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CHAPTER I

THE ORIGIN OF THEORIES: A CASE-STUDY PROCEDURE

If the activities of men were arranged in sequence according to the degree in which he shares them with other parts of the animal creation, theory-making would surely rank amongst the most exclusively human. Younger than art and religion, and younger even than complex and exact technology, it is a late-comer to the human scene. Fire and the cutting edge, the boat, the wheel, the sail, animal husbandry, agriculture, the computation of the seasons, architecture, writing and the alphabet: all are technology. Each involves principles, but these are each self-satisfying, self-subsistent, self-contained, a rule of thumb picked up like a tool and laid down again as soon as it has served its purpose. They are not, in their own right, strands in the great web of scientific speculation; their claim upon men's minds is practical, not the claim, by which all theory ultimately stands or falls, of imaginative splendour lifting thought above itself.

Cosmology and astronomy have produced theories of arresting majesty, so stupendous in their scale of time and space as to be beyond any genuine apprehension, and to have for us only a formal meaning. Physics is said to have grounded the entire material cosmos in no more than three ultimately elementary particles. Despite appearances there is, at any rate on earth, only one form of life, its basic chemistry being the same for all living creatures. In the description of the world, a universal, all-pervasive uniformity, simplicity, and unity is assuredly the aim of science, and various sciences at various times appear to take long strides towards its attainment. Against these aims and achievements, in the midst of an architecture of ideas so overwhelming in conception, the sciences, if such they are, of human nature, conduct, policy, and institutions must seem at first glance to be dwarfed in scope and altogether outclassed in professional technique and assurance. Yet it is a truth so obvious as to be banal that science exists only in the minds of men. It

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cannot then, after all, be so negligible a task to study mankind itself, 'man the measure of all things'. Economics is a part of the study of mankind, and we do not apologize for it. Economic theorizing is one (even if artificially demarcated) department of thought, and the manner and style of this thinking, the impulses which from time to time accelerate its evolution, the circumstances which shape it, the means, materials and mechanism it employs, the technics peculiar to it (if any such is peculiar), the frictions, traps, misfortunes, and frustrations which afflict it, are, we believe, a worthy and useful object of investigation. In the spirit of the times, in the track of natural science, in the exclusively respectable and acceptable tradition, and in face of the invincible evidence that there is no other method which succeeds, such investigation must be empirical. Where, then, can we find a suitably definite and limited field?

There is something to be said for the notion that theory prospers and marches forward in any subject if that subject happens to attract a particularly able group of many young contemporaries, who, if not in touch with each other, are at least conscious of being part of a company advancing together. The most famous example is doubtless that of the founders of the Royal Society. In economics there have been at least three episodes of the kind. In the mid-eighteenth century our subject was founded as a distinct systematic discipline by Cantillon, the Physiocrats and Adam Smith. In the last third of the nineteenth, it suddenly took on a new unity and elegance in the hands of a very remarkable group of men of many countries, all born in the years 1840–51, who founded the notion of general equilibrium on the three pillars of a subjective theory of value, the application of the differential calculus to moral science, and the conception of the universal inter-penetrating influence of every economic quantity on every other. Their work and outlook were dominant for more than half a century, and, of course, it lies still at the heart of economics. But in the 1920s and 1930s it was suddenly found to be not enough. Attention was called by contemporary fact to the vagaries of money and the general price level, and then to the bewildering phenomenon of general heavy unemployment. These problems attracted a number of highly gifted minds from diverse scholarly beginnings, not only

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economics itself but mathematics, classics, and physics, and the result was a great ferment of new work at the heart of economic theory. This episode is now distant enough to be seen in some perspective, yet most of its chief participants are still alive. This moment, then, of the mid-1960s is perhaps the right one to make use of that episode to cut a few sods in aid of an eventual theory of the origin of theories.

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CHAPTER 2

ECONOMIC HARD TIMES AND THE RICHES OF IDEAS

The forty years from 1870 saw the creation of a Great Theory or Grand System of Economics, in one sense complete and self-sufficient, able, on its own terms, to answer all questions which those terms allowed. The briefest statement of those terms may be that they took as the sole purpose of economic theory the demonstration of the logical implications of given tastes or needs combined with perfect knowledge and confronted with a scarcity and versatility of resources. Scarcity and versatility of resources, combined with perfect and universal knowledge of the satisfactions to be derived from each use of these resources throughout the entire range of possibilities revealed by a given state of technology, ensured that these resources would always be fully employed. Perfect knowledge also carried with it perfection of markets, so that every good was produced by a great number of evenly sized firms amongst which buyers were completely indifferent. Perfect knowledge further abolished the need for any means of storing general purchasing power (as distinct from wealth embodied in concrete forms capable of yielding direct consumer-satisfactions or of aiding physically in production), and so there was no real money (whose function, as a store of value, is to make possible postponement of detailed decision for those whose knowledge is *imperfect*). The theory eschewed consideration of growth in any form. It analysed the process of production into time-sequential stages, but not in such a way as to show precisely how the quantity required of each 'intermediate product' emerging at each such stage would be altered by an alteration in the 'bill of goods' wanted for final use. The Austrian theory of capital (in any case somewhat of an appendix to the main theory) in fact neglected the inter-dependence of industries and the feed-back or reflexive aspects of roundabout production, and concerned itself only with the consequences of its time-consuming aspect. This Great Theory was thus the theory of general, perfectly competitive,

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full-employment stationary (or better, timeless) equilibrium. It was complete in essentials by the time that Wicksteed, Wicksell, and John Bates Clark had solved the 'adding-up problem' of the matching of factor-shares in total with the total result of their collaborative effort, and this had happened before the end of the century. In its arresting beauty and completeness this theory seemed to need no corroborative evidence from observation. It seemed to derive from these aesthetic qualities its own stamp of authentication and an independent ascendancy over men's minds. The intellectual Establishment were basically content, and therefore passive. Only a few questions, that lay outside the terms on which the Great Theory allowed itself to be consulted, remained as scraps to satisfy the prowlers round the edge of the camp. The overwhelming concentration of intellectual power within the camp was such as to daunt any possible attacker, and the Great Theory, thus guarded, remained inviolate for two decades. But the second of those decades brought to an end the Pax Britannica and the tranquil generation-and-a-half which had favoured and fostered a belief in a self-regulating, inherently and naturally self-optimizing, stable and coherent economic system. When men had got back their breath after the war and turned to apply their conceptual tools to repair the ruins of European organization, their failure (which a few years of endeavour forced them to acknowledge) to bring back the old order of things made them begin to ask for new tools. A new generation of students, which went seriously to college only in 1919 or after, had graduated and begun to think, impelled by new questions and freed in some degree from old pre-conceptions. Thus there began in the mid-1920s an immense creative spasm, lasting for fourteen years until the Second World War, and yielding six or seven major innovations of theory, which together have completely altered the orientation and character of economics. This extraordinary temporal concentration of innovative intellectual effort in one limited sphere seems to present a special empiric field for the study of theoretical creation itself, in a general sense and context. It is this opportunity which, in this book, I seek to explore and exploit in some tentative and preliminary fashion.

At the opening of the 1930s economic theory still rested on the assumption of a basically orderly and tranquil world. At

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their end it had come to terms with the restless anarchy and disorder of the world of fact. Partly this transformation was effected by the brutal force of events: by a slump without parallel and the unnerving spectacle of the rise of Nazism in a world cheated of the hope of peace. But partly it was the work of a mere handful of great theoreticians. One thing above all divided the new theory from the old: the discarding of the assumption (which had often been quite tacit) of universal perfect knowledge. What sense did it make to assume perfect knowledge in a world where every morning's newspaper was opened in fear and scanned with foreboding? But the ferment had been working in the world of theory from the beginning of the 1920s. Frank Knight's *Risk Uncertainty and Profit* of 1921 puts entrepreneurship in the forefront of a treatise on value theory which largely sets forth the old orthodoxy. But perhaps its title was a portent. It was in Sweden that *expectation* was first taken seriously as a prime mover in the economic process. (Marshall, as always, was with the angels, but he did not blow this particular trumpet very loud.) Erik Lindahl and, more incisively and with one brilliant and epoch-marking stroke, Gunnar Myrdal, developed the first 'economics of expectation'. Myrdal's essay, published in Swedish in 1931, in German in 1933, and in English only in 1939, would have served very well as the launching-pad for a theory of general output and employment, had the *General Theory* never been written. 1937 was the year of intensive Keynesian critical debate. In February Keynes himself declared in the *Quarterly Journal of Economics* that the *General Theory* was concerned with the consequences of our modes of coping with, or of concealing from our conscious selves, our ignorance of the future. Hugh Townshend, his intellectually most radical interpreter, simultaneously expressed the matter (in the *Economic Journal* for March) in terms, if anything, even more uncompromising. Uncertainty was the new strand placed gleamingly in the skein of economic ideas in the 1930s.

It is uncertainty which gives to money every character and capability which distinguish it from a mere numéraire. Money is the refuge from specialized commitment, the postponer of the need to take far-reaching decisions. Money is liquidity. Money is not mechanical nor hydraulic, but psychological. The beginning of new things in monetary theory came with Sir Dennis

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Robertson's *Banking Policy and the Price Level* in 1926, and this is one of our two reasons for starting our period with that year.

Until the 1930s, economics was the science of coping with basic scarcity. After the 1930s, it was the account of how men cope with scarcity and uncertainty. This was far the greatest of the achievements of the 1930s in economic theory. There was just time for the first emergence of another idea of comparable importance, namely, that the natural condition of efficient economies is not a static optimum, the best use of *given* resources, but growth, the continually improving use of steadily increasing resources. The insistence on the need for a theory of growth, as general in application and as abstract in character as that of general equilibrium, was the contribution of Sir Roy Harrod.

Harrod seized upon and essentially answered the root question from which all theory of growth must spring: what are the implications of the double, two-way relation between investment and general output, namely, the theorem that the pace of investment (the net flow of expenditure on augmenting and improving equipment) governs the pace, or size of flow, of general output, and the acceleration of general output governs the pace of investment? Or: what consequences flow from the co-existence of the multiplier and the accelerator? For 'regular' or unfluctuating growth, Harrod showed, the ratio of capital (equipment) to a month's production, times the percentage by which output (monthly production) grows in a month, has to be equal to the proportion of income voluntarily saved. He did not express his theorem in *ex ante* terms, but the translation into that language is easily made. Harrod's theorem is one of the great simplicities. On its own level of high abstraction, it is wonderfully fruitful of insight into sources and consequences of instability, of stagnation, and of inflation, and it provides in this way the basis of Sir John Hicks's refined 'explosion–collapse' model of the business cycle. It is, of course, a macro-economic theory, not concerning itself with the Leontief problem, the balance of different *sorts* of production, the internal coherence, that is, of the multifarious and involuted productive process as a whole. The study of multi-sectoral growth had to be left until after the war, but multi-sectoral production itself had suggested to Wassily Leontief at the outset of the 1930s a most beautiful, simple, and powerful use of matrix algebra, which

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was thus brought into economics at the same moment as it was brought (by Max Born) into quantum physics, a whole human life-span after Arthur Cayley and others had invented it. One thing we shall ask ourselves in later chapters is why, in economics, the seeds of theory seem in so many instances to have taken decades, generations and centuries to germinate.

Myrdal, Keynes and Harrod each in his way changed the content and purposes of economic theory. Leontief exposed a problem and invented a tool for solving it. The problem was not a theoretical enigma, where we feel a need for insight in a situation such that even the right questions to ask are not obvious, but a highly practical desire for a means of calculation in a matter which was not mysterious but only intricate. Firms and industries supply things to each other as well as to consumers or the buyers of long-lasting equipment. For a given 'bill of goods'—list of (say) annual quantities to be supplied to those 'final' buyers—the sizes of the flows of intermediate products required by each firm or industry from others is, in a given state of technology and in given market conditions, determinate. Thus the required output of each and every firm's, or industry's product will be composed of the part it sells to consumers, etc., and the part it sells to other firms. Any change whatsoever in the list of annual quantities taken by 'final' buyers will in general require a change in the output of every firm or industry. Even if its direct sale to consumers is unaffected, the demands from other firms for intermediate products from this firm or industry will change. But the degree of this change is wrapped in an immensely complex shift of the whole quantitative pattern of inter-industrial flows. How can it be calculated? The fact of the intricate inter-dependence of industries has, of course, been clearly recognized from the beginnings of economics. The Physiocrats were centrally concerned with it, at any rate at an aggregative level, and Walter Bagehot, for example, a century after them has a celebrated passage on its effects in transmitting and propagating prosperity and depression. Leontief, by expressing the genetic tree of inter-industry production as a matrix, equipped it at once with the whole armoury of manipulations which constitute matrix algebra (only one of them is essentially required) and in principle thus solved it at a blow. His input–output analysis

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fuses theoretical clarity, mathematical manipulation and statistical fact into a tool of great beauty and practical power, one of the most impressive that economists have ever offered to the statesman, and already in world-wide use. It is the paradigm of genuine and worth-while 'econometrics'. But it offers us one more example of the central mystery of the time which the evolution of theories takes. All three elements in Leontief's scheme were ready to its inventor's hand. And they had been ready to anybody's hand for a lifetime. Anybody could have combined them. The matrix notation, by hind sight, is a self-suggesting 'natural' for the purpose. Many an economist with mathematical propensities must have been aware of matrix algebra, at least under the guise of determinants which are functions of the elements of a matrix. What might not have resulted from a mutual influence, should it have occurred, of two Cambridge men, Arthur Cayley and Alfred Marshall, belonging to nearly the same generation?

One more of the six chief developments of theory in our period was a matter of a tool. The real achievement of Hicks and Allen in their articles on consumer's behaviour, in *Economica* for 1934, was to make known the indifference-map to the Anglo-Saxon world. Of course the indifference-curve had been invented in that world. It was originated by Edgeworth in *Mathematical Psychics* in 1881. But there it was a means of insight only into bilateral monopoly. It was Pareto who seized upon it as a means of escape for theory from the non-observable and non-measurable, yet assumedly quantifiable notion of utility. Pareto, however, never achieved the complete Hicksian diagram where indifference-curves, the picture of the individual's tastes, are confronted with the budget-line, the picture of his circumstances. The tangencies in Pareto's diagrams are between indifference-curves and the technological 'paths' whose nature and constraints are not made fully clear. Nonetheless Pareto sought to place the notion of indifference-curve at the heart of his expression of a general theory of economic action (in more usual language, which Pareto seems to wish to eschew, a theory of 'value'), where the choice of action arises from the mutual confrontation of tastes and the obstacles to their fulfilment. Still the full apparatus, of indifference-curves and budget-line, is already present in Barone, who showed by its means the

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superiority of direct over indirect taxation in his article 'Studi di economia finanziaria', *Giornale degli Economisti* (1912).* Thus it was not the tool itself but its possibilities which were revealed or hinted at by Sir John Hicks and Professor Sir Roy Allen. They showed what could be done, in a form of argument which anyone, mathematician or not, could follow, with this tool which carries problems half-way to solution by the mere visual stating of them, and which performed this service for problems involving *three* variables, a vital and as it were a qualitative advance as compared with two-dimensional methods. Why, once more, did it take more than fifty years for the means of a notable advance to be fully exploited? And is it, in this case, a mere fifty years? The indifference-map is, of course, in form a *contour map* and contour-maps have been used in geography since at least 1700. Once Hicks and Allen had demonstrated it, the contour map sprang into vast popularity as a means of expressing production functions, factor-supply conditions, and many other things, all of which could have been thought of in contour-map terms at any moment for a hundred years past. What vivid, versatile, and suggestive tool is lying unrecognized beneath economists' eyes at this moment?

There is a sense in which our period saw not only the eclipse of value theory by new branches of economics, but its veritable destruction. For value theory as an account of the mode of allocation of versatile scarce resources in the *perfect knowledge* economy, is the theory of a *perfectly competitive* economy. The abandonment of the perfectly competitive assumption is part of the abandonment of the perfect knowledge assumption, and its consequences were enormously more far reaching than its authors seem to have dreamed at the outset. Paradoxically, their writing looks constantly back, seeking merely to adapt and complete the old structures, not to discard them. Yet 'imperfect competition' renders the supply curve unworkable and undermines the stable, self-adjusting mechanism of 'supply and demand'. 'The threatened wreckage', said Sir John Hicks, 'is that of the greater part of economic theory.'†

* Quoted by Mauro Fasiani in 'Di un particulare aspetto delle imposte sul consumo', *La Riforma Sociale*, vol. XLI (1930), reproduced in English in *International Economic Papers*, no. 6 (Peacock, Stolper, Turvey, Elizabeth Henderson, eds.).

† *Value and Capital*, chapter VI, p. 84 (1st edn).

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