of the position of Liu Shao-chi, see K. S. Karol, *La deuxième révolution Chinoise* (Paris: Robert Laffont, 1973) pp. 128-36 and ff.

According to the Chinese perspective the task of preventing the impairment of the environment, i.e., the elimination of the 'three wastes' (i.e. waste liquid, waste gas and waste slag) presents itself within the framework of the production plan in the form of the following specific questions: Which is the primary task: to fulfil the production plan or to reduce the dangers resulting from the 'three wastes'? Is the elimination of the three wastes a secondary task which can be neglected? Is the elimination of the three dangers (to people's health, to industrial production and to agriculture) to be considered as a separate problem of secondary importance? In short, what are benefits and costs? How are these to be determined? Apparently, some planners and managers considered it as their primary task to fulfil the production plan while the elimination of the three dangers of environmental pollution was regarded as an extra burden which could be neglected or even ignored. Apparently, some managers and industries allowed the dangers from the three wastes to become serious and were interested only in those preventive activities 'which require little labour, are easy and yield large profits. Any waste product that is of low value is considered unprofitable and not worth recovering'.³¹

This managerial way of calculating costs and benefits from the perspective of the individual production unit is now rejected as the road to continued and increasing environmental disruption and to rising social costs. Some of the 'three wastes' may be difficult to avoid but to consider them only within the context of the micro cost-benefit calculations of individual industrial units is said to be equivalent to ignoring the well-being of present generations and of neglecting that of future generations.³²

The 'correct' approach to the problem of measuring costs and benefits must be worked out on the basis of practical experiences, scientific research and experimentation, as well as the mobilization and encouragement of the initiative of workers to turn waste and harmful materials into useful things. In effect, this approach rejects the belief that 'waste is waste' and cannot be turned into positive uses. What is called for is to follow Chairman Mao's dictum: 'In observing a problem, a Marxist usually looks at the whole situa-

31. Hua Ching-yuan, *op. cit.*, p. B3.

32. 'Socialist production must serve proletarian politics, and the function of all socialist enterprises must be geared to the entire revolutionary situation, to the requirements of people throughout the country and the welfare of future generations.' *ibid.*, p. B2.

tion instead of only a part of it.'³³ In short, the answer to the question of what are costs and benefits can be found only by discovering ways and means of improving the methods of recovering and re-using the 'wastes' and of limiting, as far as possible, the environmental degradation by taking into account the situation as a whole.

In some cases, judging from appearances, the loss might be bigger than the profit to an individual factory. However, judged from the over-all situation, the profit [i.e., the over-all benefit to society] might be bigger than the loss . . . If we are concerned only with petty profits and ignore the major issues, if we pay attention only to the present and not to the future, if we only take care of our own unit instead of considering the over-all situation, and if we exert efforts only in proportion to the amount of [individual] gains expected, we must have been poisoned by the Liu Shao-chi theory of putting profits in command. Instead of eliminating the dangers from the 'three wastes', we may even lead our enterprise into the path of capitalism.³⁴

According to the Chinese point of view, the problem of the three wastes and the elimination of the 'three harms' is not only technically but also economically solvable. But it cannot be solved on the basis of a system of monetary calculation in terms of market prices because losses and gains, costs and benefits thus calculated would necessarily be judged from the narrow point of view of the individual factory. The actual issues and the social dangers would be neglected or underestimated. That is to say, for the Chinese planner both the prevention and the elimination of the 'three harms' caused by the 'three wastes' by means of a systematic recovery and re-utilization of waste materials is at the same time 'an important scientific and technical task' and 'a serious political assignment'.³⁵

As far as priorities are concerned the Chinese seem to adopt a pragmatic approach according to which it is first necessary

to grasp the projects which are most harmful and wasteful and to gradually solve the problems of the 'three wastes' in each specific trade and unit . . . In developing industry, particularly in developing the agricultural chemical industry, the medium-sized and small cities and towns must attach importance to protecting farmland and water resources, so as not to affect the development of

33. *ibid.*, p. B4.

34. *ibid.*, p. B4.

35. *ibid.*, p. B5.

agriculture and fisheries. In places where this has already occurred, immediate action must be taken to solve this problem. To eliminate the 'three wastes', it is necessary, first of all, to keep a firm grip on capital construction . . . Measures for eliminating the 'three wastes' must be included in all industrial projects under construction.³⁶

Special emphasis must be placed on the need to absorb all available knowledge and successful experiences in the field as well as on the conduct of research.³⁷

Despite the optimistic undertone of the literature on the subject the Chinese do not underestimate the difficulties of eliminating the 'three wastes' and 'three harms'.³⁸ Nor is there a failure to realize the need for an economical use of manpower and the assessment of costs *and* benefits. The Chinese literature actually warns against any extravagance in the use of manpower and calls for a comparison of inputs and outputs with a view to making 'maximum gains with minimum expenditures'.³⁹ However, input and output, costs and benefits of the prevention and elimination of the 'three harms', are not evaluated in terms of monetary or market values but rather in socio-economic terms or social use values. Unfortunately, the concrete details of this assessment are not set forth and it is uncertain to which extent these important theoretical and practical problems have actually found a solution in China at the present time.

Conclusion

Chinese experts are convinced that a solution of the environmental problem is possible. However, this conviction is not equivalent to a belief that industrialization, modern techniques, economic development and population growth will not change the natural and social environment of China. In any event, Chinese planners see no need to pursue a policy of 'zero growth', either with regard to material out-

36. *ibid.*, p. B5.

37. *ibid.*, p. B5. 'Leading personnel at all levels on the industrial front must maintain a firm grip on the task, strengthen their guidance, work out over-all plans, carry out investigation and study in depth, and map out effective measures.'

38. 'It must be conceded that we might frequently encounter problems in eliminating the "three wastes" because our lack of practical experience or scientific know-how prevents us from discovering the laws for dealing with the problems and arriving at the ideal solution.' *ibid.*, p. B4.

39. *ibid.*, p. B5.

put or to population. In fact, China considers it necessary to pursue a policy of economic development and growth which includes the protection and improvement of her natural and social environment. Her development policies do not aim at maximizing output regardless of environmental or social costs. Chinese development planning is guided by other priorities than a concentration on rapid industrialization and specialization. Ecological criteria and communal needs seem to play a significant role in her planning and decision-making. In other words, her notion and her criteria of economic calculation differ from those which have guided the process of industrialization and economic development in other parts of the world.

INDEX

SUBJECT MATTER

- ACQUISITIVE society, 243, 244
 Administered prices, 224 ff., 229
 Advertising — *see* Sales Promotion
 Affluent society, 118, 234, 238, 240-41, 246
 and Protestant Ethic, 243
 Agriculture — *see* Resources Renewable
 Air Pollution, 16, 21, 35, 172, 264, 312-6
 and human health, 51-58, 66, 67, 258, 265
 effects on agriculture, 58-61, 66
 and deterioration of materials, 61-63, 66
 maximum tolerable level of pollution, 55-57, 72, 80, 88, 95
 meteorological conditions, 49, 50, 51, 66
 Engels, F, 35
 Definition, 50
 Estimates of social costs, 63-66
 Cumulative causation, 47, 50, 52, 53, 64, 66, 67, 68, 69, 272
 Abatement, of, 70-71
 Donora, 57-58, 66, 68
 and location policy, 72-73
 radioactive fallout, 72, 80-81, 87
 Animal Resources
 see Wildlife and Fisheries
 Resources Renewable
 Automation
 see Technological Change
 CAUSATION
 see Cumulative Causation
 Child Labor
 see Impairment of Human Factor
 China, 319-334
 agriculture, re-cycling in, 320-5
 air pollution, prevention of, 326
 Changchu, 323
 economic development policy, 320
 economics of re-cycling, 328-9
 industry, re-cycling in, 320, 325-9
 Kirin, 326
 Peking, 322-3, 326
 Shanghai, 323, 325-6, 327
 Social environment, protection, improvement, disruption, 320, 329-34
 water pollution, prevention of, 326
 Compensation, 312-6
 Conservation, 154
 effects of, 146-47
 Consumers' Sovereignty, 12, 154, 246-47, 272-73
 Countervailing Power, 157, 159, 226
 "Critical Zone" 95-98, 112, 114, 136, 152, 154
 definition, 95-96
 see Ecological Balance
 Social Minima
 Cumulative Causation, 5, 11, 23-26, 28, 42, 47, 50, 52, 53, 64, 66, 67, 68, 69, 77, 81, 83, 86-87, 93-95, 101, 107, 117, 127, 138, 180, 181, 189, 195, 202, 214, 262-263, 272, 281-82
 and accelerator, 24
 and cobweb principle, 24
 Veblen, 25, 180
 non-linear, 53
 Cutthroat Competition, 44, 180, 215, 217
 and locational concentration, 226
 see Obsolescence
 DEFORESTATION, 35, 92, 95, 96, 107-110

- estimates of losses, 143 ff.
- see* Resources Renewable
- Depletion
 - see* Resources
 - Resources Renewable
 - Resources Non-Renewable
- Depression
 - see* Economic Fluctuations
- Desalinization, 75, 123
- Diseconomies (Social Costs), 8, 23, 69, 122, 131, 132, 133, 136, 148, 152, 190, 206, 207, 265
- Distribution, 214-218
 - Wicksell, 216
 - see* Excess Capacity
- Duplication, 127, 128, 133, 205-207, 209, 210, 212, 214-218 ff, 233, 254
 - see* Excess Capacity
 - Research
- EARNING Capacity
 - see* Technological Change, Cut-throat Competition
- Ecological Balance, 94-95, 107, 112, 113, 114, 136
 - see* Social Minima
 - Resources Renewable
- Economic Fluctuations, 179-180, 183, 189
 - cumulative character, 180-181, 202
 - social costs of, 200-202
 - actual versus potential output, 200 ff.
 - social impact, 202
 - and research, 257-258
 - see* Unemployment
 - Technological Change
- Economic theory, 306-7
- Economic Warfare, 224, 225
 - see* Cutthroat Competition
 - Obsolescence Planned
 - Sales Promotion
- Efficiency, social, 17, 45, 203-207, 273-274
 - technical, 206, 207, 213
 - evaluation of, 193
 - rate of growth, 194
- Environmental planning, 305-318
- Erosion, 96, 101, 105-107, 110, 146-148
 - estimates of losses, 146
 - see* Resources Renewable
- Excess Capacity, 18, 151, 224
 - case of entry, 215
 - social efficiency, 205, 206, 207
 - frictional, 205
 - in Retailing, 214-218
 - in Transportation, 207-214
 - duplication, 205, 206, 207, 209
 - lack of coordination in transportation, 206, 218
 - technical efficiency, 206, 207, 213
 - Oligopoly, 215, 216, 217, 218
 - Wicksell, 216
 - Industrial Research, 218-222
 - and Patent System, 218, 222
 - see* Duplication
- FISHERIES
 - see* Renewable Resources
- Free Income, 223, 225
- Freedom of Choice, 154
- GROSS National Product, 314
- Guaranteed Annual Wage, 198
- HUMAN Costs, 158
 - see* Impairment of Human Factor
- IMPAIRMENT of Human Factor, 33, 37, 265
 - and price system, 155 ff., 176-78, 195-196
 - in underdeveloped countries, 156-157
 - evidence and estimates, 159-171, 172, 174, 175
 - labor as fixed costs, 196 ff.
 - work injuries, 160
 - inadequacy of safety measures, 162 ff.
 - effect of social legislation, 163 ff.
 - role of small firms, 161, 163-164
 - woman and child labor, 175
 - and automation, 172-173
 - industrial noise, 173, 177n
 - occupational diseases, 171-174
- Innovation
 - see* Technological Change
- Input-Output, 116, 126
- Institutional Restraints, 136
- Integration of Social Analysis, 287
- LAND Use
 - see* Renewable Resources

- MAXIMIZATION Principle**, 115 ff,
119, 120, 121
- Micro-economic analysis**, 306, 310
- Mislocation**, 258
and social costs, 258 ff.
and market calculus, 259, 261,
262, 263
cumulative causation, 262-263
location policy in Soviet Union,
260-261
urban congestion, 258, 262
- Monopoly**, 44, 185, 194, 215, 225,
310
Schumpeter, 194-195
Wicksell, 216
see Oligopoly
- Moral Standards**, in competition,
30, 217
- OBSOLESCENCE**, 187-191, 256-257
planned (accelerated), 119, 124,
126, 224, 229-233, 242, 266
see Technological Change
Science Retardation of
- Occupational Diseases**
see Impairment of Human Factor
- Oligopoly**, 11, 194, 215-218, 219,
223, 224, 225, 229, 233, 249,
250
and defense, 227-228
see Cutthroat Competition
Monopoly
Patents
Obsolescence
Technological Change
- Optimum**, 5, 6, 9, 10, 11, 28, 123
social, 6, 37, 44, 120, 124
maximum satisfaction, 7, 9, 10,
11
operational-pragmatic, 98, 99-101,
112, 136, 153, 154
fictitious, 107, 112, 114-121
Veblen on, 120, 123
time preference, 118-119, 124
- PATENTS**, 219, 228, 229, 256
pooling of, 220
retardation of technical progress,
222
see Research
- Private Wants versus Public Needs**,
238, 243-244, 288
- RADIOACTIVE Waste**, 72, 80-81, 87
- cumulative character, 81
- Research**, 218-222, 249, 250
duplication in, 218 ff., 254
and innovations, 219-221
lack of coordination, 252-254
in small business, 255
effects of depressions, 257-258
see Patents
Science Retardation of
- Resources**, 36, 93
impact of institutions on use,
98-105
maximization principle, 119-120,
121
fictitious optimum, 107, 112,
114-121
linear projections, 124
substitutes, 122-124
"Conservation nightmare", 125,
126, 136
depletion, 113, 117, 119n, 124,
125, 132, 134, 136, 142
competitive recovery, 127-128,
152 ff.
rule of capture, 128, 268
institutional analysis, 127, 131,
133, 136
estimates of losses, 136, ff.
as capital assets, 142-143
time preference, 153
- Resources Non-renewable**
irreversible exhaustion, 122
and technological progress, 122,
134
commercial exploitation, 122, 127-
129, 130
substitutes, 122-124, 127, 134,
135
available reserves, 123, 125-126
linear projections, 124
"conservation nightmare", 125
cumulative causation, 127
depletion, 117, 119n., 132, 134,
135, 136
coal 125
competitive recovery of, 131-134
premature abandonment of mines,
150-151
natural gas, 130,
evidence of losses, 150
petroleum, 125, 126
rule of capture, 128
unnecessary wells, 148-150, 152
estimates of losses, 136 ff.

Resources Renewable 93

- ecological balance, 94-95, 102, 112, 113, 114
- critical zones, 95-98
- cumulative causation, 93, 95, 101, 107, 117
- depletion, 94, 95, 96, 97, 102, 105, 112, 142, 143
- safe minimum standards, 98
- impact of institutions on use, 98-105
- competitive utilization, 100, 102-103, 108, 110, 111, 112, 113
- and colonial rule, 100-101
- erosion, 96, 101, 105-107, 110
- deforestation, 107-110
- wildlife and fisheries, 110-111
- estimates of losses 136, ff.
- see* Optimum, fictitious

Retailing

- see* Excess Capacity

SABOTAGE, 224, 231

- Sales Promotion, 12, 21, 38, 43, 118-119, 230, 231, 233-237, 266**
 - time preference, 117-119
 - synthetic wants, 118
 - cost of, 236-237
 - psycho-cultural impact, 237-247
 - and psychology, 239, 240
 - effect on human personality, 240, 241-245
 - and moral choices, 243
 - television, 245-246

Science, Retardation of, 248, 254

- in market economy, 249-253, 254
- in Soviet Union, 249
- market calculus, 250-251
- lack of coordination, 252-254
- fear of innovation, 256-257

Scope of Economics, 285-289

- harmful delimitation, 285 ff.
- formal versus substantive definition, 287 ff.
- need for new concepts, 289 ff.

Smog *see* Air Pollution**Smoke *see* Air Pollution****Social Benefits (Returns), 7, 8, 11, 38, 41, 42, 69, 70, 113, 208, 290, 291, 292, 298****Social Causation, 283-284**

- see* Cumulative Causation

Social Choice, 292 ff., 297**Social Cost**

- definition, 13, 14, 20, 309
- causes, 13-14, 264
- and social planning, 14, 18, 26, 37, 38
- incidence, 15
- and social legislation, 15, 16, 31, 37, 45
- and economic growth, 17, 29, 64, 281
- and democracy, 18-19
- quantification and measurement, 21-23, 38, 39, 268, 292 ff., 295

Classical economics 29-31**Historical School, 31****Socialists, 31-37****Neo-classical school, 4, 16, 20, 23, 26, 27, 38 ff., 305****and Veblen, 42-44****summary, 264 ff.****and equilibrium analysis, 269 ff.****and underdeveloped countries, 100-101, 156-157, 175, 265*****see* Cumulative Causation****Diseconomies****Social Evaluation, 22-23, 41, 293****social accounting, 200****Social Legislation*****see* Impairment of the Human Factor****Workmen's Compensation Acts****Social Minima, 15, 23, 93, 114, 272, 294, 297****maximum tolerable level of air pollution, 55-57, 72, 80, 88, 93, 95****maximum permissible concentration, 72, 80-81, 88****safe minimum standards, 93, 98****ecological balance, 95, 102, 112, 114****critical zone, 95-98, 101, 112, 114, 136, 152, 154****objective criteria, 23, 294-95, 297****Social Opportunity Cost, 14, 223, 296****Social Overhead Cost, 37, 69, 207****Social Value, 23, 292-293****social preference, 294****role of minimum standard, 294****social priorities, 295****and marginal principles, 297-298****relation to individual preference, 298, 299-300**

- see* Social Evaluation
 Social Minima
 Soil Depletion
 estimates of losses, 146 ff.
see Resources, Renewable
- TECHNOLOGICAL** Change, 10, 33, 34, 175
 automation, 190-191
 obsolescence, 187-191, 195
 Hobson, 190
 Say, 181 ff.
 Sismondi, 182
 Marx, 182-184, 186, 192
 Pigou, 189-190
 threat to earning capacity, 180
 Schumpeter, 186, 189, 192-195
 Veblen, 180, 189, 190
 and unemployment, 179 ff, 183, 185, 186
 and economic fluctuations, 179 ff., 189
 "creative destruction", 193-194
 earlier controversy, 181-187
 factors obstructing reemployment, 183-185, 187
 and capital losses, 180, 187, 195, 202 ff., 256-257
 inadequate cost calculation, 187 ff., 191, 198 ff., 202 ff.
 effect on labor, 190-191
 compensation allowance, 191-192
see Economic Fluctuations
 Unemployment
- Time Preference**, 107-108, 117-119, 153, 265
 distortion of, 112, 118-119
 and resource use, 153
 fictitious optimum, 107, 112, 114, 121
 and sales promotion, 117-119
- Transportation** 207-214
 need for coordination, 208 ff.
 social benefits of, 208 ff.
 Soviet transportation, 212-213
 savings from coordination, 210-211
see Duplication
 Excess Capacity
- UNEMPLOYMENT**
 and technological change, 179, 181 ff.
 and economic fluctuations, 179-180, 181, 185
 and monopoly, 184-185
 soundness of deficit spending, 203-204
 Schumpeter, 194
 technological, 195 ff.
 constant cost of labor, 196, 197, 203
 social costs of, 195-200, 202, 309-310
 impact of, 202
- United Nations Conference on Human Environment** (Stockholm 1972), 319, 320
- WATER** Pollution, 16, 172, 264-265, 311-316
 and industrial location, 74-75, 77
 causes of, 75-81
 cumulative causation, 76-78, 83, 86, 87
 and human health, 76
 radioactive material, 80, 87
 maximum permissible concentration, 80-81, 88
 and synthetic chemicals, 82
 negative effects of, 81-85
 in underdeveloped countries, 83, 84
 evaluation of social costs, 86, 89
 abatement, 88-89, 90-92
- Welfare Economics**, 8, 37-42, 44, 279, 292, 305, 311
 critique of, 41-42
- Wildlife and Fisheries**, 96, 111
 estimates of losses, 137 ff.
 Veblen, 137, 139
see Resources Renewable
- Workman's Compensation Acts**, 55
 inadequacy of, 155, 157-58, 160, 164 ff., 171, 177-178
 positive effects, 177
see Impairment of the Human Factor

- ALBER, H., 307
Allin, B. W., 289
Ammon, A., 285, 286
Anderson, B. M., 293
Andreeva-Galanina, E. Z., 52
Andrews, J. B., 171, 174
Arnold, T. W., 227
Ashe, W. F., 50, 58
- BAUER, O., 196, 198
Baster, A. S., 234
Beckerman, W., 305-6, 308, 309,
310, 311, 312, 314, 315, 316,
317
Behling, B. N., 210
Bell, D., 241, 243
Benline, A. J., 71
Bennett, H. H., 109, 147-48
Berliner, J. S., 14
Bernal, J. D., 254, 256
Beveridge, W. H., 292
Blum, F. H., 45, 287
Bonar, J., 3
Braithwaite, D., 239
Breslow, L., 53
Bohm-Bawerk, E., 4, 6, 293
Bowen, H. R., 299
Bunce, A. C., 142
Burney, L. E., 74, 87
Burns, A. R., 129
Bush, V., 252
- CAIRNES, J. E., 182
Cantillon, R., 3
Chamberlin, E. H., 44, 238, 239
Chi Wei, 327, 329
Chung-Kuo Hsin-Wen, 327
Griacy-Wantrup, S. V., 95, 96, 97, 98,
101, 103, 104, 114, 115, 118,
141, 154, 268
Clark, J. B., 6, 217, 293
Clark, J. M., 4, 6, 37, 44, 196, 197,
198, 200, 207, 238, 284, 289,
293, 294, 297
Clark, M. G., 258
Commons, J. R., 174
Comte, A. 31, 101
Cournot, A. A., 37, 38
Cristiani, H., 59, 60, 61
Curtis, H. A., 133
- DEVINE, J. M., 79
- Diamond, N., 176
Dillard, D., 204
Dobb, M., 261
Dodd, W. F., 171
Douglas, P. H., 181
Dowd, D. F., 25
Dublin, L. J., 174
Dumont, R., 101
- EASTABROOK, E. L., 149
Edwards, C. D., 227, 230
Effertz, O., 37
Ellis, H. S. 289
Ely, N., 150
Engels, F., 34, 35
Ensley, G. W., 296
Everett, J. R., 6
- FOURIER, Ch., 35
Fox, K., 15
Frank, L. K., 278
Fraser, L. M., 275
Frisch, R., 283
Fromm, E., 46, 242
- GABRIELSON, I. N., 138
Gaitskell, A., 101
Galbraith, J. K., 12, 119, 123, 154,
238, 247, 250, 273
Garver, F. D., 186
Georgescu-Roegen, N., 324
Gide, C., 33
Goldsmith, J. R., 54
Gourvitch, A., 182, 186
Grant, E. L., 187
Gruchy, G., 288
Guise, C. H., 59, 138, 139, 140
Gustafson, A. F., 59, 138, 139, 140
Gustavson, R. G., 66
- HALL, A. R., 110
Hall, D., 254
Hamilton, W. H. 220, 221, 228
Hamilton, W. J., 59, 138, 139, 140
Hegelland, H., 310
Hensel, K. P., 45
Hobson, J. A., 30, 36, 173, 190
Horkheimer, M., 282
Horney, K., 46, 241, 242
Hua Ching-yuan, 328, 329
Hunter, H., 213
- IVES, J. E., 65

- JACOBI, E., H., 101
 Jevons, W., St., 6
- KANTOROVICH, O., 297
 Kapp, K. Wm., 3, 11, 12, 22, 86,
 242, 273, 284, 287, 289, 305,
 319, 320
 Karol, K. S., 330
 Kennedy, J. F., 144, 258
 Kester, R. B., 156
 Keynes, J. M., 4, 30, 281, 311
 King, W. I., 181, 182, 201
 Kingsley, C., 34
 Kristol, I., 244, 245
 Krock, A., 229
- LANDAU, E., 55
 Landry, A., 37, 38
 Lange, O., 37, 189
 Langier, H., 253, 254
 Larson, R. I., 63
 Lederer, E., 184
 Liebig, J. V., 35, 36, 101
 Liefmann, R., 189
 Liu Shao-chi, 330, 332
 Lundberg, G. A., 299
- MACIVER, R. M., 284
 Magnuson, H. J., 163, 172, 173, 174
 Malthus, T. R., 30, 182
 Manning, L., 176
 Mao Tse-tung, 330, 331-2
 Marshall, A., 4, 7, 9, 69, 225, 235,
 309
 Martin, W. H., 8
 Marx, K., 24, 31, 32, 33, 34, 35, 36,
 101, 102, 182, 183, 184, 186,
 192, 300, 307, 311
 May, R., 242
 McCamman, D., 165
 McGann, P., 117, 125, 126
 Mehring, O. V., 278
 Meller, H. B., 49, 62, 63, 65
 Merriam, C., 162
 Metcalfe, C. R., 61
 Middleton, J. T., 60, 61
 Mill, J. St., 182
 Miller, H. C., 79
 Millis, H. A., 175, 176
 Mills, C. W., 309
 Mills, F. C., 186
 Mitchell, W. C., 25, 44, 201
 Montgomery, R. E., 175, 176
 Mumford, L., 263
- Myrdal, G., 3, 25, 129, 163, 171,
 187, 188, 276, 277, 279, 285,
 307, 309, 310
- NELSON, N., 53, 54
 Neurath, O., 285
- OBERMEYER, H., 65
 Ogilvie, A. G., 56
 Orleans, L. A., 326
 Owen, R., 34
- PACKARD, V., 232, 243
 Parkins, A. E., 109, 110, 133, 140,
 141, 142, 145
 Pepper, C., 316
 Perelman, M. J., 321
 Petty, W., 3
 Pigou, A. C., 8, 38-40, 63, 189, 190,
 235, 236, 310
 Pogue, F. E., 129
 Polanyi, K., 45, 288
 Pollack, J., 169
 Prindle, R. A., 53, 58
- QUESNAY, G., 2, 3
- REDER, M. W., 41
 Reede, A. H., 165, 166, 167, 168,
 169, 170, 171
 Reston, S., 322
 Ricardo, D., 24, 30, 31, 33
 Ries, H., 59, 138, 139, 140
 Rist, C., 33
 Rivière, Mercier de la, 3
 Robbins, L., 285, 286, 287, 288
 Roberts, A., 56
 Robinson, J., 42
 Rockie, Wm. A., 147, 148
 Rodbertus, J. K., 38
 Rostow, W. W., 202
 Roueche, B., 58
- SAMUELSON, P. A., 8, 201
 Sawicki, E., 55
 Sax, E., 208
 Say, J. B., 181, 184
 Sayers, R. R., 65
 Schiffmann, R., 55
 Schmidt, L., 79
 Schmookler, J., 222
 Schmoller, G., 31
 Schumpeter, J. A., 10, 24, 25, 186,

- 189, 192-195, 219, 238, 239,
276, 293, 310
Schurr, S. H., 116
Schwarz, H., 207
Sebastian, F. P., 324, 326
Seligman, E. R. A., 293
Shaw, B. T., 146, 147
Shea, G. B., 79
Shonfield, A., 249
Sidgwick, H., 10, 11
Sigurdson, J., 323, 326
Sismondi, J. C. L., 30, 32, 33, 182,
292
Sisson, L. B., 49, 63
Skolnik, A. M., 165
Smith, A., 2, 3, 29, 30, 181, 225,
229, 269, 274
Smith, H., 234
Snyder, C., 326
Somers, A. R. and Somers, H. M.,
165, 166, 167, 168, 169, 170,
171, 172, 177
Sotiroff, G., 32
Soudek, J., 202
Souter, R. W., 286
Stigler, G. J., 3, 41
Stocklasa, J., 59, 60, 61
Stocking, G. W., 128
Stone, J. F., 227
Sullivan, H. S., 46, 242
Suttmeier, R. P., 326
Sutton, G., 276

TAWNEY, R. H., 243, 244
Taylor, F. M., 37, 189
Taylor, O. C., 61
Thomas, D. A., 70
Thomas, D. S., 202
T. N. E. C., 149, 150, 191, 220,
221, 228
Tomasevitch, F., 140

VEBLEN, T., 4, 5, 25, 42-44, 45,
120, 137, 139, 180, 189, 224,
231, 233, 235, 237, 238, 239,
240, 241, 249, 307, 308, 311
Viner, J., 285
Voigt, H., 72

WALRAS, M. E. L., 6, 311
Wang Te-P'u, 326
Watkins, M. W., 25, 127
Webb, S. and Webb, B., 36
Weber, M., 307
Weiler, E. T., 8
Weippert, G., 297
Weisskopf, W. A., 121, 307
Whitaker, J. R., 109, 110, 133, 140,
141, 142, 145
White, G. F., 113
Whitehead, A. N., 276, 280, 281
Whitney, M., 307
Wicksell, K., 7, 8, 9, 37, 216
Wickstead, P. H., 7, 8, 9, 37
Wiser, F., 293, 297
Wilhelm, C. J., 79
Williams, E. W., 209, 212
Wong Chi, L., 323
Wootton, B., 277
Wright, D. M., 17