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FIVE LECTURES ON ECONOMIC PROBLEMS

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Five Lectures delivered at the London School of Economics and Political Science on the invitation of the Senate of the University of London

BY

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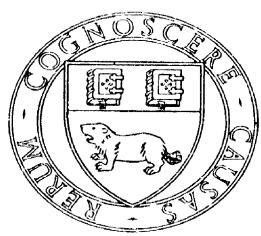

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ONE

THE ECONOMISTS AND EQUALITY

ECONOMISTS as a class have always been opposed to inequality of income, and also to equality. This summary, however, does not disclose the major shift of attitude within the last generation. From Smith to Marshall greater equality of income was an objective, but it was one of the lesser objectives, of good social policy. Even John Stuart Mill, an evangelist whom a kind fate had given a logical father, preferred capitalism to communism although he conceded every claim of the communists and attributed grotesque deficiencies to capitalism. The relative unimportance of the distribution of income to the classical economists is perhaps most eloquently and certainly most effectively shown simply by their neglect of the subject.

More recently the desire for greater equality has grown strong. Every policy is scrutinized for its effects on the distribution of income, and the results of this scrutiny weigh heavily in the final judgment of the desirability of the policy. A growing number of economists, indeed, implicitly argue that no other injustice equals in enormity that of large differences in income.

.I do not propose to investigate the origins of this change of attitude, which lie almost wholly outside of economics. Rather, I wish first to review the reasons for the neglect of equality by the classical economists. Thereafter I shall briefly examine the contemporary attitude, and finally discuss the modern implications of the classical position.

1. The Classical Economics

Throughout the classical economics there runs a strong argument against assigning to greater equality of income a primary rôle in social ethics. The argument is essentially that respect for private property is necessary to get men to work and save. The argument was not a dogmatic defence of the existing institution of private property. Adam Smith stated that " the property which every man has in his own labour . . . is the most sacred and inviolable," so the

statutes requiring long apprenticeship were a violation of property rights.[1] Mill accepted this position, as we would expect;[2] it is more interesting to notice that so staunch a conservative as McCulloch should also do so :

> But it must not be imagined that the security of property is violated only when a man is deprived of the power of peaceably enjoying the fruits of his industry: it is also violated, and perhaps in a still more unjustifiable manner, when he is prevented from using the powers given him by nature, in any way, not injurious to others, he considers most beneficial for himself.[3]

McCulloch accordingly classified monopolies as a violation of private property.

But why encourage men to work and save? The customary answer is: to maximize output. Maximum output, however, is a proximate, and not an ultimate goal, and it has no logical priority to greater equality of income. One might defend the goal of maximum output by arguing that the ultimate utilitarian goal was maximum satisfaction, and that greater output will lead to larger increases of satisfaction than will greater equality. This interpretation is plausible, but I believe it is mistaken. Most of the important classical economists explicitly rejected maximum satisfaction as a goal, and none except Bentham explicitly adopted it:[4] they simply did not attach much importance to maximum output. This sounds heretical, but I think it can be documented.

Adam Smith firmly believed that the utility a man enjoyed was independent of the income he possessed. He speaks at length of "the never failing certainty with which all men, sooner or later, accommodate themselves to whatever becomes their permanent situation . . .; that, between one permanent situation and another, there was, with regard to real happiness, no essential difference. . . ."[5] The view is given elaboration by his parable

[1] *Wealth of Nations* [Modern Library], pp. 121-2.

[2] *Principles of Political Economy* [Ashley edition], p. 115.

[3] *Principles of Political Economy* [4th edition, 1849], p. 83.

[4] And even Bentham's formalistic utilitarianism at times gave way: he drastically qualified his doctrine when he said, "It is the pleasure of acquisition, not the satisfaction of possessing, which gives the greatest delights." (*The Theory of Legislation* [Ogden edition], p. 105.) He also believed that private property did not extend to monopoly (*ibid.*, pp. 123, 140).

[5] *The Theory of Moral Sentiments* [Boston: Wells & Lilly, 1817], Part III, Chapter III (p. 195).

of " the poor man's son, whom heaven in its anger has visited with ambition " :

He finds the cottage of his father too small for his accommodation, and fancies he should be lodged more at his ease in a palace. He is displeased with being obliged to walk afoot . . . [He] judges, that a numerous retinue of servants would save him from a great deal of trouble . . . he devotes himself for ever to the pursuit of wealth and greatness . . . he submits in the first year, nay in the first month of his application, to more fatigue of body, and more uneasiness of mind, than he could have suffered through the whole of his life from the want of them. . . . Through the whole of his life he pursues the idea of a certain artificial and elegant repose which he may never arrive at, for which he sacrifices a real tranquillity that is at all times in his power, and which, if in the extremity of old age he should at last attain to it, he will find to be in no respect preferable to that humble security and contentment which he had abandoned for it. It is then, in the last dregs of life, his body wasted with toil and diseases, his mind galled and ruffled by the memory of a thousand injuries and disappointments which he imagines he has met with from the injustice of his enemies, or from the perfidy and ingratitude of his friends, that he begins at last to find that wealth and greatness are mere trinkets of frivolous utility. . . .[1]

The Smith of the *Wealth of Nations* did not abandon this view, although he gave it less melodramatic expression. His proposal of labour disutility as the true measure of value over time is a corollary of this position. Utility is independent of income, so Smith could not use the concept of bundles of goods yielding equal satisfaction —the device of the modern index number theorist—for measuring changes in real income. Labour disutility appeared to have a more durable and stable significance : an hour's toil was as irksome in 1400 as in 1776.

This view of the utility of income as dependent only on the incomes of other times and other people accounts for much of the neglect of utility in the classical economics. Senior reached and stated the law of diminishing marginal utility, only to dismiss it :

. . . the desire for distinction . . . if we consider its universality and its constancy, that it affects all men and at all times, that it comes with us from the cradle, and never leaves us till we go into the grave, may be pronounced to be the most powerful of human passions.

The most obvious source of distinction is the possession of superior wealth. It is the one which excites most the admiration of the bulk of mankind, and the only one which they feel capable of attaining. To seem more rich, or, to use a common expression, to keep up a better appearance,

[1] *Ibid.*, Part IV, Chapter I (pp. 244-5).

is, with almost all men who are placed beyond the fear of actual want, the ruling principle of conduct. For this object they undergo toil which no pain or pleasure addressed to the senses would lead them to encounter; into which no slave could be lashed or bribed.[1]

Mill followed the tradition :

I know not why it should be a matter of congratulation that persons who are already richer than any one needs to be, should have doubled their means of consuming things which give little or no pleasure except as representative of wealth ; or that numbers of individuals should pass over, every year, from the middle classes into a richer class, or from the class of the occupied rich to that of the unoccupied. It is only in the backward countries of the world that increased production is still an important object. . . ."[2]

Why, then, did the classical economists display such great and persistent concern with policies that maximize output? Their concern was with the maximizing, not with the output. The struggle of men for larger incomes was good because in the process they learned independence, self-reliance, self-discipline—because, in short, they became better men. Smith, it is well known, was no uncritical admirer of the division of labour, that mainspring of economic progress :

In the progress of the division of labour, the employment of the far greater part of those who live by labour, that is, of the great body of the people, comes to be confined to a few very simple operations, frequently to one or two. But the understandings of the greater part of men are necessarily formed by their ordinary employments. The man whose whole life is spent in performing a few simple operations, of which the effects too are, perhaps, always the same, or very nearly the same, has no occasion to exert his understanding, or to exercise his invention in finding out expedients for removing difficulties which never occur. He naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become! The torpor of his mind renders him, not only incapable of relishing or bearing a part in any rational conversation, but of conceiving any generous, noble, or tender sentiment, and consequently of forming any just judgment concerning many even of the ordinary duties of private life.[3]

And so, to avoid a society populated with " mutilated and deformed " spirits, he proposed compulsory education.

The desire for better men, rather than for larger national incomes, was a main theme of the classical economics. We find it

[1] *Political Economy*, p. 12.
[2] *Principles*, p. 749.
[3] *Wealth of Nations*, pp. 734-5.

in Senior and Mill—indeed it is the reason Mill rejected communism.[1] It gives reason to concepts such as productive consumption, which is self-contradictory on utility logic, and explains the (urban) economists' love for the rural life and an independent peasantry.

The theme became most explicit in the work of Alfred Marshall. It dominates his discussion of utility, of distribution, of the comparative merits of forms of organization, and so on. Of education he said that not only would it improve the efficiency of the ordinary workman, but that, " regarded as an end in itself, it is inferior to none of those which the production of material wealth can be made to subserve."[2] And recall the comment on equality : " Any diminution of [the inequalities of wealth] which can be attained by means that would not sap the springs of free initiative and strength of character, and would not therefore materially check the growth of the national dividend, would seem to be a clear social gain."[3]

Lest we attribute this philosophy only to the economists, who were perhaps unduly preoccupied with the virtues of the independent entrepreneur, it may be well to reproduce de Tocqueville's lucid defence :

> The principle of self-interest rightly understood is not a lofty one, but it is clear and sure. It does not aim at mighty objects, but it attains without excessive exertion all those at which it aims. As it lies within the reach of all capacities, everyone can without difficulty learn and retain it. By its admirable conformity to human weaknesses it easily obtains great dominion; nor is that dominion precarious, since the principle checks one personal interest by another, and uses, to direct the passions, the very same instrument that excites them.
>
> The principle of self-interest rightly understood produces no great acts of self-sacrifice, but it suggests daily small acts of self-denial. By itself it cannot suffice to make a man virtuous; but it disciplines a number of persons in habits of regularity, temperance, moderation, foresight, self-command; and if it does not lead men straight to virtue by the will, it gradually draws them in that direction by their habits. If the principle of interest rightly understood were to sway the whole moral world, extraordinary virtues would doubtless be more rare, but I think that gross

[1] Senior, *Political Economy*, p. 55 ; Mill, *Principles*, pp. 210-11, the chapter on peasant proprietors (Part II, Chapter VI), pp. 749-50, the chapter on the probable futurity of the labouring classes (Part IV, Chapter VII).

[2] *Principles*, p. 211 ; see also the *Memorials*, p. 228.

[3] *Ibid.*, p. 714. On the whole subject of Marshall's ethical position, see Talcott Parsons, *The Structure of Social Action*, Chapter IV.

depravity would then also be less common. The principle of interest rightly understood perhaps prevents men from rising far above the level of mankind, but a great number of other men, who were falling far below it, are caught and restrained by it. Observe some few individuals, they are lowered by it; survey mankind, they are raised.

I am not afraid to say that the principle of self-interest rightly understood appears to me the best suited of all philosophical theories to the wants of the men of our time, and that I regard it as their chief remaining security against themselves. Toward it, therefore, the minds of the moralists of our age should turn; even should they judge it to be incomplete, it must nevertheless be adopted as necessary.[1]

2. The Modern Economics

The modern economist justifies the greater urgency of his desire for more equality of income by one or more of three lines of argument. The oldest is utilitarian: as a consequence of diminishing marginal utility of income, a given aggregate income yields most satisfaction when it is equally distributed. The newest is Keynesian: the more equal the distribution of income, the higher the level of output and employment. The most important is that everyone wants more equality.

The utility argument seems to me mistaken for precisely the reason Adam Smith gave, that the utility of income depends wholly upon one's past income, and one's neighbours' incomes. This position, I should add, does not permit one to engage in a cynical commentary on automobiles, or bed-springs, or medical service. His memory, after all, is an extravagantly important part of man.

Even if this amateur psychology be rejected, it is clear that the utility argument for greater equality is of no importance. It is only a minor objection that the dominant stream of modern economic analysis denies the measurability of utility or the meaningfulness of inter-personal comparisons of utility. The decisive objection is that the utility argument requires the utterly question-begging assumption that the heights of marginal utility schedules are not correlated with income. In short, the utility argument is a sophisticated version of the direct demand for equality. But where the direct demand is humane, the pseudo-scientific argument is obfuscatory.

The Keynesian argument is that with a more equal distribution of income, a larger share of a given income is consumed and

[1] *Democracy in America* (Knopf, 1945), II, 122-3.

therefore, given limited investment opportunities, the larger will be the income of the society. I personally find it difficult to believe that this theory has led anyone to adopt equality as a goal. The argument applies also to booms : by parallel logic it argues for greater inequality of income when huge programmes of capital investment and governmental deficits are in sight. Not yet, however, have I encountered a Keynesian who argues for greater inequality in these conditions. Nor does Keynes' theory prove, even on its face, that greater equality will lead to greater output ; this result follows only if the output per worker does not materially diminish with greater equality. The Keynesian argument for equality appears to endear his system to his followers, rather than to endear equality to his followers.

Even if this be true, however, it does not touch upon the validity of the Keynesian apparatus or his estimates of the empirical shapes of the fundamental economic functions. It is hardly possible to digress here into a full-fledged investigation of these large subjects, and I shall restrict myself to one adverse opinion. Keynes' low estimate of investment outlets is already palpably unrealistic for the non-American world, and I do not think it is less so in the American situation. Of all economists, Lord Keynes was most sensitive to the conditions of the next moment—he was a Geiger counter of future headlines. This was a most extraordinary gift, and it may have extraordinary consequences for his theories.

.The third, and weighty, argument for greater equality is simply that it is a good thing. I agree, for the classical economists' reasons.

3. Implications of the Classical Position

If it were a matter only of choosing between the classical goal of improvement of the individual and the modern goals of greater equality, maximum output, full employment, and the like, the discussion would have to stop at this point. Each person would make the choice for himself, and that would be the end of the matter. But this is not quite the case.

The modern goals are much more in the nature of means than of ends. Their very multiplicity indicates this : if equality and maximum output were ultimate and independent goals, for example, it would be quite impossible to engage in sensible discussions of policy. The lover of equality would dismiss every policy inimical

to his goal ; the lover of maximum output would act similarly ; and there would be no basis for an agreement between them. No individual who sought both goals would know how to compromise between them if, as is almost always true, a given policy is not equally suited to achieve both goals. Implicitly this individual must be able to estimate the relative importance of various goals —to say whether a large move toward equality is well worth a large or a small decrease in output. In other words, he must have some more fundamental goal.

The classical goal is ambiguous, indeed it is deliberately ambiguous. It emphasizes the absolute primacy of the integrity of the individual, but its adherents recognize the great influence that the form of social organization exercises over its members. There is not and can not be agreement on the precise character of man we seek to achieve (although there is wide agreement on characteristics we wish to avoid), and we are not certain of the precise effects of a given type of society on its members. But we are persuaded that an economic system will not help us to move in the right direction unless it grants both opportunity and responsibility to the individual : the very uncertainty of our ultimate ethical goals dictates a wide area of individual self-determination. We are not able to supply a blueprint of the ideal life, but we are persuaded that even if it were known it would be ideal only for the person who individually and knowingly and voluntarily accepted it. It is not necessary, however, to know what is best ; it is enough to know what is better.

One may prefer another goal, perhaps the development of the society as distinct from its members. But whether one seeks to strengthen the individual, the society, or something else, surely an ultimate goal is necessary. Rule-of-thumb guides such as greater equality and maximum output are insufficient to distinguish policies that lead to very different types of society, and therefore insufficient to distinguish good from bad policies. Yet these rough guides have been used, and I wish to devote the remainder of my time to an examination of errors and misplaced emphases that have followed from their use by economists who accept the liberal goal.

Let us consider first the goal of maximum output. The liberal goal really suggests the desirability of rising output, so the gains of one individual are not necessarily the losses of another, but for most purposes this is equivalent to maximizing output, and therefore maximum output is a good proximate goal. But its proximate

nature must be kept in mind. It has been used to justify attacks on private monopolies, for such monopolies occasion a misallocation of resources and therefore reduce national income. Often it has been proposed that such monopolies be nationalized to avoid this misdirection of resources. This proposal is indeed germane if one wishes only to maximize output ; it is less attractive in light of the fundamental liberal goal. A monopoly is bad also because it restricts the area within which excluded individuals may exercise their talents and their ambitions, and because it generates an inequality of wealth that indirectly creates another generation of privileged persons. If the monopoly is transferred to public ownership, one monopolist is succeeded by another. On this view, a trust-busting policy is to be supported even if it entails substantial diseconomies of small size, as is constantly averred and never demonstrated.

Or again, the restriction of educational opportunities is often measured by the excess of earnings in the professions over the amounts necessary to reimburse the cost of training, and it is implied that the goal will be achieved when extra earnings in the professions just compensate the extra costs. This view is proper if one wishes to maximize output, and it is a highly useful immediate goal in any event. But surely this rule provides a lower limit on the ideal amount of education if one returns to the liberal goal. How much greater the provision of education should be depends upon the effects of financing larger programmes on those who are bearing the costs. Were these effects negligible, I should argue that education should be expanded to the point where no one could learn more by attending school than by entering employment.

Let us turn now to the goal of greater equality. The liberal goal is unattainable in the presence of great and permanent inequalities, and it is also unattainable in the presence of permanent equality. On the liberal philosophy, it is necessary that all contestants begin the race at the same point, but it is fatal to require that they reach the finish line simultaneously. There is only one resource in reconciling these desiderata : time. And a society should use time lavishly, for it is the one thing of which it possesses more than its individual members.

Yet even in this difficult terrain the liberal goal is more illuminating than the proximate goal of greater equality of income. It suggests that we seek more to start the contestants at the same

point, rather than to reduce handicaps at each twelve-month interval. The policy of ignoring inequalities of resources and battling vigorously against inequalities of income is a wanton subsidy to psychiatrists. Our concern should be much more with the ownership of resources that leads to the wide differences in income. We should seek to make labour incomes more equal by enlarged educational systems, improvements of labour mobility, elimination of labour monopolies, provision of medical care for poor children, and the like. We should seek to make property incomes more equal (and smaller) by elimination of monopoly and by extremely heavy taxation of inheritances.

Or again, consider rationing. There is a fundamental antithesis between equality and identity on the liberal philosophy : it is of the essence of the good society that it permits individuals to behave as they wish provided they bear the chief consequences of their actions.[1] The limitation of individuals to equal quantities of narrow classes of commodities is an improper interference with innocent and desirable diversity. Specific rationing of an inadequate supply of insulin would make sense in a society of besieged diabetics, for there is no real freedom of choice under general income rationing. The price system, for all its great subtlety and selectivity, cannot designate those who must die. But despite much contemporary argument to the contrary, I refuse to believe that besieged diabetics are the prototype of the economic problem.

Maximum output and greater equality are on an equal footing as proximate goals, and neither has content except as part of a philosophical system.[2] Ricardo is as much to be censured for his preoccupation with maximum output as certain modern economists for their preoccupation with equality. And yet there is political wisdom in maximum output that is not in greater equality. I shall allow de Tocqueville to explain why :

> The hatred that men bear to privilege increases in proportion as privileges become fewer and less considerable, so that democratic passions would seem to burn most fiercely just when they have least fuel. . . . When all conditions are unequal, no inequality is so great as to offend the eye, whereas the slightest dissimilarity is odious in the midst of general

[1] " No society in which eccentricity is a matter of reproach can be in a wholesome state." (Mill, *Principles*, p. 211.)

[2] Full employment seems to me to have no status even as a proximate goal : it contains nothing good that is not already implied by maximum output and greater equality, and its additional implications are objectionable.

uniformity; the more complete this uniformity is, the more insupportable the sight of such a difference becomes. Hence it is natural that the love of equality should constantly increase together with the equality itself, and that it should grow by what it feeds on.

This never dying, ever kindling hatred which sets a democratic people against the smallest privileges is peculiarly favourable to the gradual concentration of all political rights in the hands of the representatives of the state alone. The sovereign, being necessarily and incontestably above all the citizens, does not excite their envy, and each of them thinks that he strips his equals of the prerogative that he concedes to the crown. The man of a democratic age is extremely reluctant to obey his neighbour, who is his equal; he refuses to acknowledge superior ability in such a person; he mistrusts his justice and is jealous of his power; he fears and despises him; and he loves continually to remind him of the common dependence in which both of them stand to the same master.

Every central power, which follows its natural tendencies, courts and encourages the principle of equality; for equality singularly facilitates, extends, and secures the influence of a central power.

In like manner it may be said that every central government worships uniformity; uniformity relieves it from inquiry into an infinity of details, which must be attended to if rules have to be adapted to different men, instead of indiscriminately subjecting all men to the same rule. Thus the government likes what the citizens like, and naturally hates what they hate.

To lay down extensive but distinct and settled limits to the action of the government; to confer certain rights on private persons, and to secure them the undisputed enjoyment of these rights; to enable individual man to maintain whatever independence, strength, and original power he still possesses; to raise him by the side of society at large, and uphold him in that position; these appear to me the main objects of legislators in the ages upon which we are now entering.

It would seem as if the rulers of our time sought only to use men in order to make things great; I wish that they would try a little more to make great men; that they would set less value on the work and more upon the workman; that they would never forget that a nation cannot long remain strong when every man belonging to it is individually weak; and that no form or combination of social polity has yet been devised to make an energetic people out of a community of pusillanimous and enfeebled citizens.[1]

[1] *Democracy in America*, II, 295, 329.

TWO

MONOPOLISTIC COMPETITION IN RETROSPECT

BEFORE the Great Depression, that chasm between darkness and light, economists had generally looked upon the economy as a mixture of industries that approximated conditions of perfect competition and industries that were " monopolies." The competitive industries, it was believed, were satisfactorily analyzed by the theory of competition, and although the " monopolies " were diverse in structure and power, they could be informatively analyzed by a discriminating use of the theory of monopoly. Individual economists varied considerably in the relative importance they attached to these two groups of industries, of course, but they varied surprisingly little in the type of analytical system they deemed appropriate to the analysis of economic events. This is not to say that the details of the analytical system were, or were thought to be, definitive : indeed certain portions of the system, such as duopoly, admittedly were (and are) in wretched shape.

Then came the works of Mrs. Robinson and Professor Chamberlin, who criticized this viewpoint and demanded a new orientation of our thought. Because of the high quality of their volumes, and because it was the " 'thirties," they were enthusiastically received. Then too, their messages seemed to reinforce one another, but this was a confusion that was quickly detected by, and almost only by, Professor Chamberlin.

Of Mrs. Robinson's work I need say little. It is amply clear, on a re-reading at this distant date, that her message was in no sense revolutionary, although at times her language was rebellious. Her two basic theses were : (1) that price theory is capable of great improvements in elegance and significant improvements in logic ; and (2) that the theory of monopoly is the appropriate instrument of analysis of all real situations in which the assumptions of perfect competition are not completely and exactly fulfilled. If she gave no evidence for her second thesis, to which I shall return later, she contributed much to the fulfilment of the first. Her volume marks no break with the tradition of neo-classical economics ;

indeed it contains, I think, too uncritical an acceptance of the substantive content of orthodoxy.

Professor Chamberlin was a true revolutionary. Instead of assimilating observed market structures into exclusive classes such as competition and monopoly, he told us, we must throw off our theoretical heritage and look at the world with clear and candid eyes. Then we shall find that no simple dichotomy does justice to the rich variety of industrial organization. True, there are (a very few) industries that closely resemble those studied by the economist of perfect competition. True, there are (perhaps more) firms that partake of the nature of monopoly as this concept was used in neo-classical economics. But vastly more often the firm displays a mixture of insulation from other rivals, by means of real or fancied product differences, and of indirect rivalry by way of (1) the willingness of some consumers to shift among products and (2) the ability of firms to change their products. As a result, there are important—in fact, typical—phenomena which cannot be explained, or can be explained only with serious error, if economic reality is forced into the neo-classical categories.

Let us spell out Professor Chamberlin's *Weltanschauung* in a bit more detail. Suppose our primary interest is (or perhaps I should say, begins with) the housing of the people who work in New York City. Even casual observation indicates the prominence of two characteristics in this housing market: (1) a great variety of products; and (2) a certain "unsystematism" or irregularity or randomness in the interrelationships among these products. (1) The housing facilities range from incredible estates to unbelievable slums. Every unit is unique in a rigorous technological sense and, more relevant, there are thousands of classes of dwellings whose rents need not move in strict proportion on threat of wholesale vacancy or queuing up. Our housing facilities, moreover, roam far afield. They extend to several states directly, and—through summer and winter places and other channels—ultimately to the whole world. They very probably extend also to automobiles, fur coats, and trips abroad, for the competition may well be stronger between these products and various classes of housing than the competition between some classes of housing. (2) Nor is there any systematic arrangement of this assemblage of products. The barriers between products are not of uniform height or thickness, nor is

there any discernible order in their occurrence. It is not impossible that apartments A and B do not compete directly and yet are both in close rivalry with automobiles. The existence of many similar and closely situated apartments is compatible with pervasive duopoly.

This picture of economic life was not fundamentally new, but Professor Chamberlin's reaction was. Customarily the picture had led to some sort of " institutional " economics, that strange mixture of magnificent methodological pronouncements and skinny, *ad hoc* analyses. Chamberlin, however, persevered to construct an analytical system of recognizable type to deal with the picture : the co-ordinates of his diagrams would be price and quantity, not Church and State.

Chamberlin's vision was clearly a legitimate way of looking at economic life. One may even argue that it was more congruent with untutored observation, and in this sense more " realistic." But these are points, not of unimportance, but of complete irrelevance, despite the part they played in securing popularity for his theory. There is a question of minor interest : did Chamberlin develop from this viewpoint a logically consistent theory of economic events ? And there is a question of paramount importance : does a theory incorporating this viewpoint contain more accurate or more comprehensive implications than the neo-classical theory ? I wish to emphasize this second question because it is not true that a theory which is realistic in its assumptions—if any meaning can be attached to this—is necessarily realistic in its implications, a theme to which I shall return.

But let us return to Chamberlin's picture. How does he reduce this stupendous diversity and complexity to a manageable system without assuming away its essential characteristics ?

1. The First Attempt : Chamberlin

One cannot long talk sensibly and simultaneously about a Connecticut estate, a Brooklyn walk-up, and a New Jersey hotel—to say very little of the fur coats and trips to Europe. And so Professor Chamberlin introduced the " group " :

> The group contemplated is one which would *ordinarily* be regarded as composing one imperfectly competitive market : a number of automobile

manufacturers, of producers of pots and pans, of magazine publishers, or of retail shoe dealers.[1]

The ambiguity of the concept of a group is not removed by this enumeration or the references to competing monopolists; we are left with the strong impression that the Marshallian industry has reappeared and we do not understand its new rôle, for our new picture is one of diversity. But then our picture is not an analytical system; it is therefore necessary to turn to Chamberlin's use of the concept in order to discover its rôle in his analytical system.

The subsequent analysis indicates that the group is a collection of (producers of?) fairly close substitutes; and at least once Chamberlin refers to "groups of products that are close substitutes for each other" (p. 140). More formally, the group may be defined as the collection of firms whose cross-elasticities of demand exceed some pre-assigned value. We must suspend judgment on the usefulness of the concept until we see the results to which it permits Chamberlin to arrive, but several direct implications of the definition should be noticed at once:

1. It is perfectly possible, on Chamberlin's picture of economic life, that the group contain only one firm, or, on the contrary, that it include all of the firms in the economy. This latter possibility can readily follow from the asymmetry of substitution relationships among firms: taking any one product as our point of departure, each substitute has in turn its substitutes, so that the adjacent cross-elasticities may not diminish, and even increase, as we move farther away from the "base" firm in some technological or geographical sense.
2. The picture of diversity and unsystematism also makes it very likely, if the group contains several firms, that the products be heterogeneous from the technological viewpoint.
3. The picture also dictates that often, and perhaps usually, a large or dominant rôle is played by firms outside the group in determining prices and profits within the group.

The importance of the group concept for the theory of monopolistic competition must be emphasized. Chamberlin asks the reader: can not the conventional theory of monopoly cope with the problems

[1] *Theory of Monopolistic Competition*, 5th edition, p. 81. Our interest at this point is in the early editions, but with two exceptions the quotations are identical in content and pagination in the first and fifth editions. The first exception is in the above quotation: "ordinarily" is not italicized in the early editions.

of monopolistic competition? And he answers: No. "Monopolistic competition, then, concerns itself not only with the problem of an *individual* equilibrium (the ordinary theory of monopoly), but also with that of a *group* equilibrium (the adjustment of economic forces within a group of competing monopolists, ordinarily regarded merely as a group of competitors)" (p. 69). The group is no mere expedient to get the analysis started, it is the vehicle of Chamberlin's theory of interdependence of products.

What, then, can we say of the (perhaps) 100 products—dwellings and limousines—in the group? Further simplification is obviously necessary, and Chamberlin introduces what he calls the "uniformity" assumption:

> We therefore proceed under the heroic assumption that both demand and cost curves for all the "products" are uniform throughout the group (p. 82).

Again we must pause: the uniformity assumption is only temporary, we are promised, but even a temporary assumption should be meaningful. How can different products have uniform costs and demands? The quantity axes of the various product diagrams are simply not the same: one measures three-room apartments, another four-room houses, and perhaps still another, restaurant meals (an excellent substitute for a kitchen). We cannot translate one into another by the ratio of their prices, for we are constructing the apparatus to explain prices. We do not wish to say that two physically similar apartments are "really" the same. They are not the same if their prices differ, and perhaps even if they do not differ[1]—this is the fundamental picture. And we do wish to say that restaurant meals plus a bedroom may form a better substitute for a Manhattan apartment than does a Brooklyn apartment—this is also part of the picture.

And yet, by the uniformity assumption Chamberlin has implicitly defined the group as a collection of physically homogeneous products. The identity of costs and demands is otherwise meaningless, and so also is the demand curve he proceeds to draw for a firm on the assumption that "competitors' prices are always identical" (p. 90). We simply cannot attach meaning to the statement that physically diverse things have the same price. This physical homogeneity

[1] "... general uniformity of price proves nothing as to the freedom of competition from monopoly elements" (p. 88).

possibly destroys, at least temporarily, Chamberlin's monopolistic competition (except for spatially distributed firms), for he has also assumed that buyers have perfect knowledge (p. 73), in order further to simplify the analysis. With perfect knowledge and homogeneous products, must not the demand curve confronting each firm be infinitely elastic? But the uniformity assumption is only temporary, we recall.

So we have 100 products of various sorts (blinking the inconsistency) or of one sort, but with negatively sloping demand curves (dropping the assumption of perfect knowledge), what then? Our vision tells us that we are unlikely to find symmetry, continuity, or any sort of smoothness in the relationships among these products. To meet this problem, Chamberlin introduces what I shall term the "symmetry" assumption:

> Specifically, we assume for the present that any adjustment of price or of "product" by a single producer spreads its influence over so many of his competitors that the impact felt by any one is negligible and does not lead him to any readjustment of his own situation (p. 83).

It is now an anti-climax to notice that Chamberlin further assumes, throughout his entire volume, that (1) the only relationship between products is that of substitution—complementarity "is beyond the scope of our problem" (p. 39 n.), and (2) the Marshallian cost apparatus is acceptable *in toto*: the vision of diversity and unsystematism does not extend to the resources market.[1]

But now we have utterly abandoned the picture with which our analytical technique was designed to deal: there is no variety and there is only one possible type of interrelationship between products. We probably have a Marshallian industry. We appear also to have negatively sloping demand curves for individual products, because our picture and our group are inconsistent with our uniformity assumption. The tangency of average cost and demand curves which we now deduce is of little importance to us: this familiar result of competitive theory, I will argue later, is not enriched. Possibly of more importance is the finding that even under these extreme conditions our new variable, "product," cannot be "measured along an axis" (p. 79)—that is, cannot be measured. Each time "product" appears in the discussion, we are told to choose it to

[1] Although, in strict logic, it must: there are no consumer goods that are purchased exclusively by consumers.

maximize profits, and nothing more.[1] As a result, for practical purposes the theory of monopolistic competition concerns only consumers moving among products, and ignores products moving among consumers.

We hasten on to the sections in which the uniformity and symmetry assumptions are separately (but, oddly, never jointly) lifted. Oligopoly may, and perhaps usually will, enter if the symmetry assumption fails, and then we are reduced to the familiar uncertainty over assumptions and results (pp. 100-4), from which we salvage only the conclusion that prices may be higher than under competition (p. 104). The effect of diversity of demand and cost conditions is even more devastating: there may be monopoly profits throughout the group at equilibrium—and then again, there may not. Indeed, although Professor Chamberlin does not state the possibility, it is not even clear that equilibrium is attainable: under these vague conditions prices may continue to change, and new firms may continue to enter and old firms continue to leave the "group." This indeterminacy is especially likely if we recognize variety through time—the consumers' liking for novelty, which Professor Chamberlin should surely add to his picture. He sums up the effects of diversity:

> To sum up this phase of the matter, our statement of the group problem must be modified by recognizing that the demand curves are not adjusted uniformly to a position tangent to the cost curves. In so far as profits are higher than the general competitive level in the field as a whole or in any portion of it, new competitors will, *if possible*, invade the field and reduce them. If this were always possible, as hitherto assumed, the curves would always be tangent and monopoly profits would be eliminated. In fact it is only partially possible. As a result some (or all) of the curves may lie at various distances to the right of the point of tangency, leaving monopoly profits scattered throughout the group—and throughout the price system (p. 113).

It will be observed that the theory of monopolistic competition now contains no conditions of equilibrium, only a definition of equilibrium.

As a result, in the general case we cannot make a single

[1] "The difficulties of representing graphically the variation of 'product' render hazardous any attempt to define with precision the exact point of equilibrium. It would seem that the most that can be said is that it will be characterized by (1) the equation of cost and price, and (2) the impossibility of a 'product' adjustment by anyone which would increase his profits" (p. 97). This, of course, is a statement of the problem, not of its solution.

statement about economic events in the world we sought to analyze. It is true that many such statements are made by Chamberlin, but none follows rigorously from the ambiguous apparatus. All of the definite comparisons with competition, for example, are made when there is uniformity and symmetry.[1] Indeed even these comparisons rest upon the further and technically inadmissible assumption that the cost curves of a firm will be the same under competition and monopolistic competition, although there is no presumption that the size of the " group " will be the same in the two situations if they really differ.[2]

And so the first attempt has failed.[3] Professor Chamberlin did not reduce his picture of reality to a manageable analytical system.

2. The Second Attempt: Chamberlin-Triffin

In the course of time and controversy, Professor Chamberlin indicated the probable desirability of abandoning the concept of the group, which in his system was, after all, an anachronistic vestige of neo-classical economics. When discussing the closely related concept of entry of new firms (into a group), he said:

> The upshot of the matter seems to be that the concept is not very useful and is even seriously misleading in connection with monopolistic competition. It is, in reality, a concept usually related to a market for a definite commodity, and the fundamental difficulty is that there is no such commodity under monopolistic competition beyond that produced by an individual firm (p. 201).

[1] This is recognized in a footnote (p. 78 n.), where it is said that if there is not tangency, the monopolistically competitive output of the firm may exceed the competitive output. This is held to be an unimportant exception because of " considerations introduced below in connection with the group problem." In the group discussion, under symmetry and uniformity, the footnote is recalled (p. 88) but not elaborated. The exception is forgotten when diversity of costs and demands is reached, although tangency of cost and demand curves has now vanished, and with it the improbability of the exception.

[2] The neglect of cost differences is justified on two grounds. (1) Many industries are constant cost industries—a result borrowed from Marshallian analysis, for which there is no presumption in the Chamberlin group. (2) The belief that even with increasing or decreasing cost industries, " the divergences from the norms of purely competitive theory are always of the same sort " (p. 87). This belief is without foundation.

[3] I pass over the theory of selling costs because my subject is monopolistic competition, not the economics of Professor Chamberlin. Selling costs played only one rôle in the discussion that we need notice: their existence was adduced as a criticism of the theory of perfect competition, for none would be needed with perfect knowledge. Professor Chamberlin was right in concluding that perfect competition is a poor instrument in analyzing selling costs. His results might have been more informative, however, if he had chosen to drop the assumption that the economy was stationary, rather than the assumption that the economy was competitive.

But he does not follow this line of thought to its conclusion :

> It is not meant by this argument to discard completely the concept of an " industry." In many connections, it is obviously useful to delimit a portion of the economic system and study it in some degree of isolation from the rest. And if this can be done, although entry is never " free," it is not wholly without meaning to speak of the *relative* ease with which this particular field may be entered, in the sense of the relative ease with which substitutes for the particular products which compose the " industry " may be produced. One emerges from any attempt to classify industries, however, with a feeling that it is all exceedingly arbitrary. The " common sense " definitions of industries in terms of which practical problems are likely to be studied seem to be based much more upon technological criteria than upon the possibility of market substitution (p. 202 n.).

Except for the last sentence, which is an indirect admission of the entire Marshallian system,[1] the tenor of the argument is that the group must go.

This is a most baffling state in which to leave the theory of monopolistic competition, for we recall that the theory differs from that of monopoly only in containing a group equilibrium. " As for monopoly, *as ordinarily conceived and defined*, monopolistic competition embraces it and takes it as a starting point " (p. 68, not in first edition). But if the group is suspect, if at best it is a notion " not wholly without meaning," the theory of monopoly seems to be also the final destination.

It was left for an able disciple, Dr. Robert Triffin, to carry the purification of the technique a step farther, in his *Monopolistic Competition and General Equilibrium Theory* (1940). He succeeds in making the analytical apparatus portray faithfully the original picture of variety and unsystematism. Costs, demands, and hence profits of each firm are functions of all prices in the economy, i.e. profits of firm $i = \phi (p_1, p_2, \ldots, p_n)$, where n is very large. The firm will maximize profits, subject to the usual uncertainties of oligopolistic situations—that is, it will equate marginal revenue and marginal cost.

And what of the group ? It must go, for it is inconsistent with the fundamental vision. " In the general pure theory of value, the group

[1] This last sentence is even more remarkable in the original article of which the above quotations are revisions : " It seems much easier and more defensible to set up classifications based upon technological criteria than upon the possibility of market substitution." (" *Monopolistic or Imperfect Competition ?* " Q.J.E., LI (1937), 568 n.)

and the industry are useless concepts" (p. 89). "Product differentiation robs the concept of industry of both its definiteness and its serviceability" (p. 188). How, then, are we to analyze the interrelationships among firms? Apparently we cannot; Dr. Triffin's chapter (III) on the theory of external interdependence consists only of an elegant classification of types of interdependence.

Dr. Triffin does not fail to draw the conclusion that monopolistic competition has nothing to say of the interdependence of firms; this silence is indeed hailed as an advance over the Marshallian theory (p. 189). The basis for this claim deserves our attention. Dr. Triffin visualizes the discipline as composed of two very different types of studies: the "general pure theory of value"; and the investigation of concrete economic problems—for example, the New York housing problem:

> Is anything gained by limiting the investigation to a group of close competitors, which we would call a group or industry? In an empirical, statistical study, yes: we can, in this way, reduce to a manageable size the research work involved, without any serious loss in precision or exhaustiveness. In the general statement of value theory, no: when competition is discussed in general abstract terms, we may just as well make the group (or industry) coextensive with the whole economic collectivity. The problems are the same, and the complexity is no greater.
>
> In other words, the value of these groupings is only a concrete, empirical one: it is never useful to speak of "industries" or "groups" in a general, abstract way, but it may be very helpful to speak of the oil industry, the coal industry, the steel industry, etc. (p. 88).

And in his conclusion, Dr. Triffin goes on:

> Instead of drawing its substance from arbitrary assumptions, chosen for their simplicity and unduly extended to the whole field of economic activity, our theory may turn to more pedestrian, but more fruitful methods. It will recognize the richness and variety of all concrete cases, and tackle each problem with due respect for its individual aspects. More advantage will be taken of all relevant factual information, and less reliance will be placed on a mere resort to the pass-key of general theoretical assumptions (p. 189).

I would emphasize the separateness of these two types of economic analysis in Triffin's view of economics: there is neither substitution nor complementarity between the general theory and the specific economic investigation. The theory has nothing to learn from the study of specific problems because these problems

are so diverse that no single inductive generalization is possible.[1] Conversely the study of specific problems has nothing to gain from the general theory, for the theory can provide no apparatus to raise relevant questions, to indicate relevant types of facts, or to guide the economist in handling the facts to reach useful conclusions.

This is a fundamentally mistaken rôle to assign to general theory. The study of economic theory is not defensible on æsthetic grounds—it hardly rivals in elegance the mathematics or physics our sophomores learn. The theory is studied only as an aid in solving real problems, and it is good only in the measure that it performs this function. Dr. Triffin's advice is fundamentally to give up theory, " to tackle each problem with due respect for its individual aspects." Chamberlin's picture of reality has finally led, when consistently followed, to the familiar reaction : *ad hoc* empiricism.

3. The Reasons for Failure

Professor Chamberlin's failure to construct an analytical system capable of dealing informatively with his picture of reality is not hard to explain. The fundamental fact is that, although Chamberlin could throw off the shackles of Marshall's view of economic life, he could not throw off the shackles of Marshall's view of economic analysis. Marshall's technique was appropriate to the problem set to it : it deals informatively and with tolerable logic with the world of competitive industries and monopolies. But it is lost in the sea of diversity and unsystematism, and Chamberlin is lost with it.

Dr. Triffin's failure, on the other hand, seems to me attributable to his attempt to make the general theory an accurate description of all reality. It is as if an artist is commissioned to paint the picture of a typical skyscraper : and since skyscrapers are thick and thin, of variable height, of differing colours, with various architectural designs, his painting must be blank because it would violate reality if it contained a single identifiable detail. Dr. Triffin should have been warned by the Walrasian theory of general equilibrium he sought to generalize. This theory proved to be relatively uninformative, even when it had as many equations as unknowns; it

[1] Thus, after Dr. Triffin examines freedom of entry, he concludes, " Which type of entry prevails in any particular case is to be ascertained and ' explained ' by an investigation of the facts. Analytical reasoning is powerless to deduce the answer from general, universally valid assumptions " (p. 123).

was not likely to gain in usefulness when the unknowns were multiplied and the equations reduced.

4. Concluding Observations

I wish to close by offering an estimate of the net contribution of the attempt to construct a theory of monopolistic competition. Before undertaking this appraisal, however, it is necessary to set forth certain methodological principles.[1]

The purpose of the study of economics is to permit us to make predictions about the behaviour of economic phenomena under specified conditions. The sole test of the usefulness of an economic theory is the concordance between its predictions and the observable course of events. Often a theory is criticized or rejected because its assumptions are "unrealistic." Granting for a moment that this charge has meaning, it burdens theory with an additional function, that of description. This is a most unreasonable burden to place upon a theory: the rôle of description is to particularize, while the rôle of theory is to generalize—to disregard an infinite number of differences and capture the important common element in different phenomena.

But this line of argument grants the ungrantable: it is often impossible to determine whether assumption A is more or less realistic than assumption B, except by comparing the agreement between their implications and the observable course of events. One can but show that a theory is unrealistic in essentials by demonstrating that its predictions are wrong.

Should monopoly or competition be used to analyze the New York housing market? The answer is: both. If we are interested in the effects of rent ceilings and inflation, the theory of competition provides informative predictions. If we are interested in why one location rents for more than another, the theory of monopoly may be an informative guide. Different theories, each with its particular assumptions, can be applied to the same phenomena to answer different questions.

These remarks are especially relevant to the theory of monopolistic competition. A good deal of the support for this theory stems from the mistaken demand for correspondence between

[1] The present interpretation of these principles is due to Professor Milton Friedman; see Talcott Parsons, *The Structure of Social Action*.

" reality " and premises. The theory is further supported by the erroneous view, for which Professor Chamberlin bears some responsibility, that if the premises of competitive theory depart (in a descriptive sense) from the facts, the implications of that theory must be wrong.[1]

This leads me to the specific contribution of the theory of monopolistic competition : the analysis of the many-firm industry producing a single (technological) product under uniformity and symmetry conditions, but with a falling demand curve for each firm. Chamberlin's analysis of this particular situation is essentially correct, and many economists appear to wish to incorporate it into neo-classical theory. It should be incorporated, not if it is a more " realistic " description of industries, but if it contains different or more accurate predictions (as tested by observation) than the theory of competition. I personally think that the predictions of this standard model of monopolistic competition differ only in unimportant respects from those of the theory of competition because the underlying conditions will usually be accompanied by very high demand elasticities for the individual firms. But this is a question of fact, and it must be resolved by empirical tests of the implications of the two theories (a task the supporters of the theory of monopolistic competition have not yet undertaken).

The general contribution of the theory of monopolistic competition, on the other hand, seems to me indisputable : it has led to reorientation and refinement of our thinking on monopoly. We are now more careful to pay attention to the logical niceties of definitions of industries and commodities. We are now more careful to apply monopoly theory where it is appropriate. The importance of the trade mark and of advertising, and the need for study of product structure and evolution, have become more generally recognized. These and other improvements may seem disappointing to the hopeful proposers of a proud new theory, but they should not be. This is the way sciences grow. One of the prominent lessons of the history of human thought is that new ideas do not lead to the abandonment of the previous heritage ; the new ideas are swallowed up by the existing corpus, which is thereafter a little different. And sometimes a little better.

[1] " In all of the fields where individual products have even the slightest element of uniqueness, competition bears but faint resemblance to the pure competition of a highly organized market for a homogeneous product " (p. 9).

THREE

THE CLASSICAL ECONOMICS: AN ALTERNATIVE VIEW

IT should be a cause for self-congratulation, no doubt, that we modern economists find so little to learn from the classical economics. In our apprenticeship we are still sent back to read Smith, with pleasure, and Ricardo, with torment, and Mill, with less predictable feelings. But the classical economics seems now to have become some sort of substitute for the classical languages. We may or may not acquire erudition, but usually we acquire the conviction that we can learn little about our working technique from the classical economists.

For how little those venerable men knew. They did not know of marginal revenue and marginal cost, of marginal product and marginal propensity, of marginal utility and marginal rate of substitution. They did not know that one can draw economical diagrams, although Descartes had long been dead, nor that one can distil the essence of economics in the heat of the differential calculus, although Newton and Leibnitz had long before done their work. Nor were the deficiencies merely terminological and expositional. The classical economists did not know that one must analyze the firm and the household, nor that the demand curve is terribly important. They did not even know that competition is imperfect, and that monopolists do not charge all they may. How far we have progressed!

Or have we? At first blush, this question is surely facetious. After all, we have read the classical economics, and found not in their treatises the subjects which dominate modern economics. But that word "treatises" should give us pause. We know that if we were to write a history of economic research from the tracts on methodology, it would be an amusing exercise in hypothetical history. Pareto would be noted for his inductive studies, and Jevons for his mathematical economics. Most of our theories would be due to the economic historians, and most of our historical researches to the theoreticians. The discrepancies between pronouncements and practice are notorious in the field of methodology; can it not be so

also in the theory of value? In writing their treatises, may not the classical economists have employed an apparatus which is different, and in modern eyes inferior, to that which they employed to analyze concrete problems? I shall argue that this is indeed the case.

I shall illustrate this, we may call it working, technique of analysis of the classical economists by way of reproducing a full-scale sample of it. Such an example leads me into a topic that has no substantive relevance to my theme, but it is fundamentally more economical and convincing than a collection of quotations with explanations of context. Thereafter I shall indicate a more general type of proof of my theme and seek the explanations for the differences between formal principles and working techniques.

1. Senior and the Hand-Loom Weavers

The more skilled of the weavers had been among the aristocracy of the labour force in the eighteenth century, and toward its end the prosperity of the entire weaving industry had been exceptional. Let me quote a contemporary's recollection, no doubt too pretty, of the weavers' high estate:

> The Spitalfields Mathematical Society is second in point of time to the Royal Society, and still exists. There was an Historical Society, which was merged in the Mathematical Society. There was a Floricultural Society, very numerously attended, but now extinct. The weavers were almost the only botanists of their day in the metropolis. . . . There was an Entomological Society, and they were the first entomologists in the kingdom. The society is gone. They had a Recitation Society for Shakespearian readings, as well as reading other authors, which is now almost forgotten. They had a Musical Society, but this is also gone.[1]

Dolland left the loom to invent the achromatic telescope, and Simpson wrote his treatise on fluxions while still a weaver. Nor was the life of the weaver and his family a monotonous diet of labour and culture:

> Monday was generally a day of rest; Tuesday was not severe labour; Saturday was a day to go to the warehouse, and was an easy day for the weaver. In those times we could afford to have balls, and to go and spend money at fairs; and we could afford to take our wives and families to a tea-garden; . . . (p. 218).

[1] Testimony of Edward Church; Reports from Assistant Hand-Loom Weavers' Commissioners (*Parliamentary Papers* 1840, Vol. 8), pp. 216-17.

(Is it a macabre imagination that is reminded of the life of a college professor ?)

After the Napoleonic Wars, when the power loom (invented in 1787) began to be introduced on a large scale, the weavers' position fell rapidly. By 1835 a Select Committee concurred with one witness :

> That a very great number of the weavers are unable to provide for themselves and their families a sufficiency of food of the plainest and cheapest kind ; that they are clothed in rags, and indisposed on this account to go to any place of worship, or to send their children to the Sunday schools ; that they have scarcely anything like furniture in their houses ; that their beds and bedding are of the most wretched description, and that many of them sleep upon straw ; that notwithstanding their want of food, clothing, furniture and bedding, they, for the most part, have full employment ; that their labour is excessive, not unfrequently sixteen hours a day ; that this state of destitution and excessive labour induces them to drink ardent spirits to revive their drooping powers and allay their sorrows, whereby their suffering is increased ; . . .[1]

In the first year of her reign, Victoria appointed a Royal Commission to discover the condition of the unemployed hand-loom weavers and " to report whether any, and if so what measures could be devised for their relief."[2] The four commissioners were Nassau Senior, William E. Hickson, Samuel J. Loyd (Lord Overstone), and John Leslie ; Senior was apparently the chief draftsman of the final report.[3] Finding few wholly unemployed weavers, the Commissioners obtained permission to study the general position of the hand-loom weaver, and appointed a number of assistant commissioners to make detailed field studies of the weavers in various localities and branches of the industry. Their reports, published in 1839 and 1840, provided a wealth of material and confirmed the fact that the weavers were in pitiful circumstances—working seventy hours a week when they worked at all, living in hovels, often literally starving on a family income of as little as six shillings a week.

I shall paraphrase much of the admirable final report in a more modern patois. It would be tedious to quote at great length, constantly interspersing comments and explanations. I shall be a sympathetic reporter, but not, I hope, an unreliable one.

[1] Testimony of John Fielden ; Report from the Select Committee on the Hand-Loom Weavers' Petitions (*Parliamentary Papers*, 1835, Vol. 13), p. xi.

[2] The report of the Commissioners on the Hand-Loom Weavers (*Parliamentary Papers*, 1841, Vol. 10), p. iii.

[3] See M. Bowley, *Nassau Senior*, p. 258.

The report of the commissioners sets forth first an analysis of the causes of the weavers' plight, and then examines a series of proposed remedies. The causes are divided into those affecting demand and supply respectively, and we follow their classification as well as their arguments in what follows.[1]

The Demand for Weavers

In the short run, the demand for weavers making specialized fabrics is governed by the vagaries of fashion (p. 23). Wages are usually high when a new fabric is introduced :

> The absence of competition enables the manufacturer to obtain a high profit, and induces him to extend his operation, and to bribe workmen into his service by an increase of wages. But this prosperity carries in itself the seeds of an early decay. Other capitalists and other workmen press into the new employment ; it becomes the interest of each manufacturer to reduce the price of the commodity in order to extend its sale, and the interest of each workman to accept lower wages as long as those wages exceed, in the least, the average wages which he could obtain for his labour in any other employment ; until at length the price of the commodity, the profits of the manufacturer, and the wages of the workman sink to their natural level (p. 23).

The short-run changes in the demands for large classes of weavers, on the other hand, follow the state of business—those " constant alternations of prosperity and adversity " (p. 18). Especially those branches of the weaving industry that work on expensive luxuries (the silks in particular) suffer acutely in each depression, for when consumers' incomes fall, their purchases drop more than proportionately (p. 23). In the weavers' short-sighted view, the periods of prosperity seem more than to compensate for those of unemployment (or, as they term it, of " play "), so the instability of earnings attracts men and lowers average earnings (p. 24).

The wage offered to any large class of weavers is governed largely by the competition of other classes—producers in other areas, and more fundamentally, producers using other techniques. The manufacturer is in a highly competitive industry : he has innumerable

[1] The weaver usually works in his own cottage, assisted by his wife and children of less than marriageable age. The material is supplied by the manufacturer or putter out, and the cloth is purchased by him. The earnings of a weaver are a composite of wages and return on the loom. But the loom is cheap—it (and a room) can be hired for as little as a shilling a week—so we may properly speak of the earnings as wages.

rivals, his margin is small, and his cloth must compete on the basis of price with that of his rivals (p. 24). Thus necessity joins desire to drive him to employ the cheapest method of getting the work done :

> His interest as a tradesman must always force him to use the instrument which is least expensive, in proportion to the effect produced . . . (p. 24).

For hand-loom weavers as a group, the power-loom is of course the great rival. Its introduction has been gradual—it was first used in woollens about twenty years ago, and there it is still far outnumbered by the hand-loom ; but in cottons and silks the substitution has gone far (p. 24). The power-loom is also being introduced extensively in Europe and the United States (pp. 28-30). For reasons we shall notice shortly, however, the hand-loom weavers refuse to move to the factory although they can usually earn more by doing so (p. 5).

> They are forced, therefore, to offer their services at a rate of wages which render them rather cheaper than those of the power-loom ; and which can continue only until some further improvement shall again have made the power-loom a successful rival, and the hand-loom can be kept at work only at a still further reduction : and thus the unequal race continues, until the hand-loom weaver, finding the united wages of himself and his family unequal to support life, is gradually ground out of the market, and forced to endeavour to find some other employment (p. 25).

The widening adoption of the power-loom is the decisive cause of the decline in the demand for weavers.

The Supply of Weavers

We find, then, that the demand for the services of the hand-loom weaver has declined greatly, and that the future holds promise of further large declines. The only remedy for their condition is " that a portion of them should transfer their own labour, or at least that of their children, to better-paid occupations " (p. 38). Before we examine the reasons why this transfer has not come about automatically, it is well to distinguish between the various classes of hand-loom weavers. They may be divided into four classes, varying with the chief requirement of their work :

1. Little strength or skill. The narrow fabrics, of coarse material and simple design, can be produced by almost anyone. Earnings

are therefore very low—perhaps 5 to 7 shillings a week net per adult labourer.

2. Moderate skill. The fabrics are of more intricate design and finer material, and wages are correspondingly higher—usually 8 to 15 shillings a week.
3. Strength. The heavy and coarse work—blankets, carpets, sail-cloth—commands even higher a reward than moderate skill. Earnings range from 12 to 20 shillings a week. Because of the steadiness of the demand, this type of weaver earns more per year than any other group.
4. Strength and skill, or unusual skill. The finest products—waist-coat velvets, brocaded tabinets—yield wages of 20 to 30 shillings a week. But the demand is very unsteady (p. 18).

It is primarily the weavers in the first and second classes, numerically preponderant and in wretched circumstances, to whom we address attention.

The explanation for the failure of the weavers to leave as the demand for their services falls lies in three characteristics of the trade. The first characteristic is the pleasantness, flexibility, and independence of the weaver's mode of life. He works in his own home, he may set his work aside when he will, and complete it by working more intensively at another time, he is free of the discipline and confinement of the factory, and he associates throughout the day with his family (pp. 38-9).

The second characteristic is the profitability of employing children :

> But as each child becomes successively capable of profitable employment, it is so employed—in many branches of hand-loom weaving at the age of six years, or even younger. Of course this precocious employment is injurious to the intellectual and moral education of the child. . . . Such a state of things produces a rapidly increasing population, confined by ignorance, by habit, and generally by poverty—chains as strong as those of caste in Hindustan—to their own occupation (p. 44).

The weaver can thus eke out an existence, which may even attain a low level of decency, from the date when the oldest child is 10 to the date when his youngest is 18 or 20, but only by brutalizing his children and bequeathing to the next generation a still lower level of life, even were there no further inroads by the power-loom.

These attractions of the loom are reinforced by another factor : combinations of workmen. Such combinations are not very important or effective in weaving, in part because the weavers of

one community merely invite unemployment by high wage demands, in part because the weaver cannot strike against a capitalist—he is himself the owner of the machine (pp. 32-8). But the combinations in other trades are very powerful. They set minimum wages, refuse to work with non-union men, limit their numbers by apprenticeship requirements, practise limitation of output, and prevent the discharge of incompetent workmen (pp. 31-2). The weavers should be abandoning their trade for these more prosperous occupations, but they are directly and indirectly prevented from entering them (p. 38).

The Remedies for the Weavers' Situation

The only ultimate remedy for the weavers' situation is a decrease in the number of weavers relative to the demand. An increase in the demand for weavers will be only temporarily beneficial if the supply increases again to press down their earnings (p. 49). But an increase in demand will be helpful if it is supplemented by measures to reduce, or at least prevent further increases in, the number of weavers. We shall discuss the various proposals to help the weaver under three headings : increase or stabilization of demand ; reduction in the cost of living ; and reduction of the number of weavers.

Increasing and Stabilizing Demand

Four proposals have frequently been made with a view to increasing or stabilizing the demand for weavers :

1. The establishment of " Boards of Trade " to set legal rates of wages for weavers. Since the minimum wage would increase the cost of fabrics and therefore decrease the number of weavers employed, but through the increase of nominal wages encourage additional labourers to enter the occupation, the fundamental problem—the excessive number of weavers—would simply be exaggerated. Hence we need not discuss such further weighty objections as : a uniform wage is inappropriate to varying regions and circumstances, it would encourage foreign competition, and it would be difficult or impossible to enforce (p. 49).

2. A tax on power-looms. This tax would obviously injure consumers and weavers employed on power-looms. These weavers are better paid, so to drive them back to the hand-loom would

simply widen the area of distress. Moreover, foreign competition would be encouraged (pp. 50-1).

3. A tax on imports of fabrics. We cannot export unless we import, and the gains of an import duty appear to be greater than the losses merely because the former are concentrated and the latter diffused. Nor would the hand-loom weaver's loss from an import prohibition be wholly indirect: woollen goods alone amount to a tenth of our exports (p. 51).[1]

4. Improvement of patterns. The French are now vastly superior in producing figured silks, ribbons, printed cottons, etc. To improve the competitive position of our English producers, we recommend the establishment of schools of design (pp. 79-82) and the extension of copyright protection from the present period of three months for most printed cottons, calicoes, etc., to twelve months (pp. 82-8).

Reducing the Cost of Living

The corn laws have usually been blamed by the weavers as a chief cause of their distress. This is not a correct diagnosis: as we have argued, the chief causes are the competition of the power-loom and the conditions of supply of weavers (p. 64). But the corn laws do bear especially hard on the weavers for two reasons:

First, these laws have raised the price of wheat. Any estimate of their effect is conjectural, but a comparison with prices in Jersey and Guernsey (which are duty-free) suggests that the price of wheat has been raised by about 20 per cent. (pp. 64-5). The poorer a family, the larger the proportion of its income it spends on wheat. The weavers, among the poorest of workmen, spend perhaps half of their income on wheat (pp. 53, 61, 65). Hence the corn laws amount to a 10 per cent. income tax on one of the poorest classes in the nation.

Second, we believe that the corn laws are a substantial cause of the violence of our commercial fluctuations. In 1831 we imported 2·3 million quarters of wheat, in 1832, ·4 million quarters (p. 67). We are therefore called upon to make sudden and large exportations of specie, which supports the credit structure on which our economy operates, leading to "a violent shock to credit" (p. 68). The weaver is particularly hard hit, because the poor cannot buy clothes

[1] Indeed, the import duty on thrown silk, which is refunded on re-export of finished goods, should be repealed as an expensive and pointless piece of machinery (pp. 77-9).

when food is dear : " They clothe themselves when bread is cheap " (p. 62).[1]

The conditions of housing of the weavers—and of the urban population at large—are intolerable. The Baltic timber duty, designed to encourage the importation of the inferior but more expensive Canadian timber, is an important contributor to this condition. The duty on Baltic timber doubles its price, and timber is half the cost of building, so the substantial elimination of the duty would reduce by 25 per cent. the cost of housing (p. 75). But we may well have to go much farther—zoning land, establishing limitations on construction and occupancy, etc. (pp. 72 ff.).[2]

Reduction in the Number of Weavers

Any improvements in the demand for weavers or reductions in their cost of living are likely to be dissipated eventually by the increase of their numbers. What can be done to prevent this?

Combinations of workmen are a serious obstacle to the " free use and circulation of labour " (p. 98). A summary of the history of legislation on combinations reveals the complexity of the problem (pp. 98 ff.). So despite our conviction that the evils of combinations are so great as to endanger our society (pp. 117-18), we are content to recommend certain legal reforms designed to increase the mobility of labour (pp. 115-17) and the creation of a Royal Commission to investigate the entire problem (p. 115).

Emigration is a second possibility, and the times are very

[1] We may digress to notice the argument sometimes encountered that a fall in the price of provisions will lead to a corresponding fall in wages. There is little merit in this contention. Rather a fall in the price of provisions may reduce the supply of labour; the weaver's wife and children need not be called upon to the same extent (p. 62). And all evidence is against the belief, which certain unqualified statements of Malthus have encouraged, that eventually the population will increase to force wage rates down (p. 63). Actually the price of provisions more properly depends upon the rate of wages :

> " The labourers constitute in all countries a large majority of the people, and, in all poor countries, an overwhelming majority. Their wages form the great fund out of which the price of provisions must come, and their wages also form the principal element in the cost of producing provisions. Every change in their wages, therefore, has a double effect on the price of provisions. A rise of wages raises the price of provisions by increasing the cost of producing them, and raises it again by increasing the fund for purchasing them " (p. 63).

However, the weavers are in such a low state that the unqualified Malthusian theory has a long run applicability to them unless other policies are also adopted (p. 62).

[2] The report considers also the widespread embezzlement of weft (pp. 89 ff.), and the Colbert-like restrictions on the Irish linen trade (pp. 94 ff.), but we may pass over these minor topics.

favourable for it (pp. 118-20). But it is not a very suitable remedy for the hand-loom weavers: the rate of emigration must necessarily be rather small, perhaps four in a thousand each year; and most weavers are unsuited to follow the agricultural pursuits dominant in the colonies (pp. 119-20).

There remains one basic, but slow-moving, reform: education. Only through education can we instil "activity, intelligence, self-denial, and prudence" in the weavers or in the working classes at large (p. 120). The Factory Act has already recognized the interest of the state in improving the children of our society, but has not implemented this interest. We recommend compulsory education, with adequate financial provision by the state, and the creation of still another Royal Commission to explore this problem (p. 123).

2. The Working Technique and the Formal Theory

This example of economic analysis of a century ago has its imperfections, some of which I have silently reproduced. But perfection is not yet the signature of an economist. On the side of formal analysis, it is abundantly clear that the demand curve is subjected to detailed study, income effects are recognized, the firm-household is the unit of analysis, the law of substitution enters, imperfections of competition are duly examined. On the substantive side, the report ignores no important questions. Modern economists at their best can write somewhat better reports, and usually write inferior ones.

Even if this high estimate of the report be accepted, it may be said that Senior was, after all, an economist of unusual attainments, hardly to be taken as typical of the economists of his time. I should enthusiastically agree. Of course there were economists then, as there are economists now, content to mouth the gospel. (How is it that economic gospel is written by men successful on the exchanges?) When McCulloch, still a faithful disciple of Ricardo, was called to give the Select Committee on Artizans and Machinery the benefit of his knowledge of the effects of prohibiting the exportation of machinery, we find many passages like the following:

> [Joseph Hume] Supposing the French to have cotton machines the same kind exactly as we in England, and that in England they would have to pay £1 wages a week to persons working those machines, whilst the French had only to pay 10s.; what would be the effect of the differences in wages, in the produce of the manufacturers?

[J. R. McCulloch] The effect would be, that profits would be much higher in France than in England ; but no difference whatever would take place in the price of commodities produced in each country, when they went into the market together.[1]

And, McCulloch continued, of course the French would not expand the production of textiles because they would naturally be receiving the same large profits in all lines of investment.

But the analysis of the hand-loom weavers is not exceptional on my reading of the period. I would argue that in price theory, the economists were uniformly at their best (=most modern) where they dealt with concrete problems. Adam Smith's price theory is at its best in that brilliant discussion of British agriculture mislabelled *On the Rent of Land.* Ricardo's price theory is at its best, although still none too good, in his *On Protection to Agriculture.* Conversely, Senior's discussion of the wages-fund in his *Political Economy* does not approach the hand-loom weaver report.

Look at the period from another viewpoint : on what subject do modern specialists find the classical economics most impressive and instructive ? Without question it is money and banking. A whole series of modern scholars—Angell, Gregory, Viner, Wood, and Mints, to name only five extensive explorers of the last twenty-five years—have concurred in the high quality of this discussion. But this was precisely the area of classical discussion that was most directly oriented to concrete problems, from the suspension of convertibility in 1797 to the Act of 1844. Thereafter the urgency of the subject diminished, and with it the quantity and quality of economic discussion.

I assert, therefore, that the technical apparatus of the classical economics was best precisely in those areas, and on precisely those subjects, where the issues were posed by concrete problems of the day. To what is this attributable ? Its explanation has two sides, I believe.

On the one side, a concrete problem almost peremptorily directs economic discussion. No intelligent person can fail to modify and adapt his general position to suit its peculiarities. There are obviously important pieces of evidence, and he must take account of them. They are usually sufficiently numerous and complex and obstinate to render unnecessary and undesirable the invention of

[1] Report from the Select Committee on Artizans and Machinery (*Parliamentary Papers*, 1824, Vol. 2), pp. 596-7.

further difficulties. There are indisputable developments, and his theory must give an account of them. The theorists' eternal, and proper, striving for generality is disciplined by the facts. These, I repeat, are the effects of analysis of concrete problems. The mere currency and interest of a question, broadly posed, are much more likely to generate an especially low level of economic analysis.

On the other side, I should be inclined to argue that most of our modern economics of price was deemed by the classical economists to be pedestrian stuff, inappropriate to a treatise. The problems of the firm and industry are important, they would say—no doubt of it. But they are tolerably well handled by the journalist and the businessman. For us, they would say, there are greater problems: the true basis of value, the laws of distribution of national income, the foundations of national prosperity, the growth and decline of nations. Why should we fuss over the minutiæ of a firm's costs, or over its timid elements of monopoly? These are proper subjects for later, and lesser, men. As for us, we seek the great eternal truths and the laws of history. Pray leave us to our grand pursuit, in which, perhaps, we shall succeed.

FOUR

THE MATHEMATICAL METHOD IN ECONOMICS

MATHEMATICAL economics is riding high. It seems much longer ago than 1871 that Jevons should feel compelled to offer a variety of defences for his primitive symbols, including the designation as mathematical economists of predecessors who had used even numerical examples. Things are very different now. It is the non-mathematical economist who is becoming apologetic. Indeed he is becoming, in some circles at least, a sort of eavesdropper on serious economics, gleaning what instruction he may from the words between the formulas. As one such eavesdropper, I imprudently propose to offer an estimate of the proper rôle of the mathematical method in economics.

Let us set the stage by admiring mathematics. Mathematics is a powerful and a beautiful method of reasoning—it is the poetry of logic. Its flexibility and versatility are extraordinary. It can exhaust the implications of known quantitative relationships and it can often wring much information from only generally defined relationships. Mathematics is indeed the queen of the sciences.[1]

These praises should be set forth emphatically, simply to clear the atmosphere of a good many foolish criticisms of the mathematical method in economics, such as that it is inapplicable because the precise numerical functions are unknown, or economic relationships are too complicated, or some economic magnitudes are not "measurable." It is not a tautology to say that the proper use of mathematics never hurts an economic analysis and often improves it.

Because mathematics is the premier language of logic, it is a method: a method of drawing exact deductions from given premises, and of verifying the logical consistency and adequacy of the premises. It follows that mathematical economics is a thing without content. Economics may be divided into various more

[1] The layman's appreciation of mathematics must necessarily be based upon authoritative hearsay; I have found R. Courant and H. Robbins, *What is Mathematics?* especially illuminating.

special disciplines, but surely only the substantive bases for classification have any usefulness. The χ^2 theory provides another tool of research, but we should all revolt at the thought of χ^2 economics. History is another eminent resource of the economist, but we have all revolted against historical economics. A classification of branches of economics by method is not even clear-cut: our most mathematical economists make frequent use of words and occasional use of empirical material.

Having lavished great, but only proper, praise on mathematics, I wish to examine its proper rôle in economics. I am not very interested in specific topics, such as the recommendation of Marshall that mathematics be used for the intensive study of narrow problems, of Pareto that it be used in problems of mutual determination, of others that it be used to study time processes, functions of several variables, etc. These recommendations seem to me only expressions of personal preference. Where a particular economist uses mathematics will and should depend upon his knowledge, his problems, and his inclinations. Rather, I wish to explore special claims for the mathematical method, claims that transcend its admitted power and usefulness.

The greatest claim that can be made for the mathematical method is that it necessarily leads to good economic theory. Rarely, if ever, is so bold a claim made explicitly, but there are implicit positions that come close to it. G. F. Shove, in his excellent centenary essay on Marshall, seems to have taken this position when he explained the theoretical skeleton of the *Principles* as the product of Ricardo's theories and Marshall's differential calculus. He says, after summarizing certain gaps in the classical system,

> All these gaps (except perhaps the second) would leap to the eye of anyone trying to "translate" Ricardo's doctrines into differential equations and to "make them more general."[1]

We know that this is not true: the *Principles* is the product of Marshall's magnificent brain, not of his calculus. Had not William Whewell—also a second Wrangler—restated Ricardo's doctrines in symbols—to produce one of the lesser works in the history of economics?[2] Mathematical training will not turn a mediocre

[1] "The Place of Marshall's Principles in the Development of Economic Theory," *Economic Journal*, LII (1942), 299.

[2] "Mathematical Exposition of Some Doctrines of Political Economy," *Cambridge Philosophical Transactions*, Vol. 3, 4, 9.

economist into a great economist—a statement most mathematical economists will immodestly accept.

The second claim is that mathematical exposition has an inherent clarity. Even when the mathematical economics is wrong (and it is not an indictment of a method that it can be misused), it is clearly wrong and eagerly invites correction and improvement. Thus Samuelson says :

> . . . it is demonstrable from the literature that symbolic methods have been an aid to clear thinking and the advancement of analysis. For those who used this abstract language were forced to formulate their concepts unambiguously, and so the way was opened for modification and qualification.[1]

This widely held belief is reminiscent of Poisson : mathematics has no symbols for confused ideas.

The belief, however, has neither historical nor logical foundation. N. F. Canard is the only mathematical economist, I believe, to have won a competition under the auspices of the French Institut. He begins his explanation of the theory of price by asserting that there is necessarily a difference between the price demanded by sellers in a market, and the price offered by buyers. He proceeds :

> Let L be this difference, x the part of the difference that the sellers wish to add to the lowest possible price, $L-x$ the portion that the buyers wish to save ; and let B be the need of the buyers, N their competition, b the need of the sellers, and n their competition. It is evident that the portion x of the difference paid by the buyers will increase in proportion to their need and their competition ; x is therefore composed of B and N, and increases as BN. For the same reason, the other part $L-x$ will increase as bn, so one has the proportion :
>
> $$x : BN :: L-x : bn,$$
>
> which yields the equation
>
> $$bnx=BN\,(L-x).$$[2]

The symbol x has not lost its power to represent an ambiguous idea : in contemporary mathematical analysis of utility it serves for both the quantity of a commodity consumed and the quantity purchased ; and a single utility function seems to serve equally well for the individual and the family.

The Poisson view is objectionable not merely because it is untrue, but because it is almost the opposite of the truth. It is an

[1] *The Foundations of Economic Analysis*, p. 92.

[2] *Principes d'économie politique* (1801), p. 29.

insulting restriction on the usefulness of mathematics to credit it with the ability to deal only with clear concepts. The history of science gives us good reason to believe that every concept of modern science will be found to be ambiguous at some future time. Therefore a snobbish mathematics would be unusable at present. It is as if one were to assert that language is only for the expression of pure thoughts : we have also mathematical pornography.

This claim may be restated more conservatively : the mathematically trained economist states his concepts more clearly, on average, than the unmathematical economist. I suspect that in this more plausible version the claim is ambiguous : clarity may be confused with familiarity or susceptibility to logical manipulation. But even if the concept of clarity can be clarified, it is difficult to conceive of a method of testing the claim ; it seems necessary for each person to accept or reject it on faith.

The next claim I wish to examine is that in certain types of analysis, the mathematical method is indispensable. Without mathematics, one can give only an intuitive proof of complicated relationships, such as those expressed by Euler's theorem, Slutsky's equation, the theory of general equilibrium, and certain theorems in the theory of games. This claim must be conceded. It is not a sweeping claim : it does not say that complicated theorems cannot be invented without the mathematical method, nor does it say that complicated theorems cannot be understood without mathematical knowledge. But it is a substantial claim : there are types of economic analysis, some of which even the non-mathematical economists have deemed important, that can be executed more swiftly, more surely, and more completely with the mathematical method.

And now I turn to the most important claim for the mathematical method : that the topics involving complicated formal reasoning are so numerous and important and pervasive in economics that mathematics is virtually indispensable and should therefore be a part of every competent economist's equipment. Even if it is possible, it is certainly foolish to be a non-mathematical physicist, and the same thing is true of economics. As a corollary, mathematics is the suitable language for communication among economists.

At present this claim cannot be judged conclusively : one's decision must turn on his view of the proper nature of economic research in our times. I personally reject the claim, the analogy to

physics, and the view that mathematics become a mode of communication among economists. Here are my reasons :

Economics has for its purpose the discovery and demonstration of routines or uniformities in economic phenomena, so that ultimately one may forecast the movements of the phenomena under specified conditions. Economics is still a primitive discipline as compared with the more advanced of the natural sciences in that it possesses relatively few tested uniformities of economic phenomena. This primitive state is revealed by the lack of specificity and of accuracy of economic predictions. The chief reasons for economics' undeveloped state are that the objective study of economic phenomena began relatively recently, and the phenomena to be explained are in their totality very complicated.

In the present early stage of economic study, the economist as scientist must be largely occupied with the isolation of these uniformities in his subject matter. (This view has implications for the type of research that is most urgently needed, but it has none for the impossible choice between " deduction " and " induction.") Until we possess many uniformities, we cannot erect broad analytical systems which are likely to be illuminating in the areas where uniformities have not yet been isolated. This is true because it is a variety of uniformities calling for systematization that gives rise to a useful analytical system ; with only a few uniformities, too many plausible (but vague and conflicting) generalizations are at hand. Thus, we cannot hope to achieve a useful general theory of business cycles, if our only uniformities are that outputs of durable goods fluctuate more widely than those of perishables, and prices and employment fluctuate with durable goods. The economist as a scientist is where the physicist was when he was discovering the properties of the lever, not at the stage when he was discovering the laws of motion.

The economist as political adviser may feel the need for acting on a larger and livelier stage, but on this stage his effectiveness will depend chiefly upon his unsystematized knowledge and intuition—his judgment, if you will—and very little upon his scientific knowledge.

In this early stage of scientific economics, the mathematical method is not very important : there are not enough established economic uniformities to permit of useful generalization on the grand scale. Verbal methods of reasoning can still solve most

problems efficiently and economically : surely one need not argue the proposition that verbal reasoning can also be extremely subtle and complicated and rigorous—and even beautiful. It is for this reason that we are able to find among the leading economists of our generation a large number of wholly non-mathematical economists.

Hence I conclude that mathematics is not indispensable. It is useful, and so is formal statistics, and so is knowledge of foreign languages, and so is knowledge of other disciplines. The study of mathematics is a most desirable part of one's education, and so are the other disciplines ; none can yet make a claim to special recognition in economics. Which is most useful still depends upon the man and his problems.

And so I return to the original proposition : properly applied, a knowledge of mathematics has value. But this is only part of the story. If mathematics is the queen of the sciences, the mathematical economist is seldom a prince consort. There are certain psychological, not logical, limitations of the mathematical method that deserve attention.

These difficulties stem from the imperfect mastery of mathematics ; they may be emphasised by a comparison of the language of symbols with that of words. Relatively speaking, we are all masters of words by the time we begin the practice of economics. For a quarter-century or more we have been talking words, writing words, and reading words, so mechanical command of the means of communication has become almost second nature. We are therefore able, within limits that are still distressingly narrow, to disassociate the form from the content, and thus to maintain a partially objective attitude toward the content.

With symbols it is otherwise. Our acquaintance has been limited to a much shorter period, and confined to the class-room and the study. We do not speak symbols at breakfast, or read them in the newspaper, or propose to the lady by formula. A few persons, by their specialization and aptitudes, secure that command over mathematics that makes it also a second nature—they hesitate only so long at a step in a proof as we in selecting a word. But they are mathematicians, not economists.

This imperfection of command of mathematics by the economists could be documented in various ways. The most direct would be to reproduce the views of professional mathematicians on the degree of rigour and grace they find in mathematical economics, but I do

not wish to take this path. It is unnecessary, and merely panders to a low, if almost universal, taste. It is amazing how delighted a non-mathematician is to hear that a prominent mathematical economist is no great shakes as a mathematician. Surely the non-mathematician has no proper cause for rejoicing: he is even less adept with a tool that is indisputably useful.

A second method of documenting the imperfection of command of mathematics is to observe the frequency with which form is confused with substance in mathematical economics. Often the confusion is transparent, as when we encounter the statement, "I shall prove this result in three ways." But this type of preoccupation with form is so evident as to be innocuous.

It is a more serious matter when preoccupation with form leads to errors or ambiguities of substance, as it has with even the most outstanding economists. What section of Marshall's *Principles* is most mathematical in origin and form? Surely his theory of utility. But this is precisely the part of the *Principles* that is definitely wrong—not out of date, or incomplete, but internally inconsistent. Or take a more recent example. What part of Keynes' general theory is most clearly Keynes the twelfth Wrangler: surely it is his theory of the multiplier. And again, it is the fuzziest part of his theory.

Or view mathematical economics more broadly: what are the areas in which it has held sway? They have been utility and monopoly and duopoly, and more recently, macro-economics and economic dynamics. It is too soon to pass on the more recent writings, but it is not too soon to characterize the huge literature on utility and oligopoly as one of the least profitable portions of economic discussion. The measuring and unmeasuring of utility and the determination of what A will do if he knows that B believes that A believes that B is a Cournot duopolist are exacting problems in form; it is not apparent that they have economic substance.

Because the mathematical method is so powerful and beautiful, and its possession still sufficiently rare to command distinction, the mathematical economist is under constant temptation to use it just for the sake of using it. Cournot, one of the very greatest of the mathematical economists, begins, "I have put aside questions, to which mathematical analysis cannot be applied. . . ."[1] This method of choosing problems is doubly and pathetically wrong. It is wrong,

[1] *Researches into the Mathematical Principles of the Theory of Wealth*, p. 5.

first, because almost always the economist has a very limited command of mathematics and must therefore limit severely or contort the problems he examines. Perhaps he must avoid the study of stocks of goods—he does not know the theory of integral equations; perhaps he must assume that time processes move smoothly—he had only the beginning course in differential equations. It is wrong, second, because mathematics, for all its vast power, is dreadfully weak when alone. It cannot answer so simple a question as whether a locomotive has a higher cost of production than a toothbrush, or whether monopolists usually seek to minimize profits.

How can these psychological pitfalls of the mathematical method be avoided? There are three obvious possibilities.

First, economists can abandon mathematics entirely. This choice cannot appeal to a real scholar. We should have to abandon every weapon of research—and with them the search for truth—if we retained only those which cannot be abused.

Second, economists can study more mathematics. This choice has merit: by increasing our mastery over mathematics, we can decrease its mastery over us. The increase of mastery over mathematics, however, is not free. The budget equation of the mathematical economist applies also to himself: he purchases mathematical literacy with economic illiteracy. An economist, after all, is not an unemployed mathematician. Each person must decide his preparation for himself, in light of his aptitudes and interests. But he should make this choice with open eyes, and he should not assume that gaps in his non-mathematical training are necessarily easier to fill than those in his mathematical training.[1]

Third, in his publications the mathematical economist can provide along with his equations a translation of his results into words. This solution, I submit, is the correct one.

The translation into words is desirable from the viewpoint of the mathematical economist himself, as I have already argued. It will reduce the hazard that he has fallen in love with the form—the smooth procession of differentials and determinants, of lemmas and dilemmas. He will reduce the possibility that he has solved an unimportant problem but missed a large problem. But this is secondary.

[1] Although the study of mathematics has a substantial alternative cost for the graduate student, the cost would be small or even negative at an earlier stage. Differential calculus would be an admirable replacement of high-school economics and civics.

The fundamental point is that from the viewpoint of the profession, the translation is absolutely necessary, not merely desirable. It is undeniable that the profession contains many very able economists whose mathematical attainments are meagre or less. If the mathematical economist's results are suggestive or useful, these people have a right to know them. If the results are tentative and conjectural, these people have a right to test them. It is the fundamental obligation of the scholar to submit his results and methods to the critical scrutiny of his competent colleagues in a comprehensible fashion.

The mathematical economist can, if he wills, always meet this obligation. Even when the details of the proofs must be shrouded in a fog impenetrable to the non-mathematical economist, the assumptions and the conclusions can always be stated clearly in the language of words, and heuristic derivation of the conclusions is probably always possible.

The failure to provide these translations is a renunciation of the canons of scholarship. The failure may be justly, if harshly, attributed to one of three causes. Laziness. Or snobbishness. Or a sense of shame at the abstractness of the analysis—accompanied by an illegitimate desire to talk of the real world before one has taken into account its central features. These are not good excuses, but I can find no other. The queen of the sciences should not be made a puppet of a scientific oligarchy.

FIVE

COMPETITION IN THE UNITED STATES

I PROPOSE to make an estimate of the relative rôles of competition and monopoly in the industrial organization of the United States in 1939, and to examine the long-term movement of competition. Let us assume that a meaningful and tolerably reliable estimate can be given of the proportion of the American economy that is competitive in organization: of what value is such an estimate?

It is doubtful whether such an estimate serves any direct scientific purpose. There is little presumption that an economy which is 40 per cent. monopolized will be more unstable or inefficient or slower of growth than another economy which is 25 per cent. monopolized: the industrial distribution of the monopolies and their strength and patterns of behaviour are obviously also important variables.

Yet a study of the extent of competition has a certain usefulness, as well as considerable interest. Many people make assertions about the competitiveness of the economy, and of the rise, or, more often, the decline, of competition through time, and usually their views on these questions seem to exercise a material influence on their views of desirable social policy. There is no necessary relationship between one's views on the extent of competition and on the type of economic policy that should be pursued. One can believe that the economy is 99 per cent. monopolized, and still argue for policies designed to revive competition and private enterprise; or one can believe that the economy is 99 per cent. competitive and still argue for syndicalism or socialism. Such positions, however, are not popular. People are prone to favour goals which they believe are quickly attainable, perhaps because they wish to be present when the goals are reached, perhaps because they distrust the competence of other people's progeny. Most economists would probably change their policy views if they were convinced that their appraisal of the relative rôles of competition and monopoly was fundamentally wrong.

I propose, then, first to estimate the extent of competition in the

United States at the end of the nineteen-thirties, and then to discuss in more general terms the trend of competition.

1. Competition in the 'Thirties

(i) *What is Competition?*

The first task is to define the categories into which we wish to classify the endless variety of forms of industrialization to be encountered in the American economy. It is clear that we cannot use the precisely defined categories of pure theory: they are designed to simplify analysis, not to characterize specific industries. There are no examples of perfect competition or perfect monopoly.

The nature of our industrial organization does not lend itself to neat classification. We all attach meaning to the statement that a given firm is a strong or weak monopolist or competitive. In a stationary economy the strength of a monopolist might be measured by the difference between price and long-run marginal cost.[1] If we accept some such measure, then on my view the distribution of industries by monopoly power is skewed like the distribution of personal income. There are virtually no industries in which there is no monopoly power, there are many industries in which monopoly power is inappreciable, and a rapidly decreasing number at each higher level of monopoly power. And if we tentatively accept the ratio of price to long-run marginal cost as the numerical measure of monopoly power, there are few industries in which this ratio surpasses 1·5, and virtually none in which it exceeds (say) 3. On this view, the dividing line between competition and monopoly is not only subjective, which is to be expected, but also has a drastic effect on the proportion of industries classified as monopolies.

Let us try to formulate explicitly the criteria of a competitive industry, as economists generally use this concept for descriptive (and policy) purposes. Either of two conditions must be met by a competitive industry:

1. It must possess a large number of independent firms, none dominant in size, and additional firms can enter the industry.
2. It may possess few firms, or a few firms of relatively large size, but the departures from a competitive situation are not large.

[1] In a growing economy we also tend to attribute to competitive industries an optimum rate of technological advance, but our knowledge of economic growth is so small that this cannot be viewed as more than a plausible conjecture.

> A competitive situation is characterized by price or product competition of the individual firms, leading to approximate equality of price and marginal cost in the long run.

These classes are not logically symmetrical: the former is defined by its industrial structure; the latter by its price and output policies. But the policies of the former group of industries will also approximate a competitive situation, and attention is drawn to the industry structure only as a guide in the classification of industries.

The monopolized industries are of two quite different types: compulsory cartels and private "monopolies." An industry has a compulsory cartel if the government restricts the entrance of firms and controls the price competition of firms, provided the industry would be competitive in the absence of such controls. Examples are, bituminous coal (when the Bituminous Coal Act was in force), the milk marketing authorities, and the motor trucking industry. All the remaining industries in the private sector (except those directed to ends other than profits) and publicly owned public utilities are "monopolies."

These criteria do not provide a dividing line between industries competitive enough to be permitted to follow their own course, and those sufficiently monopolistic to call for social intervention to counteract monopolistic tendencies. In principle one might expect that the difficulty of drawing a boundary in this unexplored area would be accentuated by our almost complete ignorance of monopoly. The literature of industrial organization abounds with 200 giant corporations and concentration ratios, but it has almost studiously avoided questions of monopoly power and extent of departures from competition.[1]

On balance, however, I think that our ignorance of the economy has led to agreement rather than disagreement: we have all accepted the same legends about the various industries. It is for this reason that I find it easy to follow the classification of Clair Wilcox, and he the classifications of the specialist studies.[2] The concept of a competitive industry employed in these classifications is considerably narrower than that suggested by Professor J. M. Clark's "workable

[1] It is indicative of the literature on giant corporations that no one has explored even the question: does an industry become more monopolistic as the number of giant corporations increases? And the systematic disregard of inter-product competition renders almost all of the work with concentration ratios worthless: a problem is factored into two parts, one of which is ignored.

[2] See *Competition and Monopoly in American Industry* (T.N.E.C. Monograph No. 21).

competition "—he would include automobiles in competition, and probably also many industries such as steel, cement and petroleum.[1] It seems desirable, however, to estimate the relative rôles of competition and monopoly on the traditional view, rather than to explore this interesting approach.

One concession, however, has been made to ignorance. Some industries, for which there is no accepted classification, and which could not be approximately classified by firm structure, were placed in the category, " not allocable." This category includes also government, religion, non-profit organizations, and private education, since the question of competition is partially irrelevant to their purposes and functioning.

(ii) The Addition of Industries

Once the various industries are classified, it is necessary to find a basis for combining them. Two bases have been chosen: income originating in the industry; and the number of persons in the industry. The income originating in an industry is the appropriate measure of its economic importance, but it suffers from two statistical defects. The first is that the national income is reported only for fairly broad industrial classes, which must be sub-classified on some other basis.[2] The second defect is that all of the income of a firm is reported as originating in the industry in which the largest amount is obtained. Thus General Motors' earnings will be reported in " automobiles " (classified here as a monopoly) although it derives income from the sale of refrigerators (classified here as competitive). This defect leads to an overestimate of the proportion of income originating in monopolized industries. A second allocation of industries is also made by number of persons in the industry, both for its independent interest and for a subsequent examination of the trend of competition.[3]

(iii) The Estimate

The detailed allocation of industries by national income produced in 1939 is given in Table 1; the over-all estimates are:

[1] " Toward a Concept of Workable Competition," *American Economic Review*, June 1940.

[2] The data on national income are from *National Income and Product Statistics of the United States*, 1929-46 (Survey of Current Business, Supplement, July 1947), Table 13.

[3] The data on employees and entrepreneurs are from *ibid.*, Table 28.

Competition	55·2 per cent.
Compulsory Cartels	2·5 „
Monopoly	24·4 „
Not Allocable	17·9 „

If one disregards the unallocable sector, the estimates are:

Competition	67·3 per cent.
Compulsory Cartels	3·1 „
Monopoly	29·7 „

The corresponding allocation of the number of persons engaged in production in 1939 (the summary of which is given in Table 2) yields the estimates:

Competition	76·5 per cent.
Compulsory Cartels	3·8 „
Monopoly	19·7 „

This last estimate has a downward bias for the competitive sector because the number of persons does not include unpaid family workers, most of whom are in competitive industries.

The proportion of the economy in monopoly is, as I have argued, sensitive to marginal decisions. If the borderline industry of automobile production had been classified as competitive, for example, the monopoly sector would have fallen by 6·7 per cent. If we followed the wider concept of workable competition, and placed also petroleum (except pipe lines), iron and steel, cement, and probably insurance in the competitive sector, the monopoly sector would shrink to less than a fifth in terms of national income, and to less than a seventh in terms of labour force. More industries have been placed in monopoly than in competition on insufficient evidence. It seems conservative to estimate that the competitive industries were producing seven-tenths of the national income in 1939, and utilizing more than four-fifths of the labour force.

It is a defect of the foregoing procedure that an industry is classified only by the amount of competition among firms. Ideally labour income should be separated and classified according to the amount of competition in each labour market; this was not feasible because I do not know the degree of monopoly power possessed by each labour union. The over-all estimates would probably be changed little if this preferable classification could have been made. In 1939 about one-sixth or one-fifth of the labour force belonged in unions. Members of unions no doubt received higher average earnings than the remainder of the employed workers, and probably

also higher average earnings than entrepreneurs (who are largely farmers or small shopkeepers). Yet many of the unions must have possessed little power. Our procedure implicitly attributes 30 per cent. of labour income to monopolies, and it is unlikely that explicit classification of wages would change this figure very much.

2. The Trend of Competition

There is a widespread belief that competition has declined. The argument underlying this belief seems to be : there is certainly a lot of monopoly now, and it stands to reason that there was less monopoly at some time in the past. In its more explicit versions, the argument is supported by observations such as : the trust movement began in the latter part of the nineteenth century ; agriculture (the only competitive industry) has been declining in relative importance ; the 200 largest non-financial corporations may well have been growing in relative importance ; and companies are bigger than they used to be. These are all rather loose expeditions into history, and they are most unsatisfactory substitutes for detailed studies of the history of competition in various industries. These detailed studies have not yet been made, unfortunately, so no definite conclusion can be drawn with respect to the trend of competition. But the effects of certain important economic developments can be assessed, and I propose to discuss them briefly.

(*i*) *Industrial Composition of the Economy*

We may roughly estimate the effects of changes in the industrial composition of the American economy upon the extent of competition. The industrial composition of the labour force back to 1870 has been estimated by Daniel Carson,[1] and in each of the eleven broad sectors (other than government) he distinguishes, we may calculate the number of persons in competitive and monopolized industries on the assumption that the 1940 proportion held at earlier dates.[2] The results of this calculation are :

[1] *Industrial Composition of Manpower in the United States, 1870-1940* (to be published by the Conference on Income and Wealth).

[2] Compulsory cartels are merged with competition for this purpose. The census of population (as revised by Carson) differs so much from the industry censuses (which underlie Table 2) that the percentage of competition in each population category in 1940 is only approximate.

Year	Per cent. of Allocable Labour Force in Industries Competitive in 1940	Monopolized in 1940
1870	89·7	10·3
1880	88·7	11·3
1890	87·0	13·0
1900	85·2	14·8
1910	82·5	17·5
1920	79·9	20·1
1930	79·9	20·1
1940	81·1	18·9

So far as broad industrial composition goes, the monopolized sector doubled in relative importance from 1870 to the nineteen-twenties, and thereafter declined moderately.[1]

The chief cause of the relative growth of monopolized sectors to the 'twenties was of course the relative decline of agriculture in the economy. Excluding agriculture, 22·5 per cent. of the labour force of 1870 was in sectors monopolized in 1939, the percentage rose to a peak of 28·8 in 1920, and then fell to 23·8 by 1940. The broad pattern is attributable to the relative (and in the 'thirties, absolute) decline of mining, manufacturing, transportation, and utilities, and the relative growth of trade and domestic and personal service. It is commonly believed that these trends favourable to competitive industries will continue in the future.

(*ii*) *The Extent of the Market*

Absolute size of the firm is irrelevant to the question of competition. This is well-known, and well-forgotten: witness such a popular measure of concentration as the percentage of employees in establishments with 500 or more employees. U.S. Steel is a giant

[1] A similar classification calculation can be made for sixteen industrial classes within manufacturing, using Census of Manufacturing data for employment (as classified by S. Fabricant, *Employment in Manufacturing, 1899-1939*). The pattern is similar to that of the economy as a whole:

Year	Per cent. of the Allocable Labour Force in Manufacturing Industries Competitive in 1939	Monopolized in 1939
1899	72·7	27·3
1909	72·1	27·9
1919	65·5	34·5
1929	67·2	32·8
1939	68·2	31·8

A considerable share of the rise in the monopolized sector in 1919 is attributable to the great spurt in employment in the automobile industry.

corporation with sales of $1,486 million in 1946, but it was relatively a much bigger steel company in 1902, when its sales were $422 million.

The growth of the American economy, indeed, has surely given to competition a much larger rôle in trade and services. The numbers of food stores and beauty parlours in communities of various sizes are given for New York State in Table 3. The number of stores in a community, and the geographical density of stores within the community, increase rapidly with community size. A greater number of stores of a given type, and in closer proximity, surely makes for a more thorough competition—although this force must have been more potent in the pre-automobile age. In 1880 only 30 per cent. of our population was urban, in 1900, 40 per cent., in 1940, 56 per cent.; in 1880, 12 per cent. of our population lived in cities over 100,000, in 1900, 19 per cent., in 1940, 29 per cent. Thus a steadily increasing proportion of our population has been buying its retailing and other services under conditions of increasing competition. This growing concentration of population must also have been restricting the scope for labour monopsony.

(iii) Concentration in Manufacturing

Concentration of production (the share of the output of a commodity produced by a few firms) does not necessarily vary with the extent of monopoly. The availability of substitutes, the size of the market (local, national, or international), the extent of collusion, and other factors will influence the correspondence between concentration and monopoly. But, as we have already noticed, the more exacting analyses have not been made, and it is possible here only to notice the trend of concentration in a few manufacturing industries.

The industries chosen for study are those in which there were firms with a capitalization of $50 million or more in 1904, or assets of $300 million or more in 1937.[1] The twenty industries for which information is available are classified by the trend of concentration in Table 4.

In fourteen of the twenty industries, concentration declined substantially; in four industries it changed little (declining in all but meat packing); and in two it increased. This analysis suggests, but

[1] The 1904 list is from John Moody, *The Truth About the Trusts*; the 1937 list is from T.N.E.C. Monograph 29; in each case the list is restricted to manufacturing firms. The earlier list contains twenty-three firms, the latter twenty-two. It was not possible in the time available to obtain information on potteries, chemicals in 1904, or coal tar products in 1904.

only suggests, that monopoly in American manufacturing declined during the first four decades of this century.

(iv) Conclusion

The three factors I have briefly discussed only begin the list of relevant developments to be considered in judging the trend of competition. No attention has been paid to foreign competition, to the weakening of railroad monopoly through the development of other transportation industries, to cycles in labour union strength, and to other obviously important factors. It is my present judgment that competition declined moderately from the Civil War to the end of the nineteenth century, and thereafter increased moderately. I certainly have not proved this to be the case, but on the other hand there is no obvious evidence for the more popular thesis that competition has been declining steadily (and in many versions, drastically) for a half-century or more. This popular belief, I think, is partly fictional history, partly symptomatic of increasing sensitivity to given departures from perfectly competitive behaviour. Unless it can be given a documentation that I do not believe exists, it should be abandoned as an obstacle to clear thinking on social policy.

TABLE I

COMPETITION AND MONOPOLY IN THE UNITED STATES: A CLASSIFICATION OF INDUSTRIES WITH INCOME ORIGINATING IN 1939
(*millions of dollars*)

INDUSTRY	Competition	Compulsory Cartel	Monopoly	Not Allocable
Agriculture, Forestry and Fisheries	(5,780)	(340)		
Farming:				
Dairy Cartels (*a*)		340		
Other	5,611			
Agricultural Establishments	117			
Forestry	12			
Fisheries	40			
Mining	(660)	(503)	(422)	(16)
Metal Mining:				
Gold and Silver (*b*)	90			
Other			258	
Anthracite			126	
Bituminous		503		
Non-metallic Mining:				
Crushed Stone, Sand and Gravel (*c*)	73			
Clay, Dimension Stone				16
Other			38	
Crude Petroleum and Gas	497			
Contract Construction (*d*)	(2,254)			
Manufacturing	(9,576)		(7,255)	(1,105)
Food (*e*)				
Cheese			11	
Chewing Gum			28	
Corn Syrup			34	
Biscuits			76	
Other	2,131			
Tobacco:				
Cigar	69			
Other			229	
Textile Mill Products:				
Linoleum			29	
Other	1,230			
Apparel	1,016			
Lumber and Timber Products	491			
Furniture	508			
Paper:				
Newsprint (*f*)			26	
Other	529			
Printing and Publishing:				
Newspapers			463	
Other	743			

Industry	Competition	Compulsory Cartel	Monopoly	Not Allocable
Chemicals :				
Paints	147			
Anim. and Veg. Oils (*g*)	43			
Other			1,015	
Products of Petroleum and Coal			458	
Rubber Products :				
Boots and Shoes (*h*)			20	
Other	259			
Leather Products	423			
Stone, Glass, and Clay :				
Pottery, Marble	88			
Other			574	
Iron and Steel (*i*) :				
Hardware, Cutlery	155			
Heating Apparatus	299			
Stampings	112			
Bolts and Nuts	35			
Forgings	40			
Screw Machine Products	38			
Other			1,580	
Non-Ferrous Metals (*j*) :				
Clocks	40			
Jewellery	33			
Electroplating	15			
Lighting Equipment	47			
Sheet Metal Work	48			
Other			411	
Machinery (*k*) :				
Construction, Mining, Related Machinery	116			
Machine Tools, Shops	423			
Laundry Equipment	19			
Textile Machinery, Woodworking Machinery	55			
Refrigerators	97			
Paper Mill, Printing Machinery				73
General and Industrial Machinery				318
Other			391	
Electrical Machinery :				
Appliances	74			
Radios	111			
Communication Equipment				122
Wiring Devices				42
Other			501	
Transportation Equipment :				
Aircraft				154
Shipbuilding				151
Other			92	

Industry	Competition	Compulsory Cartel	Monopoly	Not Allocable
Automobile (*l*)			1,188	
Miscellaneous:				
Costume Jewellery	34			
Toys	62			
Buttons	13			
Brushes	18			
Musical Instruments			18	
Professional Instruments, Photographic Equipment			126	
Other				245
Trade	(11,061)	(118)	(947)	
Wholesale:				
Petroleum			258	
Other	3,300			
Retail:				
Liquor		118		
Gasoline			569	
Milk			120	
Other	7,761			
Finance	(5,835)		(1,700)	(681)
Banking:				
Federal Reserve Banks (*m*)				30
Other			846	
Brokers	160			
Finance, n.e.c.				160
Insurance			854	
Insurance Agents				491
Real Estate	5,675			
Transportation		(863)	(3,484)	(196)
Railroads			2,735	
Local Railroads and Bus Lines			338	
Highway Passenger		177		
Highway Freight		642		
Water Transportation			280	
Air Transportation		44		
Pipe Line			131	
Services				196
Communication			(2,863)	
Telephone and Telegraph			1,008	
Radio			75	
Utilities			1,716	
Local Public Services			64	
Services	(4,899)		(984)	(2,197)
Hotels	436			
Personal Services	1,001			
Private Households	1,761			
Commercial Schools, etc.				35

Industry	Competition	Compulsory Cartel	Monopoly	Not Allocable
Services:				
Business Services, n.e.c.:				
Advertising (*n*)	68			
Other				569
Miscellaneous Repair	238			
Motion Pictures			428	
Amusement				278
Medical:				
Physicians (*o*)			556	
Hospitals				316
Other	493			
Legal	692			
Engineering	210			
Education				452
Religion				303
Non-profit				244
Government				(8,550)
Rest of World				(243)
Grand Total	40,050	1,824	17,670	12,988

Notes to Table I

For the classification of industries, see Clair Wilcox, *Competition and Monopoly in American Industry* (T.N.E.C. Monograph No. 21). For the composition of industry groups, see *Standard Industrial Classification* (Bureau of the Budget, 1940). Sub-classifications of income are by value-added in manufacturing, by sales elsewhere, and sub-classifications of numbers of persons (in Table II) are by wage-earners in manufacturing, by wage-earners plus proprietors elsewhere, unless otherwise noted.

(*a*) The fraction of agricultural income going to farmers in milk authorities is roughly approximated by the product: (1) the fraction of gross farm income received from dairy products (*Statistical Abstract*, 1941, p. 709); and (2) the fraction of milk products sold as fluid milk in cities and villages (*Agricultural Statistics*, 1942, p. 470). This proportion (5·718 per cent.) is used also for number of persons.

(*b*) Gold and silver are unusual in that the industries, as well as the firms, have infinitely elastic demand curves. For the outputs of individual firms, see *Yearbook of the American Bureau of Metal Statistics*, 1939, pp. 94, 96.

(*c*) On crushed stone, see *Industrial Minerals and Rocks* (American Institute of Mining and Metallurgical Engineers, 1937), p. 833. On sand and gravel, see the report in *Minerals Yearbook*, 1941, esp. p. 1,280.

(*d*) Recall that this is a classification of firms, not labour markets.

(*e*) Meat-packing is borderline. I have been influenced by war-time black markets, which revealed very high supply elasticities of small firms; see also A. C. Hoffman, *Large-Scale Organization in the Food Industries* (T.N.E.C. Monograph No. 35), Chapter 10.

(*f*) Sub-classification of income by value of product.

(*g*) Concentration ratios were relatively low (J. M. Blair et al., *Economic Concentration and World War II* [79th Cong., 2nd Sess., Sen. Doc. 206], p. 184).

(*h*) The concentration ratio is relatively high (*ibid.*, p. 173).

(*i*) Concentration ratios in the competitive sectors are low (*ibid.*, pp. 77, 95).

(*j*) The same (*ibid.*, p. 97).

(*k*) The same (*ibid.*, pp. 118, 133, 139 ff.).

(*l*) I have followed Wilcox in this questionable classification, which is opposite to that of the Federal Trade Commission study from which he draws his evidence. There is some slight additional confirmation for the classification in the failure of the small companies to raise prices to market levels in the post-war period.

(*m*) Income taken as gross earnings less dividends paid out.

(*n*) Income taken as payroll (Census of Services) plus net corporate earnings (Statistics of Income).

(*o*) See M. Friedman and S. Kuznets, *Incomes from Independent Professional Practice*. Incomes estimated as proportional to consumer expenditures (National Income Supplement, Table 30).

TABLE II

COMPETITION AND MONOPOLY IN THE UNITED STATES: A CLASSIFICATION OF INDUSTRIES WITH NUMBER OF PERSONS IN 1939
(*thousands of persons*)

INDUSTRY	Competition	Compulsory Cartel	Monopoly	Not Allocable
Agriculture, Fishery, Forestry ..	7,577	443		
Mining	276	389	189	16
Contract Construction	1,827			
Manufacturing	6,511		3,066	514
Trade	7,533	40	704	
Finance	570		612	400
Transportation		571	1,462	136
Communication			871	
Services	4,469		501	1,337
Government				6,142
Rest of World				1
Grand Total	28,763	1,443	7,405	8,546

Note to Table II: See notes to Table I.

TABLE III

NUMBER OF FOOD STORES AND BEAUTY PARLOURS IN NEW YORK STATE IN 1939, BY COMMUNITY SIZE

Community Size	Average Number of Shops per Community	1,000 Population	Square Mile
1. Food Stores			
Under 2,500	—	3·76	·18
2,500 to 5,000	22·32	6·05	11·79
5,000 to 10,000	38·65	5·69	17·34
10,000 to 25,000	85·96	5·21	15·84
25,000 to 50,000	224·90	6·15	15·43
50,000 to 100,000	377·17	5·14	37·04
100,000 to 500,000	980·33	5·45	32·48
500,000 to 1,000,000	3,506	6·09	69·84
1,000,000 and over	46,945	6·45	155·96
2. Beauty Parlours			
Under 5,000	—	·51	·03
5,000 to 10,000	8·66	1·26	3·82
10,000 to 25,000	16·77	1·02	3·09
25,000 to 50,000	40·70	1·11	2·79
50,000 to 100,000	74	1·01	7·27
100,000 to 500,000	163	·91	5·40
500,000 to 1,000,000	551	·96	10·98
1,000,000 and over	4,579	·63	15·21

Note to Table III: Data compiled from Census of Population (1940) and Census of Retail Distribution (1939).

TABLE IV

CHANGES IN CONCENTRATION OF PRODUCTION IN TWENTY MANUFACTURING INDUSTRIES FROM BEGINNING OF TWENTIETH CENTURY TO THE NINETEEN-THIRTIES

1. Substantial Decreases in Concentration
    1. Agricultural Implements
    2. Biscuits
    3. Cans
    4. Copper Smelting
    5. Corn Products
    6. Explosives
    7. Leather
    8. Liquor Distilleries
    9. Newsprint
    10. Petroleum
    11. Rubber Products
    12. Railroad Cars
    13. Sugar Refining
    14. Tobacco
2. Minor Changes in Concentration
    1. Electrical Equipment
    2. Locomotives
    3. Meat Packing
    4. Steel
3. Substantial Increases in Concentration
    1. Automobile
    2. Copper Mining

Note to Table IV: See appendix.

APPENDIX

BRIEF statements of concentration in the twenty industries listed in Table IV are given in this appendix.

Substantial Decreases in Concentration

1. Agricultural Implements
   At the beginning of the century International Harvester produced about 85 per cent. of harvesting machines, and comparable percentages of other implements. Its average share in 1936 was 41 per cent. (T.N.E.C. Monograph 27, p. 242).
2. Biscuits
   National Biscuit controlled 70 per cent. of the output in 1902 (Moody, *Truth about the Trusts*). In the 'thirties, the two leading companies produced 62 per cent. (T.N.E.C. Monograph 21, p. 114).
3. Cans
   American Can produced 90 per cent. of the output in 1901 (Monograph 21, p. 68). It produced about 50 per cent. in 1937 (Stigler, *Journal of Political Economy*, 1947, p. 447).
4. Copper Smelting
   American Smelting and Refining did 85 to 95 per cent. of all copper refining in 1902 (Moody). In 1937 it had 31 per cent. of industry capacity and Phelps Dodge had 33 per cent. (*1937 Yearbook of American Bureau of Metal Statistics*, p. 24).
5. Corn Products
   Corn Products Company had 80 per cent. of the capacity of the industry in 1902 (A. S. Dewing, *Corporate Promotions and Reorganizations*, p. 95). A subsequent merger in 1906 gave it complete control. In 1937 this company produced less than half the output (Monograph 21, p. 113).
6. Explosives
   In 1907 Du Pont produced 72 per cent. of the dynamite and 64 to 100 per cent. of powders (W. S. Dutton, *Dupont*, p. 194); in 1935 the four leading companies produced 82 per cent. of explosives (Monograph 21, p. 115).
7. Leather
   United States Leather produced more than 60 per cent. of the leather in 1902 (Moody). The four largest companies had only 22·5 per cent. of the output in 1935 (Monograph 21, p. 47).
8. Liquor Distilleries
   Distillers' Securities controlled about 60 per cent. of the output of whiskies, etc., when it was formed in 1902 (Moody). In 1937 the four largest firms produced 38 per cent. of the whisky (Monograph 27, p. 422).

9. Newsprint
In 1902 International Paper produced about 60 per cent. of the output (Moody) ; in 1928 it was still the largest company, with 14 per cent. of American-Canadian production (Stigler, p. 448).

10. Petroleum
Around 1900 Standard Oil controlled 85 to 90 per cent. of refined petroleum products. In 1938 the twenty largest companies controlled 84 per cent. ; in no region did the leading company sell more than 28 per cent. of the gasoline (Monograph 27, p. 261; Federal Trade Commission, *Distribution Methods and Costs*, Part IV).

11. Rubber Products
In 1902 United States Rubber had half the output of boots and shoes ; tyres were unimportant (Moody). The four largest firms in 1937 produced about 80 per cent. of both footwear and tyres (Monograph 27, pp. 447, 448).

12. Railroad Cars
American Car and Foundry produced 65 per cent. of the output in 1902 (Moody) ; the four largest firms produced 72 per cent. of railroad cars in 1935 (Monograph 21, p. 115).

13. Sugar Refining
Around 1900 American Sugar Refining refined virtually all the sugar in the United States (Monograph 21, p. 67). In 1937, the four largest firms refined 65 per cent. of cane sugar (Monograph 27, p. 424).

14. Tobacco
The companies of the tobacco combination controlled in 1902 66 per cent. of smoking tobacco, 71 to 86 per cent. of cigarettes, plug, snuff, fine cut tobacco, and little cigars. By 1910 the percentages had risen substantially (H. R. Seager and C. A. Gulick, *Trust and Corporation Problems*, p. 163). In 1937 the three largest companies were producing about the same percentages (Federal Trade Commission, *Agricultural Income Inquiry*, I, 261).

Minor Changes in Concentration

1. Electrical Equipment
In 1902, General Electric " Divides easily 90 per cent. of the field with the Westinghouse concerns, with whom it has various working agreements " (Moody, p. 249 n.). They account for a somewhat smaller percentage in the 'thirties (Monograph 21, p. 114).

2. Locomotives
American Locomotive made about 70 per cent. of the locomotives in 1902 (Moody) ; apparently Baldwin Locomotive made most of the remainder. They produced about 80 per cent. in the 'thirties (Monograph 21, p. 114).

3. Meat Packing
The " Big Five " had about equal shares of interstate slaughter (1908) and federally inspected slaughter (1935) (Federal Trade Commission, *Agricultural Income Inquiry*, I, 198). The share in 1908, however,

includes that of companies subsequently merged with the "Big Five," so concentration probably rose.

4. Steel
U.S. Steel Corporation produced 66 per cent. of total ingots in 1901, 33·1 per cent. in 1938 (U.S. Steel, *T.N.E.C. Papers*, II, 142). But Bethlehem, Republic, and Jones and Laughlin have grown in relative size so the aggregate share of the four biggest firms was about the same in 1901 and 1938 (Monograph 27, p. 258).

Substantial Increases in Concentration

1. Automobile
In 1900 the industry consisted of several score very small companies (L. H. Seltzer, *A Financial History of the American Automobile Industry*). The "Big Three" produced 90 per cent. of the automobiles in 1938 (Monograph 21, p. 195).

2. Copper Mining
A comparison of the four leading firms (not the same at both dates) is given:

	Per cent. of U.S. Output	
	1900	1937
Largest Company ..	38·8	35·9
Second Company ..	12·8	22·9
Third Company ..	7·4	18·8
Fourth Company ..	6·6	4·5

(Monograph 27, p. 249).