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Kahn, Richard Ferdinand (1905–1989)

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Keywords

Cambridge Circus; Duopoly; Elasticity of substitution; Ideal output; Kahn, R. F.; Keynes, J. M.; Keynesian Revolution; Liquidity preference; Market imperfections; Multiplier; Oligopoly; Radcliffe Committee view; Robinson, J. V.; Sraffa, P

JEL Classifications

B31

Kahn was the favourite pupil and closest collaborator of John Maynard Keynes, at the time when the 'Keynesian Revolution' was under way (Keynes 1936). For the whole of his academic career, he remained associated with King's College, Cambridge (Keynes's College), where he lived, as a bachelor, from his undergraduate days.

Kahn was born in London on 10 August 1905, into a Jewish family of very strict religious observance. His father, Augustus Kahn, a schoolmaster, was a first-generation Englishman (his parents being German), who went back to Germany to marry Regina Schoyer, Richard's mother. They had three daughters besides Richard, their eldest son.

Richard won a scholarship to St Paul's School, London (curiously enough, Joan Robinson was educated in the girls' section of the same school). Then he won a scholarship to King's College, Cambridge, where he studied mathematics and physics, and graduated in physics in 1927 (being placed in the second class of the Natural Science Tripos). The scholarship gave him the right to a fourth year and he took up economics, at a time of great effervescence in Cambridge intellectual circles.

He was taught economics (in 1927–8) at King's College by Keynes and Shove, and attended university lectures delivered by Pigou, Keynes, Shove, Dennis Robertson and, in the following academic year, by Piero Sraffa, the Italian economist who had just arrived at Cambridge. He obtained his university degree in economics in June 1928 (placing himself, after only one year, in the first class of the Economic Tripos Part II), and immediately, under strong encouragement from Sraffa and Keynes, started work on a Fellowship dissertation (under the title 'The Economics of the Short Period'), which he wrote in a surprisingly short time, obtaining a Fellowship of King's College in March 1930.

'The Economics of the Short Period' (Kahn 1929), which has remained unpublished (though a translation appeared in Italian, in 1983), is one of the two substantial works (the other being Joan Robinson's *Economics of Imperfect Competition*,

Macmillan Publishers Ltd (ed.), *The New Palgrave Dictionary of Economics*,
https://doi.org/10.1057/978-1-349-95189-5

1933) that were stimulated in Cambridge by the devastating critique of Marshall launched by Piero Sraffa in the late 1920s (Sraffa 1926). Richard Kahn and Joan Robinson worked very much in collaboration, under the strong influence of Sraffa and Keynes. For Kahn and Joan Robinson this was the beginning of an intense intellectual partnership that lasted for life.

The most interesting part of Kahn's 'Economics of the Short Period' is perhaps his analysis of the extent to which – in periods of depressions – market imperfections affect the way in which output gets distributed among the various firms, the essential point being that market imperfections prevent the most efficient firms from reaching an optimum utilization of their productive capacities and instead cause *all* firms (efficient and inefficient alike) to reach equilibrium at a point at which there is under-utilization of productive capacity at less than full employment. This sets obvious relations between the microeconomic behaviour of the single firms and the situations of underutilization of productive capacity for the economic system as a whole.

The only part of the dissertation that reached publication in English is the treatment (part of Chap. 7) of duopoly, which Kahn re-elaborated in the form of an elegant article (Kahn 1937) that has since become a standard reference in the economic literature on duopoly and oligopoly. But the whole of Kahn's dissertation deserves closer scrutiny. When it becomes more readily available, it may well contribute to piecing together the great analytical puzzle of the relations between Sraffa's critique of Marshall's theory of the firm and Keynes's macroeconomic theory, or, to put it in other terms, of the microfoundations of Keynes's *General Theory.* It will also contribute to clarify the role played by Kahn in Joan Robinson's *Economics of Imperfect Competition,* whose Preface, as is well known, contains heavy acknowledgements of Kahn's help.

There can be no doubt that on a strictly intellectual level these were the most productive years in Kahn's life. It was in the summer of 1930, in the process of criticizing a paper by Keynes and Henderson on public works, that he discovered the principle of the multiplier.

The multiplier is a relation between the *increase* in exogenous aggregate expenditure and the *increase* in net national product thereby generated (and thus also in employment, if employment is proportional to net national product and the economy is in a situation of unemployment due to lack of effective aggregate demand). If c is the fraction of any increase in income that consumers tend to spend, it can be shown that any increase of £1 of exogenous expenditure (or else of such an amount that generate 1 extra job) will finally generate £$1/(1-c)$ of net national product (or else $1/(1-c)$ extra jobs). This is Kahn's multiplier. The author originally presented it in a short article with reference to employment (1931). It was then to be used by Keynes with reference to national income (and to the process of investments generating a corresponding amount of savings), as one of the major ingredients of Keynes's revolutionary work.

In 1930, Kahn started chairing and conducting the so-called 'Cambridge Circus', a group (or rather a closed club) of young Cambridge economists, among whom the most prominent members, besides Kahn, were Joan and Austin Robinson, Piero Sraffa and James Meade. The Cambridge Circus met regularly to discuss, criticize and propose changes to the subsequent drafts of what was later to become Keynes's *General Theory.*

The exact nature and extent of the part played by Kahn in Keynes's masterpiece will remain a matter of speculation. Schumpeter's view that Kahn's 'share in the historic achievement cannot have fallen very far short of co-authorship' (Schumpeter 1954, p. 1172) may well be exaggerated. Yet, from Keynes's acknowledgement of indebtedness to him, it can surely be argued that that part must have been very large.

But this was not all. Kahn's contributions to economic theory in those years also concern two other debated subjects in the 1930s: the development of the concept of elasticity of substitution among 'factors of production', as an analytical tool in the traditional theory of income distribution (Kahn 1933), and the laying out of the foundations of welfare economics. Kahn's notes on 'ideal output' (1935), and his article on tariffs

and the terms of trade (1947) were later to be basic to de Villiers Graaff's systematic (and rather pessimistic) theoretical work on welfare economics (de Graaff 1957).

Kahn was appointed a university lecturer in 1933 and became a member of the King's economics teaching staff in 1936. Except for an interruption due to the war, he was responsible for the teaching of economics at King's College from 1936 to 1951 (first with Shove and Keynes and later, from 1949, with Kaldor). From 1939 to 1944, during the Second World War, he worked for the British government on various schemes, mainly connected with war production and war rationing. He also became head of the General Division of the Board of Trade. At the end of the war he returned to economics teaching in King's College. He was appointed a professor of economics at the University of Cambridge in 1951, and retired from that professorship in 1972.

On many occasions, and for temporary periods, Kahn worked for various international organizations: in 1955 he was a member of the Research Unit of the Economic Commission for Europe; in 1959 he was a member of a Group of Experts of the OEEC to study the problem of rising prices; in the 1960s he served as a member of four Groups of Experts of UNCTAD. In this capacity, he contributed to numerous official publications, both of British and of international organizations (see, for example, Kahn et al. 1956; 1961). Of considerable importance has been his Memorandum of Evidence submitted to the Government-appointed Committee on the Working of the Monetary System (the Radcliffe Committee) (1960). This Memorandum, jointly with his theoretical work on the extension of the concept of liquidity preference (1954a), was among the substantial pieces behind the formation of what has become known as 'the Radcliffe Committee view' on the working of the monetary system. When in the 1970s the more traditional 'monetarist' views once again became fashionable, Kahn was consistent in reacting vehemently against them and in rallying to the defence of the Keynesian approach (1976a; 1976b).

In 1965, Kahn was elevated to the House of Lords as a life peer (taking the title of Baron Kahn of Hampstead), in recognition of his services to the British government. Although a member of the Labour Party, he sat on the cross benches. For a number of years he was a reasonably active member of the House of Lords and made a number of speeches – almost exclusively on issues of government economic policy.

Kahn remained, for the whole of his life, a strong defender and faithful expositor of the original ideas contained in Keynes's major work. In a book reproducing his Mattioli Lectures and published in 1984, he gave his version – no doubt a version from the spot closest to the master – of how Keynes's historic work came into being. In one respect Kahn did go on to new ground to complete Keynes's views, and that was with reference to the inevitability of inflationary pressures in industrialized countries, once full employment is reached, unless some drastic changes are introduced into our institutions. On this subject he explored in considerable detail those institutional changes that he thought should be introduced into the process of wage negotiations (1976a; 1976b; 1977). He also took a major part in the shaping of the post-Keynesian theories of capital, growth and income distribution, as opposed to the neoclassical theories (see, for example, Kahn 1954b; 1959), as well as in the development of a post-Keynesian approach to planning (1958).

On the whole, Kahn was not a prolific writer. Apart from his Fellowship dissertation (still unpublished in its original version) and the publication of his Mattioli Lectures (Kahn 1984), the only book that can be found in the library under his name is Kahn (1972), which is not in fact a proper book but the collection of his best articles, arranged together and published by two of his pupils on the occasion of his retirement from his Cambridge professorship. His most remarkable contribution to economic theory clearly remains the multiplier. But he will also be remembered as one of the crucial members of the post-Keynesian group of critics of neoclassical economics, although rarely did he come out in the battle forefront. By temperament, he constantly preferred to play the role of the meticulous scholar, never completely satisfied with any version of any

work, of the relentless, sometimes even fastidious, critic, of the propounder of new alternatives and ideas to suggest to others to develop. In a few words, Kahn superbly played the role – rather congenial to him – of the *éminence grise* behind the scene. Precisely for these reasons, Kahn's association with Keynes in the late 1920s and the 1930s and his lifelong intellectual partnership with Joan Robinson will stimulate the imagination and curiosity of historians of economic thought for years to come.

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Kahneman, Daniel (Born 1934)

Matthew Rabin

Abstract

A prominent figure in the new hedonic psychology, Daniel Kahneman has been influential in the emergence of behavioural

economics. His research programme on heuristics and judgemental biases points to a range of important ways that economics has traditionally misunderstood human behaviour, and identifies how some common economic assumptions have been misleading. Especially in light of potential flaws in the way people manage their well-being, Kahneman and his colleagues have launched research that may help move economics towards a more realistic approach both to predicting behaviour and to welfare analysis.

Keywords

Behavioural economics; Biases; Cognition; Conjunction effect; Conjunction rule; Diminishing sensitivity; Endowment effect; Fairness; Framing effect; Happiness; Hedonic psychology; Heuristics; Judgement; Kahneman, D; Law of small numbers; Loss aversion; Probability; Representativeness heuristic; Risk aversion; Thaler, R; Tversky, A; Utility theory; Well-being

JEL Classification

B31

Daniel Kahneman was born in 1934, after his Jewish parents had emigrated from Lithuania to France. He grew up in France under German occupation, and then moved as an adolescent to what is now Israel. After studying in Israel, he entered the Ph.D. programme in psychology at the University of California in Berkeley in 1961. His intellectual journey continued from there, as he grew from a young psychologist specializing in vision research into a highly influential social and cognitive psychologist. Kahneman is a major figure in the field of psychology – his work with Amos Tversky on heuristics and biases was central to the 'cognitive revolution' in social psychology, and his later work on the psychology of happiness has made him a prominent figure in the new hedonic psychology. Kahneman's contribution to economics, outside his own field, is more remarkable. He is one of the two psychologists (along with his long-standing collaborator Tversky) to most influence the field of economics. Along with Tversky, Richard Thaler, and a few others, he is one of the primary founding figures in the emerging field of 'behavioural economics'. In recognition of his contributions, in 2002 he was awarded the Nobel Memorial Prize in Economics.

Kahneman's research presents a menu of important ways that economics has traditionally misunderstood human behaviour, and hence plays the useful role of identifying ways in which common economic assumptions have been misleading. Yet Kahneman has not just been a thorn in the side of economics; his research provides the material to improve economics. Although he has not himself specialized in conventional economic analysis, a recent spate of behavioural economic research – which attempts to improve economic analysis by incorporating greater psychological realism into economics – has been built on different strands of Kahneman's research.

Heuristics and Biases

Economics has traditionally assumed that, when making decisions under uncertainty, people form subjective probabilistic assessments about the state of the world derived correctly from to the laws of probability. Kahneman's influential early research, conducted jointly with Tversky, documents departures from rationality in probabilistic judgement and decision-making under uncertainty. As Tversky and Kahneman (1974, p. 1124) frame their agenda,

> . . . people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors. The subjective assessment of probability resembles the subjective assessment of physical quantities such as distance or size. These judgments are all based on data of limited validity, which are processed according to heuristic rules. For example, the apparent distance of an object is determined in part by its clarity. The more sharply the object is seen, the closer it appears to be. This rule has some validity, because in any given scene the more distant objects are seen less

> sharply than nearer objects. However, the reliance on this rule leads to systematic errors in the estimation of distance. Specifically, distances are often overestimated when visibility is poor because the contours of objects are blurred. On the other hand, distances are often underestimated when visibility is good because the objects are seen sharply. Thus, the reliance on clarity as an indication of distance leads to common biases. Such biases are also found in the intuitive judgment of probability.

Many other approaches to the study of cognition and judgement have been explored by psychologists. Yet, by dint of its study of systematic but limited departures from a normative Bayesian model, Kahneman and Tversky's research programme on judgemental biases has shown the most promise for integration into economics.

Probably the most important biases Kahneman and Tversky identified are an array of related phenomena collected under the rubric of 'the representativeness heuristic'. Although Bayesian updating tells us that people ought use conditional probabilities as a clue to underlying states – somebody who has symptoms of a disease is more likely to have the disease – Kahneman and Tversky and subsequent researchers demonstrate that people tend to *overuse* 'representativeness' in assessing probabilities. One implication of this is the tendency to underuse base rates: even if a certain symptom appears always among people with a rare disease, and only occasionally among people without the disease, given the rarity of the disease Bayesian reasoning tells us that most people who have the symptom do not have the disease. Yet people tend to exaggerate the likelihood of having the disease given the symptom.

The most striking manifestation of such base-rate neglect is the common violation of the conjunction rule, a fundamental axiom of probability theory: the probability that somebody belongs to both categories A and B is less than or equal to the probability that she belongs to category B alone. Kahneman and Tversky demonstrate what they call the *conjunction effect:* when a description is representative of a person in category A but not of a person in category B, people often judge it more likely that the description matches somebody who falls into both categories A and B than into category B alone. Tversky and Kahneman (1982b, p. 92) illustrate this effect by recounting an experiment in which subjects were provided with the following description:

> Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Subjects were then asked to rate the relative likelihood that eight different statements about Linda were true. Two statements on the list were 'Linda is a bank teller' and 'Linda is a bank teller and is active in the feminist movement'. Over 85% of subjects judged it more likely that Linda was both a bank teller and a feminist than that she was a bank teller. This is because the description of Linda made her seem like a feminist, so that being a bank teller and a feminist seemed a more natural description, and thus more 'representative' of Linda, than simply being a bank teller.

Tversky and Kahneman (1971) argue that another manifestation of the representativeness heuristic is a bias they call 'The Law of Small Numbers': people exaggerate how often a small sample closely resembles the parent population or underlying probability distribution that generates the sample. We expect even small classes of students to contain very close to the typical distribution of smart ones and not-so-smart ones. Likewise, we underestimate how often a good financial analyst will be wrong a few times in a row, and how often a clueless analyst will be right a few times in a row. Such misunderstandings of variance in small samples have far-reaching implications for social and economic judgements.

Kahneman and Tversky identified and provided evidence for other heuristics and biases. Beyond the biases that Kahneman and Tversky have themselves documented, however, research on other biases (for example, the hindsight bias) that are likely to be quite important for economics has benefited from the more general research programme to which they have centrally contributed. Indeed, the early collection of papers edited by Kahneman, Slovic, and Tversky (1982c) serves as a sort of early bible of the programme, and the later collection edited by Gilovich, Griffin, and

Kahneman (2002) presents much of the subsequent research indicating the insights of this research programme.

Loss Aversion, Prospect Theory, and Choice Under Uncertainty

One of the most important and widely cited papers in economics of recent decades is Kahneman and Tversky's (1979) 'Prospect Theory: An Analysis of Decision Under Risk'. (An ISI Web of Science search in April 2006 indicates that this is the second most widely cited article in *Econometrica*, and the only article among the top ten most cited that was not concerned with econometric theory.)

Humans are typically more sensitive to how an outcome contrasts with reference levels than to the absolute level of the outcome itself. Kahneman and Tversky (1979, p. 277) stress that the salience of changes from reference points is a basic aspect of human nature:

> An essential feature of the present theory is that the carriers of value are changes in wealth or welfare, rather than final states. This assumption is compatible with basic principles of perception and judgment. Our perceptual apparatus is attuned to the evaluation of changes or differences rather than to the evaluation of absolute magnitudes. When we respond to attributes such as brightness, loudness, or temperature, the past and present context of experience defines an adaptation level, or reference point, and stimuli are perceived in relation to this reference point (Helson, 1964). Thus, an object at a given temperature may be experienced as hot or cold to the touch depending on the temperature to which one has adapted. The same principle applies to non- sensory attributes such as health, prestige, and wealth. The same level of wealth, for example, may imply abject poverty for one person and great riches for another – depending on their current assets.

In the context of utility theory, people often feel the effects of changes and contrasts more intensely than absolute levels. (While the role of reference levels in decision making is often inconsistent with fully rational behaviour, Tversky and Kahneman, 1991, and others have shown that many reference-level effects can be captured within the framework of utility theory.)

Kahneman and Tversky identify two pervasive ways in which reference levels influence preferences and choice. First, people are *loss averse*: in a wide variety of domains, people are more averse to losses relative to their reference level than they are attracted to same-sized gains. Second, people exhibit *diminishing sensitivity*: the marginal change in perceived well-being is greater for changes that are close to one's reference level than for changes that are further away. While these features of preferences have much broader implications, the most important and striking are in the context of choice involving monetary uncertainty. Loss aversion implies that people are significantly 'risk averse' for even small amounts of money. People dislike losing $10 more than they like gaining $11, and hence prefer their status quo to a 50–50 bet of losing $10 or gaining $11. While such 'first-order' risk aversion is widely observed, the standard concave-utility function implies that people are close to risk-neutral for small stakes. Diminishing sensitivity also has a provocative implication for risk preferences: while people are likely to be risk averse over gains, they are often risk *loving* over losses. For instance, Kahneman and Tversky (1979) find that 70% of subjects report that they would prefer a 3/4 probability of losing nothing and 1/4 probability of losing $6000 to a 1/2 probability of losing nothing and 1/4 probability each of losing $4000 or $2000. The preferred lottery here is a mean-preserving spread of the less-preferred lottery; hence, the responses of 70% of the subjects are inconsistent with the standard concave utility-for-wealth assumption. Subsequent evidence has suggested more varied and context- specific features of risk attitudes in the loss domain, but it supports the finding that people more often have risk-seeking preferences over modest-scale losses than over modest-scale gains.

Another important phenomenon attributed by most researchers to loss aversion is the striking *endowment effect* identified by Thaler (1980; 1985), and subsequently fleshed out by Kahneman, Knetsch and Thaler (1990). Once a person comes to possess a good, she immediately values it more than before she possessed it. An experiment in the latter paper nicely illustrates this phenomenon. A decorated mug (worth about $5) was placed in front of each of one-third of a group of students.

Prices at which the subjects were willing to sell their mugs were elicited in a way that made it optimal for subjects to be truthful. Other subjects were asked to give the minimal amount of money that they would prefer to receiving that mug. These two groups faced exactly the same choice, but differed in their reference level – for sellers, losing the mug was a loss, while for 'choosers' no loss was involved. The average selling price was about $7.00, and the average exchange value for choosers was about $3.50. The difference in these amounts reflects an instantaneous effect of owning on object on the valuation of that object. Such an endowment effect is usefully conceptualized as a case of loss aversion. Individuals treated the endowed mugs as part of their reference levels, and considered subsequently not having a mug to be a loss, whereas individuals without mugs considered not having a mug as remaining at their reference point. The inducement of a nearly instantaneous endowment effect suggests that reference points ubiquitously influence decision making – with potentially significant economic consequences.

Besides this value function, a second important element of Kahneman and Tversky's (1979) multifaceted prospect theory is the fact that people do not evaluate uncertain prospects in the linear-in-probabilities way conventionally assumed by economists. Kahneman and Tversky argue that people maximize with respect to a monotonic nonlinear function of probabilities with the following properties: they ignore *very* low probability events, but among events they don't ignore low probabilities are overweighted and moderate and high probabilities are underweighted, and the latter effect is more pronounced than the former. Tversky and Kahneman (1992, p. 297) conclude that decision weights and the value function combine to imply 'a distinctive fourfold pattern of risk attitudes: risk aversion for gains and risk seeking for losses of high probability; risk seeking for gains and risk aversion for losses of low probability'.

Framing Effects

Probably the most striking and problematic departure from rationality emphasized in Kahneman and Tversky's early research is what they call the *framing effect:* two logically equivalent statements of a problem lead decision-makers to choose different options. Examples of framing effects typically involve differing frames whose logical equivalence is neither totally transparent nor terribly obscure. Because losses resonate with people more than gains, for instance, a frame that highlights the losses associated with a choice makes that choice less attractive. Tversky and Kahneman (1986, p. S260) demonstrate framing effects in a public-health context, asking subjects the following hypothetical question:

> Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:
>
> If Program A is adopted, 200 people will be saved.
>
> If Program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

Seventy-two per cent of subjects said that they preferred Program A over B. But they also asked another group of subjects the same question with the two programs framed thusly:

> If Program C is adopted, 400 people will die.
>
> If Program D is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die.

In this second group, 78% preferred Program D. Although A vs. B and C vs. D are precisely the same choices, framing the choice in terms of numbers of lives saved clearly evokes 'risk aversion' in gains – better to save 200 lives for sure than an uncertain number of lives averaging 200. Framing the choice in terms of number of victims dying evokes 'risk-loving' attitudes in losses – the chance of preventing any deaths is very attractive. (While these and other questions are hypothetical,

Tversky and Kahneman found similar effects among experienced physicians judging cancer treatment, suggesting that similar patterns might play out in the real world. Moreover, similar framing effects were found in choices over lotteries with small monetary stakes.)

Perhaps the most fundamental example of a framing effect – whose centrality to understanding risk attitudes and other economic choices has only recently begun to be fully appreciated by researchers – is that people assess risky prospects in isolation, rather than by aggregating them. As an illustration of isolation errors, Tversky and Kahneman (1986, p. S255) ask subjects to 'Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer.' To simplify, the choices were:

Choose between:

A: $240 for sure
and
B: (.25 + $1,000, .75 $0)

Choose between:

C: − $750 for sure and
D: (.75 − $1,000, .25 $0)

Eighty-four per cent of subjects chose A over B and 87% chose D over C – in accordance with the principles of diminishing sensitivity. But, when subjects' choices for both decisions were combined, 73% chose the combination AD, 11% chose AC, 14% chose BD, and 3% chose BC. The problem with these choices is that AD is in fact a 75% chance of losing $760 and 25% chance of no change, while BC is a 75% chance of losing $750 and 25% of no change. BC is clearly better than AD. The fact that most people made the choice AD when asked to choose separately clearly indicates that they did not integrate the decisions. (Indeed, in groups of other subjects asked to make just one of the A vs. B or C vs. D choices in isolation, 85% chose A over B and 86% chose D over C, virtually the same as those choosing for both choices.) Such examples were also observed for real (but smaller) monetary stakes by Tversky and Kahneman and subsequent researchers. In recent years, this notion that risk attitudes are fundamentally influenced by 'narrow framing' has become a major theme of research as researchers have begun to establish that loss aversion is not itself a sufficient explanation for modest-scale risk aversion without such narrow framing. (If people hated losses but integrated their losses and gains across different choices, they would become de facto risk neutral by cancelling out losses with gains.)

Fairness

Many economists have over the years discussed the existence and economic implications of preferences that depart from pure self-interest, as narrowly defined. But much of the credit for introducing the empirical study of the economic implications of fairness judgements into economics should go to Kahneman, Knetsch, and Thaler (1986). Their interest is positive, not normative: instead of studying normative standards of what we as policymakers (or philosophers) might consider fair allocations or appropriate social-welfare functions, they study with surveys what a typical economic actor might assess as fair or unfair behaviour. For instance, they asked subjects to assess the fairness of reducing the wages of current employees as opposed to hiring new employees at lower wages after normal turnover in response to market unemployment. They found that respondents are likely to consider lowering wages to current workers unfair, while they consider using market conditions to set new wages acceptable. Respondents also considered it unfair to raise the price of peanut butter already in stock in response to a rise in the wholesale price of peanut butter – much as people protest when gas stations immediately raise prices on petrol in stock in response to an increase in wholesale petrol prices. Kahneman, Knetsch, and Thaler identify some more general principles with their surveys: people generally find it acceptable for firms to raise prices or lower wages in response to concurrent shifts in their costs, but not in response to demand shifts or to shortages.

Decision Utility, Experienced Utility, and Happiness

The research on heuristics and biases discussed above indicates that people misjudge the probabilistic consequences of their decisions. But a spate of recent research suggests that, even when they correctly perceive the *physical* consequences of choices they make, people may systematically misperceive the *hedonic* consequences of those choices. As Kahneman (1994, pp. 20–1) argues,

> . . . it may be rash to assume as a general rule that people will later enjoy what they want now. The relation between preferences and hedonic consequences is better studied than postulated. These considerations suggest an explicit distinction between two notions of utility. The *experienced utility* of an outcome is the measure of the hedonic experience of that outcome. . . . The *decision utility* of an outcome, as in modern usage, is the weight assigned to that outcome in a decision.

Kahneman (2000) summarizes and provides a conceptual framework for understanding utility misprediction, and identifies several errors in this domain. He argues, for instance, that in forecasting future utility people tend to use the *'transition rule:* predictions of a person's initial reaction to a new situation, which may be quite accurate in itself, is incorrectly used as a proxy to forecast the long-term effects of that situation' (2000, p. 703). The most important error resulting from this is the tendency to under-appreciate the hedonic effects of adaptation, leading people to exaggerate changes in utility caused by small and big changes in their lives.

Kahneman and fellow researchers have also conducted a series of experiments demonstrating that another source of misprediction of future utility actually comes from a biased evaluation of past episodes: even when people might well recollect the momentary hedonic sensations from past experiences, they might be bad at 'adding up' these hedonic sensations from extended episodes. Through comparing moment-by-moment evaluation with retrospective evaluation of episodes (such as unpleasant medical procedures), they show that people are biased in sundry ways: retrospective evaluation tends to be over-influenced by such factors as extreme moments and final moments, and people are subject to 'duration neglect', with intensity of an episode looming much larger than its duration.

More generally, especially in light of potential flaws in how people manage their well-being, Kahneman and others have launched research that may help move economics towards a more realistic approach to welfare analysis. As an editor of and contributor to a recent volume (Kahneman, Diener and Schwarz, 1999), indeed, Kahneman is a leader in the exciting new focus in social science and public policy on the study of what makes people happy.

Conclusion

Daniel Kahneman, despite his accolades and influence in economics, is a psychologist and self-identifies as such. Although many of the examples and motivations in his research are quite directly inspired by economic concerns, his research rarely constitutes traditional economic analysis per se. But with the gradual rise of 'behavioural economics' as a field of research, and more recently as this research programme has moved into the mainstream, the insights established in his research has become ever more widely influential.

See Also

- ▶ Behavioural Public Economics
- ▶ Happiness, Economics of

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Kain, John Forest (1935–2003)

Eric A. Hanushek

Keywords

Housing markets and policy; Kain, F. K.; Residential segregation; School achievement; Spatial mismatch hypothesis; Urban economics; Urban simulation models

JEL Classifications
B31

John Kain was an empirical economist who significantly changed analysis and modeling in urban economics. Modern urban economics was extensively developed during the 1960s, and Kain's contributions were particularly important in several key areas. His most famous line of inquiry revolved around the interactions of race and urban location and the importance of housing segregation for black welfare. He was also one of the early pioneers in developing general equilibrium urban simulation models that were capable of addressing interesting and important policy questions. His analyses of urban transportation policies have been influential in both developed and developing countries (Meyer et al. 1966). A fourth significant endeavour, while having some of the same underpinnings, went to the issues of educational achievement.

His influential paper on the spatial mismatch hypothesis started a large line of inquiry (Kain 1968, 1992). The innovative idea was that housing segregation kept blacks in areas that were increasingly farther from jobs (which were rapidly decentralizing from more central locations). As commuting to work became more costly, black employment suffered. Kain's connection of urban location, housing, and labour markets was a true innovation. A second important inquiry was the investigation of how segregation affected black housing costs and home ownership (Kain and Quigley 1972). His early urban simulation models were developed to permit investigation of how multiple housing and job locations interact with a variety of housing policies and urban dynamics (for example, Ingram et al. 1972).

These urban studies derived from his intense interest in the intersection of geography, schools and race. In a different direction, he originated the use of large- scale administrative databases on school achievement to study the elements of human capital formation (Rivkin et al. 2005). But, again, he emphasized the fundamental influence of race on opportunities and outcomes (Hanushek et al. 2004).

Ultimately, one of his most important and lasting influences was legitimizing the study of the economics of race through showing its fundamental importance to a range of social issues. Before his systematic work, few economists considered the economic influence of race and segregation.

He received his PhD from the University of California at Berkeley. Most of his career was spent in the Department of Economics at Harvard University, although he also taught at the US Air Force Academy and the University of Texas at Dallas. His last position at the University of Texas at Dallas led to his development of the extensive stacked panel databases on school performance.

See Also

▶ Housing Policy in the United States
▶ Urban Economics

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Kaldor, Nicholas (1908–1986)

Adrian Wood

Keywords

Buffer stocks; Capital theory; Cobweb theorem; Compensation tests; Decreasing returns; Distribution theory; Division of labour; Economic growth; Entrepreneurship; Excess capacity; Expenditure tax; Firm, theory of; Foreign trade multiplier; Imperfect competition; Incomes policies; Increasing returns; Infant-industry protection; Kaldor, N.; Labour productivity; Money supply; Multiplier–accelerator models; Nominal wages; Non-price competition; Oligopoly; Polypoly; Price formation; Price leadership; Real wages; Relative wages; Roundaboutness; Steady-state models; Tariffs; Technical change; Terms of trade; Trade cycles; Uneven development; Verdoorn's Law

JEL Classifications

B31

Nicholas Kaldor was born in Budapest. From 1927 to 1947 he studied and taught at the London School of Economics. Then, following two years at the Economic Commission for Europe in Geneva, he moved to Cambridge University, where he became a fellow of King's College and, in 1966, professor of economics. He was elevated to the peerage in 1974, as Baron Kaldor of Newnham. (For more biographical information, see Kaldor 1960–89, vol. 1, pp. vii–xxxi, and Pasinetti 1979.)

Kaldor was always passionately involved with practical problems of economic policy. As a (vigorously dissenting) member of a British Royal Commission in the early 1950s, he acquired international renown in the field of taxation. But he also constantly addressed the major domestic and international economic issues of the day – in books and journal articles, in letters to newspapers, in lectures and speeches, and through personal contacts. He was special advisor to the British Chancellor of the Exchequer in 1964–8 and 1974–6, and also gave advice to the governments of many other countries, and to various international organizations. Though a defender of the private enterprise market system, he consistently advocated government intervention to make capitalist economies more productive and equitable, and has devised many policies and instruments for this purpose.

Yet Kaldor's main intellectual interest, and the main basis of his fame as an economist, was always theory – simplified analytical description of how economies function. Driven from within by logic, creativity and curiosity, he nonetheless became a committed advocate and exponent of the inductive method – that to be fruitful, theory must spring from (and constantly be tested against) direct observation of reality. His involvement in practical matters contributed to, as well as benefited from, his theoretical work; and he was a steady and perceptive consumer of statistics and the empirical work of other economists.

Range and Evolution of Kaldor's Thought

Kaldor's theoretical contributions cover an astonishing range. And on many topics, his views changed over time – sometimes evolving linearly, sometimes being rejected and replaced with contrary views. His nine volumes of *Collected Economic Essays*, with illuminating retrospective introductions, amply document the scope and chronological progress of his theorizing – important aspects of which are concealed in many of the ostensibly non-theoretical essays. Studies of his work include Nell and Semmler (1991), Targetti (1992) and Turner (1993).

During the 1930s, with Hicks, Hayek, Robbins and Scitovsky among his friends and colleagues, Kaldor made several notable contributions to mainstream neoclassical theory. He named the cobweb theorem, introduced the idea of

compensation tests into welfare economics, and clarified the relationship between tariffs and the terms of trade. He also entered into the prevailing controversy on the theory of capital, defending the Austrian view against the criticisms of Knight (though he later came to accept that the concept of roundaboutness could not solve the problem of measuring capital in homogeneous units, and indeed to reject the whole idea of interpreting the rate of profit or interest as the marginal product of capital).

But much of his theoretical work during this period revolved around the firm and imperfect competition. Like others, he saw the supply curve as a weak link in competitive theory, arguing that diminishing returns to scale do not convincingly explain firm size, and hence that perfect competition is not compatible with equilibrium. He accordingly welcomed the emphasis that Joan Robinson and Chamberlin gave to demand-side limitations on firm size in imperfectly competitive markets, being particularly impressed by Chamberlin's reconciliation of imperfect competition with free entry. At the same time, however, he criticized them for assuming that firms in imperfectly competitive markets generally face conventional demand curves. More commonly, Kaldor contended, such firms must take direct account of the reactions of a relatively small group of rivals to their price and output decisions.

Though Kaldor never lost sight of the importance of microeconomic foundations, the publication of Keynes's *General Theory* greatly stimulated his interest in macroeconomics, as well as setting him on the path to becoming a committed critic of mainstream neoclassical theory. The first fruits of this change were two essays closely related to Keynes's own theorizing. One was on speculation and economic stability, focusing on the relationships between changes in demand and supply flows and changes in speculative stocks, and between price stability and income stability. Among other things, this essay argues that the long-term interest rate cannot adjust sufficiently to equate current saving and investment because it is constrained by the bond market's concept of a normal interest rate, which is simply the expected future average of short-term rates (themselves determined by the prevailing balance between the transactions demand for, and the supply of, money). The second essay – of equal analytical power, though less influential – concerned own-rates of interest.

There then followed some prominent contributions to trade cycle theory. Kaldor criticized simple multiplier–accelerator models for having to be either unrealistically stable or unrealistically unstable. He argued that a convincing theory of purely endogenous cycles would need to be based on nonlinearities in the investment function, but also that in reality cycles are not purely endogenous. In particular, he suggested that entrepreneurial dynamism could cause cumulative upswings of investment that periodically crashed against exogenous barriers such as full employment or bottlenecks in the supply of capital goods. This approach, and perhaps also the sustained prosperity of the 1950s, gradually led him to become less interested in cycles as such, and much more interested in long-term economic growth.

The first main phase of his work on growth, which lasted until the mid-1960s, found expression in a series of formal steady-state models. Though similar to other such models in some respects, including the assumptions that full employment generally prevails and that long-term growth of output is governed by supply rather than demand, Kaldor's models have two important distinctive features. One is an original theory of distribution, whereby the share of profits in national income is determined by the share of investment, which in turn depends on the aggregate capital–output ratio and on the (independently given) aggregate growth rate. Another way of expressing this theory is to say that the aggregate profit rate on capital is determined by the aggregate growth rate – an approach further developed by Pasinetti (1962), and in Kaldor's subsequent neo-Pasinetti theorem.

The reason for this linkage between profits and investment is that the proportion of profits saved (by enterprises, not by rentiers) is much higher than the proportion of wages saved. As a result, an economy can achieve the aggregate saving rate needed to sustain any given growth rate through

adjustment of the share of profits in its national income. This Kaldor regarded as a long-term generalization of a Keynesian principle – that investment determines savings, rather than the other way round. He opposed it to the neoclassical principle that 'availability of capital' constrains growth and governs the rate of profit.

The other distinctive feature of Kaldor's formal growth models is his technical progress function. He rejected the neoclassical concept of a production function that is shifted over time by autonomous technical progress, and indeed the whole notion that productivity gains due to capital accumulation are separable from those due to technical advance. Instead, he argued that the knowledge needed to increase productivity is acquired through a process of learning that is inseparable from the process of investment, and hence that the pace of applied technical progress depends on the rate of investment (which in turn depends on entrepreneurial expectations of profitability and risk). This principle was eventually formalized, in an ingenious vintage model developed with Mirrlees, as a relationship between the rate of change of gross investment per worker and the rate of increase in labour productivity on newly installed equipment.

During the 1960s, however, Kaldor's own empirical research and practical experience caused him to become deeply dissatisfied with formal macroeconomic growth models. Their microeconomic underpinnings seemed inadequate. They were excessively aggregated, and did not capture the different characteristics of (and critical relationships between) the various broad economic sectors. Their assumptions of full employment and of growth governed solely by supply appeared increasingly implausible. And they failed to come to grips with international economic linkages and the spatial pattern of development.

These concerns launched the second main phase of Kaldor's work on growth, in which several fundamentally new ideas displaced or modified some – but by no means all – of the principles of the first phase, and in which some of his earlier theoretical insights were reintroduced. This work was not, however, embodied in formal models. Nor, more generally, did Kaldor ever attempt a comprehensive theoretical treatise, showing how his ideas in different areas fitted together, and how new ideas in particular areas affected his thinking in other areas.

For this reason, the rest of the present article will try to summarize the latest versions of Kaldor's theories in several areas, and to assemble them into a relatively complete Kaldorian view of how the world works. A number of questions can be raised about this view, some calling for theoretical amplification, others for more empirical research. But all theories have shortcomings; and economists choose among alternative theories ultimately on the basis of their strong points, not their weak points. It is thus on the strengths and insights of the Kaldorian view that this article will concentrate.

The Process of Economic Growth

Kaldor's account of growth provides the context for most of his theorizing in other areas. Like Ricardo, he drew a sharp distinction between industry and primary production.

Increasing Returns

In industry, especially in manufacturing, growth of output per worker arises principally from static and dynamic economies of scale, whose realization depends on (but also contributes to) expansion of markets for industrial products. Increasing returns, noted by Smith but subsequently emphasized by only a few economists such as Marx, Marshall and Allyn Young (who taught Kaldor at LSE), are a multifaceted and pervasive feature of industrial production. They often exist at plant and firm level. They are to be found also at the industry level, where larger scale permits greater internal specialization of production among different firms (many of which may in fact be small). Finally, increasing returns operate at the 'macroeconomic' level, partly because different industries stimulate each others' development through demand and supply linkages, partly because all of them benefit from a common labour market large enough to justify the development of many highly specialized skills.

Increasing returns and technical progress are intimately related. This is because the construction and operation of larger-scale plants, the finer subdivision of production processes, and the emergence of more specialized skills, all require the development and application of new knowledge. Each path-breaking stage of realization of scale economies is initially painful and problematic; but effort and experience gradually eliminate the problems and realize the full potential of this technical stage, making it possible to plan and implement the next step forward. (Increasing returns are thus not simply a static function of the scale of production, but also of the cumulative amount of production over time.) Scientific advances, and better technical and general education, facilitate industrial growth, but do not drive it.

Much the same is true, in Kaldor's view, of the accumulation of physical capital. Sustained growth of labour productivity in industry requires investment, mainly because a finer division of labour can generally only be realized through increased mechanization – more capital per worker. This explains why the secular growth of modern industry has entailed continuing increases in both output per worker and the capital–labour ratio, but much less change in capital–output ratios (and why there are large differences in capital–labour ratios, but no systematic differences in capital–output ratios, between rich and poor countries). It also explains why rapid industrial growth is associated with high ratios of investment to output. But it is not the investment that is generating the growth; rather, it is the growth that is generating the investment.

Increasing returns cause a strong statistical correlation, for example across countries, between growth of industrial labour productivity and growth of total industrial output. (This is known as Verdoorn's Law, after the economist who first noticed the correlation.) On average across industries, and over periods of a decade or more, industrial labour productivity nonetheless generally grows slower than total industrial output. This means that relatively rapid industrial labour productivity growth tends to involve relatively rapid growth of industrial employment.

Sectoral Complementarities

Agriculture and mining are subject not to increasing but to decreasing returns. Over time, the productivity of most land is increased through accretion of technical knowledge; but in Kaldor's view, technical progress in primary production is more exogenous – less responsive to the need for it – than in industry, which means that there is a relatively inflexible upper limit on the rate of growth of primary production. Nor are the primary sectors subject to Verdoorn's Law – labour productivity growth is generally independent of output growth.

In a closed system, this technically determined upper limit on the rate of primary production growth is the main long-term constraint on the growth rate of industrial production, and hence on the growth of the whole economy. One reason for this is that expansion of industrial production requires increased amounts of food for industrial workers and of raw materials for processing. Relatedly, growth of primary production and incomes is a vital source of growth in demand for the products of industry. For industrial expansion cannot be self-sustaining, simply because a significant part of the incomes generated in industry is spent on non-industrial goods such as primary products.

To offset this leakage of industrial demand into other sectors, there must clearly be demand for industrial products from the incomes generated in other sectors. But Kaldor's position is stronger and more specific, namely, that growth of demand from the primary sectors in a closed economy actually *determines* the long-term growth rate of industrial production. This is because there is no enduring limit to growth within industry itself: the supply of industrial capital, labour, knowledge and skills will generally respond to whatever happens to be the rate of growth of overall demand for industrial products. It is also because expansion of demand for industrial products from within the industrial sector is in the long term passively determined by expansion of industrial production. (Kaldor regarded all this as a long-run generalization, albeit confined to industry, of the Keynesian principle that output is determined by effective demand, combined with Harrod's concept of the

foreign trade multiplier and Hicks's concept of the supermultiplier.)

For primary production to constrain the growth of a closed economy, decreasing returns (and comparatively unresponsive technical advance) in agriculture and mining are essential, since otherwise primary output could be profitably increased to any required level simply by a larger allocation of capital, skilled labour and research expenditure. It is likewise important that the primary-industry terms of trade not be completely flexible, since otherwise any primary sector output constraint on industrial growth might be overcome by an increase in the prices of agricultural and mining products relative to industrial products, which could make a larger volume of primary output profitable, increase the purchasing power of primary producers over industrial goods, and switch some industrial purchasing power from primary to industrial products. This does not happen, in Kaldor's view, because industrial wages – and hence industrial prices – are inflexible downwards in terms of their purchasing power over primary products, especially food. The primary-industry terms of trade thus cannot improve enough to prevent primary sector production from constraining the long-term pace of industrial growth.

A substantial share of output and employment in all economies of course derives from neither the primary nor the industrial sector, but from services. However, Kaldor argued that service sector expansion is not generally an active ingredient of economic growth, but rather a consequence and complement of expansion in other sectors, particularly industry. He also argued that in high-income countries the service sector acts as an industrial employment reservoir, since (for reasons discussed below) it usually contains a considerable proportion of underemployed workers, who are paid less than workers in industry and are thus willing and able to fill industrial vacancies as they arise. In low-income countries, by contrast, agriculture is the main reservoir of industrial labour. But in both sorts of countries the existence of these reservoirs is one of Kaldor's main reasons for arguing that expansion of industrial output is not normally constrained by availability of labour.

Cyclical Interruptions

Economic growth is not mechanical or smooth. Even though its long-run path is governed by certain basic constraints and linkages, entrepreneurial dynamism – expectations of future growth – is what keeps the process going. Shocks and disturbances of many kinds are constantly disrupting the process in an upward or downward direction. But the resilience of entrepreneurial expectations normally tends to damp rather than to amplify these disturbances, and gives the long-term growth path a momentum sufficient to transcend temporary shocks. The momentum can be broken, however, in deep and sustained recessions, which may cause an enduring downward shift of business expectations and hence the actual growth rate for long periods to fall below the maximum imposed by technical advance in the primary sectors.

Kaldor regarded the volatility of primary product prices as an important source of economic instability, especially when expectations of normal prices for these products are weak (and hence movements in speculative stocks reinforce rather than offset price changes arising from demand or supply fluctuations). A large fall in primary product prices tends to retard industrial growth by slashing the purchasing power of primary producers over industrial products. But a large rise in primary product prices does not have symmetrical benefits for industry, since it tends to push up industrial wages and prices, and provokes governments to deflate. (For reasons of this kind, Kaldor strongly advocated international buffer stock schemes to stabilize the general level of primary product prices, ideally in the form of a commodity-backed world currency).

The resilience of entrepreneurial expectations in the face of temporary disturbances causes increasing returns to be a short-term as well as a long-term feature of industrial production. This is partly because firms deliberately expand capacity somewhat ahead of demand, partly because they base their employment decisions on medium-term prospects rather than immediate needs. As a consequence, and because increases and decreases in aggregate demand tend to be spread across efficient and inefficient firms alike, industrial labour productivity normally rises in booms and falls in

slumps. Only in a severe recession, when business expectations are badly dented and financial reserves are exhausted, do the least efficient firms close down – thus checking the fall in productivity and causing the industrial sector to display some signs of decreasing returns.

Spatial Patterns and Relationships

The 'closed economy' to which the growth model sketched above applies most directly is the world as a whole. But Kaldor also offered a theoretical explanation for the differing development paths of the various geographical subdivisions of the world economy, and a complementary account of the determinants and consequences of trade among these subdivisions. The spatial pattern of primary production and trade is more or less self-explanatory, being determined mainly by the unalterable location of natural resources. Kaldor thus focused mainly on industrial development, and especially on the reasons for its tremendous spatial unevenness – its long-term tendency to become concentrated in particular cities, regions, and countries.

Cumulative Causation

The root cause of the unevenness of industrial development is increasing returns, which mean that success tends to breed further success, and that failure also tends to be self-perpetuating. For example, within a particular country or region, any locality that somehow becomes a substantial centre of industry will thereby achieve higher labour productivity than other smaller industrial centres, which, with fairly uniform wages, will mean lower unit labour costs. The firms in the larger locality will thus be able to charge lower prices or to spend more on marketing and product development, which will cause their sales to increase at the expense of their competitors in the smaller industrial centres. They will thus be able to expand production, further increasing their labour productivity and competitive advantage, and so on, with migration of workers from the declining smaller centres overcoming any labour shortages in the expanding larger centre.

Even within a single country, and even without deliberate government intervention, the eventual outcome will not necessarily be the concentration of all industry in a single place. This is because increasing returns, possibly in conjunction with diseconomies of urban agglomeration, may cause different large centres to specialize in different industrial products. There are also forces which retard the disequalizing process. One is the automatic redistributive effects of a unitary fiscal system. Another is that the smaller centres usually derive some offsetting benefits from expansion of the larger centres, including a bigger market for some of their products. But their growing competitive disadvantage is ultimately more important, and hence they tend to fall further and further behind.

Kaldor also emphasized a subtly different version of cumulative causation, based on the Verdoorn relationship between growth of industrial output and growth of industrial labour productivity, coupled with the assumption that the relative growth rates of exports from different localities depend on relative growth rates – rather than relative levels – of unit costs. This makes differences in industrial growth rates self-perpetuating. For, just as in a closed economy the long-term rate of industrial growth is governed by growth of demand from primary producers, so for a particular locality the necessary 'external' determinant of industrial growth is its growth rate of industrial exports. A locality whose industrial output happens to be growing relatively fast thereby has relatively rapid growth of labour productivity. In so far as wages are uniform across localities, it therefore has relatively slow growth of unit labour costs, and can thus achieve relatively rapid growth of exports. This causes the locality to sustain relatively rapid output growth, and so on.

Kaldor regarded cumulative causation as important also in explaining the differing industrial development paths of different countries. Rapid industrial output growth, rapid labour productivity growth, and rapid export growth constitute a virtuous circle for some countries, with a corresponding vicious circle of low growth for others. But the underlying mechanism cannot be

exactly the same as for different localities within a single country, because restrictions on international migration mean that wages are not uniform across countries. Moreover, empirical observation confirms what Kaldor's own theory of distribution implies, namely, that variation in the level and growth of real wages across countries is closely related to variation in the level and growth of average labour productivity. This clearly reduces the competitive advantage in international markets that countries with higher or faster-growing productivity would otherwise possess.

Indeed, Kaldor himself for many years argued that real wage rate changes brought about by regular exchange rate adjustments (with dual exchange rates for developing countries) could prevent cumulative causation at the international level. Experience with floating exchange rates after 1971, however, led him to the conclusion that neither exchange rate adjustments nor linkages between productivity and real wages are in practice sufficient to neutralize cumulative causation. There are various possible reasons for this. One is that the demand for industrial products is much more sensitive to quality than to price: increasing returns may thus involve feedback from faster output growth to faster product quality improvement, which increases international competitiveness and hence makes for faster export growth, faster output growth and so on.

Development and Trade Policy

Cumulative causation explains why places which acquire an initial advantage in industrial production tend to consolidate and increase this advantage at the expense of other places. Yet why do some places, rather than others, get ahead initially? Kaldor argued that this cannot usually be explained by the location of natural resources, nor by endowments of industrial capital or skills (which are for the most part generated by industrial growth itself). More important are transport facilities and general education, as well as social and institutional circumstances, which affect the willingness of individuals (or government organizations) to become entrepreneurs, and their ability to obtain bridging finance and to recruit a factory labour force. But what starts the process going is some stimulus to local industrial production, typically provided by deliberate protection against (or extraneous interruption of) imports.

Kaldor therefore advocated protection or subsidies (of one sort or another) for infant industries, which can enable backward places to get the virtuous circle of industrialization started. He also argued that protection may be needed to prevent decline in an industrialized place (such as the UK) that has somehow begun to slip behind. At the same time, he emphasized that high or indiscriminate protection may be harmful. This is partly because it causes production to be spread thinly over many industries, none of which benefits sufficiently from increasing returns. It is also because protection discourages industrial exports, whose growth is in Kaldor's view essential – to pay for the increasing imports required by industrial expansion, to realize scale economies in particular industries, and to provide a dynamic external source of demand to propel the whole industrial sector.

In this and other senses, Kaldor's emphasis on increasing returns caused him to have very mixed feelings about trade. On the one hand, trade can have destructive or disequalizing effects. On the other hand, trade is essential to the expansion of markets needed for the realization of increasing returns and hence for economic growth. The world as a whole therefore benefits from faster growth of trade, and most advanced (and some developing) countries from increased industrial specialization and exchange. The problem for policy – which Kaldor himself regarded as largely unsolved – is how to secure these collective benefits without aggravating the difficulties of industrially weak or backward places.

Markets, Prices and Wages

Kaldor's macroeconomic view of growth both stems from and contributes to his microeconomic view of how markets function. For primary products, his account of price formation is basically conventional – demand and supply under perfect competition – though modified to allow for the important influence of changes in stocks held by dealers and speculators.

Imperfect Competition

Industrial and service enterprises, by contrast, are generally neither atomistic, passive price-takers nor static monopolies preoccupied with marginal adjustments in the face of given demand and technology. Instead the main task of most enterprises is to seek and develop both markets and technological opportunities, under competitive pressure from other enterprises. Enterprises generally do not have a well-defined optimum size, and they usually operate with excess capacity (either involuntarily or in order to be able to take advantage of unexpected sales opportunities), so that their actual size at any moment is determined by the demand for their products. Over time, by attracting more demand, many enterprises grow. Indeed, with increasing returns, industrial enterprises must grow in order to remain competitive.

Kaldor emphasized the force of competition in most markets for industrial goods and services, but also that it is imperfect, since firms have some discretion in setting their prices, and since nonprice competition is important. He distinguished two main types of imperfect competition. One is polypoly, in which numerous firms – which can freely enter or leave the market – supply more or less imperfectly substitutable products. The number of competitors is too great for each firm to take direct account of the possible reactions of other firms in setting its price, which it accordingly does with a markup based on its perception of the elasticity of demand for its own product. But although prices are thus set above marginal costs, free entry ensures that the rate of profit on capital is not more than normal, by obliging firms to operate with excess capacity – underutilization of indivisible overhead inputs. (In services such as commerce, where polypoly often prevails, labour is usually treated as an overhead cost, which explains why these sectors act as reservoirs of underutilized labour, even in advanced countries.)

The other form of imperfect competition is oligopoly, where a smaller number of sellers (often the result of increasing returns) must consider each other's reactions in price setting and similar decisions. Kaldor regarded price leadership as the most common type of behaviour in this situation, with most firms tailoring their own market strategies to that adopted by one of the largest and most efficient firms. All firms tend to set their prices on the basis of markups over costs at normal capacity use, and not to vary their prices in the face of temporary fluctuations in demand. Nonetheless, the need to remain competitive with the leader greatly influences the size of the markups chosen by individual firms, and in particular means that less efficient firms must accept smaller margins of profit.

It is clearly important in this model of oligopoly to explain how the leading firm sets its own profit markup. Kaldor argued that this involves striking a balance between two opposing pressures, both arising from a desire to make the firm expand as fast as possible (which in Kaldor's view serves the interests not just of managers but also – in an uncertain world of increasing returns – of shareholders). One is the need to compete demand away from other firms, by lower prices or higher marketing and product development expenditure, which requires a low profit margin. The other is the need to finance investment in capacity expansion, which requires a high profit margin. This is because borrowing and new share issues are necessarily limited in relation to existing equity capital, and hence enterprises must rely heavily on retained profits as a source of finance.

Though Kaldor regarded this account of profit margin determination as relevant mainly to the leading firm in each market, it could apply more generally, especially when price is only one of a number of dimensions of market strategy. This is because each follower firm presumably also wants to grow, and also faces an inverse trade-off between its profit margin and expansion of its share of market demand, as well as needing to finance much of its capacity expansion internally – even though its maximum attainable growth rate will normally be less than that of the market leader. In any event, such an account of behaviour on the part of the average or representative firm (as in Wood 1975) fits well with Kaldor's macroeconomic theory of profits, discussed earlier.

Real, Relative and Money Wages

This theory of profits ties real wages to average productivity, except in low-income countries,

where they may be governed by a subsistence minimum. Actually, Kaldor distinguished two such subsistence minima, one applicable to traditional agriculture, the other to industry, where higher food intake requirements (because of more intensive work) and other expenses of factory employment necessitate higher wages. Even at higher income levels, industrial real wages – especially in terms of primary commodities such as food, and especially where unions are powerful – tend to be inflexible downwards from whatever level they happen previously to have been raised to by productivity growth.

Although relative wage rates within the industrial sector tend to be rather rigid, and although labour market pressures may tend to equalize wages within agriculture and within services, wages are not normally uniform across these broad sectors. The initially large wage gap between agriculture and industry tends to diminish in the course of development, as more and more labour is sucked out of agriculture into other employment. But a similar wage gap between the industrial and service sectors tends to persist, fluctuating cyclically as workers released from industry in periods of recession crowd into service jobs, with a reverse flow in booms. Only perhaps at a very mature level of development would wages tend to equality across all broad sectors.

The average level of money wages, which is the main determinant of the absolute level of prices, has a life of its own, and tends to rise spontaneously in economies where collective wage bargaining is widespread, even in the face of substantial unemployment. Kaldor was inclined to believe that no simple general model can explain why money wages have risen at different rates in different places and at different times. But he identified some key elements, including efforts by unions in fast-growing industries to capture some of the profits created by productivity growth, imitative transmission of wage increases from one industry to another, and generalized resistance to real wage reductions. He has also consistently advocated the control of inflation through incomes policy (with restraint of dividends as well as wages), despite the many practical problems involved.

Fiscal and Monetary Policy

Though well aware of the political obstacles to effective tax reform, Kaldor regarded taxation as the best available instrument for improving the distribution of income (as well as for altering the composition of production and expenditure). His extensive writings on tax policy covered many issues, theoretical and practical. But one consistent theme was equity as between different sources of income, and specifically the need to ensure that income from property bears a fair (but not penal) share of the tax burden. This motivated, among other things, his well-known pioneering proposal to change the basis of progressive personal taxation from income to expenditure, which better covers capital gains and other windfalls.

In macroeconomic management, Kaldor subscribed to the Keynesian view that effective demand is crucial and can be powerfully influenced through the budget. He also believed, however, that full employment and sustained growth in an open industrial economy cannot be secured simply through fiscal deficits, because these tend to be reflected in (ultimately unsustainable) foreign trade deficits. Instead, employment and growth objectives must be approached, for theoretical reasons discussed above, by operating on the foreign trade multiplier – especially on the rate of increase of exports, but also on the propensity to import. Yet this, Kaldor thought, is in practice not at all easy, since exchange rate adjustments are not very effective, even if coupled with an incomes policy to prevent offsetting money wage adjustments. Measures aimed at the basic determinants of international competitiveness, such as faster replacement of equipment and increased expenditure on training and product development, can make a significant contribution; but subsidies and protective tariffs or their equivalent may also be necessary.

Kaldor attached much less importance to monetary policy. The financial system is vital to modern capitalism, especially because it enables investment to be relatively independent of the current level of income. But the demand for money is not a stable function of income. Nor

can the authorities effectively control the money supply, which in a credit money economy is largely endogeneously determined by the needs of enterprises and households. On these grounds, Kaldor always rejected the view that regulation of the money supply is an important ingredient of macroeconomic policy, even though interest rates can be directly manipulated to influence some components of domestic demand and international capital flows.

Conclusion

No second-hand account of Kaldor's economic theorizing can capture the force and vitality of the original, which greatly influenced many other economists, especially those fortunate enough to have been his students or colleagues in Cambridge. Nor can one adequately convey in a few pages the tremendous scope and depth of Kaldor's theoretical work. Finally, a survey like this is liable to give a misleadingly settled impression. Kaldor's thinking evolved constantly, and in its latest form – as at earlier stages – contained gaps, loose ends, inner tensions and unanswered empirical questions, which will provoke further progress. But it is an analytical framework of great range, power, and practical relevance, which constitutes a major contribution to our understanding of the way in which economies work.

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Kalecki, Michal (1899–1970)

Malcolm Sawyer

Abstract

This article gives an outline of the life and work of Michał Kalecki, in particular his contributions on macroeconomics in capitalist economics, including his discoveries of the role of effective demand, the significance of investment, the interplay between profits and investment and the degree of monopoly. His writings on socialism and on development are also outlined.

Keywords

Agriculture and economic development; Budget deficits; Business cycles; Capitalism; Circuitist approach; Distribution of income;

Economic development; Economic growth; Effective demand; Endogenous money; Full employment; Intermediate regime; Investment expenditure; Kalecki, M.; Keynes, J. M.; Limit cycles; Market power; Market socialism; Mixed differential-difference equation; Monopoly; Oligopoly; Perfect competition; Planning; Political business cycles; Post Keynesian economics; Principle of increasing risk; Profit; Rate of interest; Robinson, J. V.; Socialism; State capitalism; Unemployment; Wage determination; Workers' councils

JEL Classifications
B31

Michal Kalecki was born on 22 June 1899 in Lodz, Poland, and died in Warsaw on 17 April 1970. His academic training was in engineering, and he was self-taught in economics, influenced by writers such as Marx and Rosa Luxemburg. He obtained his first quasi-academic employment in 1929 at the Research Institute of Business Cycles and Prices in Warsaw, where his work involved the study of business cycles and the preparation of reports on specific industries. A Rockefeller Foundation Fellowship allowed him in 1936 to study abroad in Sweden and then England, where he remained for the next ten years; during the Second World War he was employed at the Oxford University Institute of Statistics. After work for the International Labour Office in Montreal, Canada, in 1945 and 1946, Kalecki was appointed at the end of 1946 as deputy director of a section of the economics department of the United Nations secretariat in New York. In that job, a major task was the preparation of the *World Economic Reports*. When a board of directors was appointed to exercise control over that *Report*, which he and others viewed as McCarthyite American involvement in the work of the UN, he resigned in protest. Kalecki returned to Poland in 1955. He served as a consultant on economic planning with the government and then with the Planning Commission (1955–1964), and was heavily involved in the debates over the role of decentralization and of workers' councils, the speed of industrialization and the relative size of consumption and investment. He undertook research and teaching at the Polish Academy of Sciences between 1955 and 1961. The centre of his activities after 1961 was the Central School of Planning and Statistics.

In his analysis of capitalist economies, Kalecki discovered a range of ideas on the importance of effective demand and the role of investment similar to those discovered by Keynes, but Kalecki can claim priority of publication (Kalecki 1933; Keynes 1936). While there are similarities there are also differences, for example over the determinants of investment, the perception of the economy as competitive or oligopolistic (on the relationship between Kalecki and Keynes, see Sawyer 1985, ch. 9).

A central element in Kalecki's work was the idea that the level of economic activity would be determined by the level of aggregate demand, and that investment decisions were a particularly significant element in the determination of the level of demand. Any decision to increase investment expenditure can come to fruition only if the finance is available, and the provision of additional finance comes through the banking system. Actual investment expenditure generates a corresponding amount of savings. Kalecki argued that savings were undertaken predominantly out of profits, and he often assumed as a first approximation that workers did not save, and hence investment expenditure in aggregate determined the volume of profits. As Kalecki wrote, 'capitalists as a class gain exactly as much as they invest or consume, and if – in a closed system – they ceased to construct and consume they could not make any money at all' (Kalecki 1990–97, vol. 1, p. 79). If sp is the propensity to save out of profits, and if there are no savings out of wages, then in a closed economy $sp\ P = I$ where P is profits and I investment, with the direction of causation here running from investment to profits. The assumption that wages are spent and the view that capitalists' expenditure determines their income was reflected in the aphorism that was ascribed by Joan Robinson to Kalecki – 'the workers spend what they get, and capitalists get what they spend' (Robinson 1966, p. 341) – though it cannot be

found in the writings of Kalecki. There is also a reverse direction of causation at the level of the enterprise, whereby the profitability of the enterprise will influence its investment decisions. Profits provide internal finance for investment, and the present level of profits influences expectation on future profits.

Kalecki saw capitalism as oligopolistic and monopolistic and dismissed the notion of perfect competition as a 'dangerous myth'. His approach to pricing put forward the idea of the 'degree of monopoly' which expresses the notion that the market power which an enterprise possess will strongly influence the markup of its price over its (production) costs. The extent of market power depends on factors such as the dominance of the enterprise in its market, the barriers to entry into the industry and so forth. The degree of monopoly leads to a theory of the distribution of income and of the determination of real wages. At the level of the enterprise, the degree of monopoly sets the price–cost ratio; from this the ratio of profits to sales can be derived.

$$p = \lambda(w+m)\,R = \lambda(W+M)\,Y = \Pi + W\,\frac{\Pi}{Y} = \frac{(R-W-M)}{(W+\Pi)}$$

Then the share of profits is $\frac{(\lambda-1)(1+j)}{[1+(\lambda-1)(1+j)]}$ and the share of wages $\frac{1}{[1+(\lambda-1)(1+j)]}$, where $j = M/W$. The real product wage can be calculated as $\frac{w}{p} = \frac{1}{\lambda} - \frac{m}{p}$.

Further derivation and then aggregation indicates that the share of profits in national income depends on the average degree of monopoly and on the cost of imports. Since wages are a major component of costs, the degree of monopoly impacts of the real product wage. Kalecki thus advanced a distinctive theory of the distribution of income between wages and profits, and the view that firms' pricing behaviour, rather than events in the labour market, set the real wage.

Kalecki's approach could be summarized by saying that the volume of profits depends on the level of investment, while the share of profits in national income depends on the degree of monopoly, that is, the market power possessed by firms.

The phenomenon of the business cycle was central to Kalecki's economic analysis of capitalism, and his discovery of the importance of aggregate demand for the level of economic activity was undertaken in the context of cyclical fluctuations. Kalecki viewed 'the determination of investment decisions by, broadly speaking, the level and the rate of change of economic activity' as the *pièce de résistance* of economics (Kalecki 1968, p. 263). The central feature of Kalecki's explanation of the business cycle is the influence of investment on economic activity, and hence the determinants of investment. He distinguished between on the one hand the decision to invest and the placing of orders for investment, and, on the other hand, the actual investment taking place (for example, because it takes time to build the factory, there is a lag between investment orders and actual investment). Investment orders depend on profits, and profits are generated by actual investment (as noted above). He also postulated that investment is negatively influenced by the size of the capital stock.

Combining these elements, Kalecki arrived at a mixed differential-difference equation (see, for example, Kalecki 1990, vol. 1, pp. 82–3), for which there may be many solutions. Kalecki sought to establish that there is one solution for which the amplitude remains constant. 'This case is especially important because it corresponds roughly to the real course of the business cycle' (Kalecki 1990, p. 90). He then argued that, with that condition satisfied, the other parameters of the model are such that a regular cycle of around ten years would be generated, which conforms with the general pattern of the time of a cycle of the order of eight to twelve years in length. The mixed differential-difference equation was the basis of Kalecki's attempt to generate a self-perpetuating cycle, which was later to be resolved through the notion of limit cycles.

The central feature of Kalecki's explanation of the business cycle is the influence of investment on economic activity, and hence the determinants of investment. Steindl (1981) identified three versions by Kalecki of the trade cycle, each with a different view of the determinants of investment, and he observed that there are differences in the ways through which profits influence investment

and the impact of the size of the existing capital stock on investment (see also Sawyer 1996).

Kalecki argued that 'the long-run trend is but a slowly changing component of a chain of short-period situations; it has no independent entity' (Kalecki 1968, p. 263). This can be interpreted as undermining the predominant equilibrium approach to economic analysis whereby there is a long-period equilibrium around which the economy fluctuates or towards which the economy tends and which is unaffected by the short-period movements of the economy.

The expansion of investment (and other forms of spending) has to be financed, and that comes predominantly through the creation of bank credit. In one of his earliest papers (1933), Kalecki acknowledged the link between the cycle and money creation. He asked:

> how can capitalists invest more than remains from their current profits after spending part of them for personal consumption? This is made possible by the banking system in various forms of credit inflation. Hence . . . without credit inflation there would be no fluctuations in investment activity. *Business fluctuations are strictly connected with credit inflation*. . .. A similar type of inflation is the financing of investments from bank deposits, a process usually not classified as inflation but one which perhaps has the greatest importance in the inflationary financing of investments during an upswing in the business cycle. (1990, vol. 1, pp. 148 and 149; emphasis in original)

Kalecki presented a number of ideas which now appear in the structuralist Post Keynesian analysis of endogenous money and in the circuitist approach, and he developed a substantial analysis of the workings of the monetary system (see Sawyer 2001). Kalecki viewed the rate of interest as essentially a monetary phenomenon, and specifically not as a mechanism for bringing about the equality between savings and investment. He wrote that 'the rate of interest cannot be determined by the demand for and supply of capital because investment automatically brings into existence an equal amount of savings. Thus, investment "finances itself" whatever the level of the rate of interest. The rate of interest is, therefore, the result of the interplay of other factors' (Kalecki 1997, vol. 7, p. 262).

The cost of borrowing is influenced by the 'principle of increasing risk' (Kalecki 1937). Simply put, this principle is the idea that the greater the volume of borrowing a company wishes to undertake, relative to its own size and profits, the greater is the risk that the company will be unable to repay the borrowing. Any investment venture is subject to risk and uncertainty and to the vagaries of the business cycle. There is then some chance that a business will not be able to meet its loan commitments when its profits turn down. The lender would charge a risk premium on the loan, which makes the loan more expensive and increases the chances that the loan repayments cannot be met. The 'principle of increasing risk' then forms an upper limit on a business's ability to borrow and then to expand and grow.

The discoveries of Keynes and Kalecki in the 1930s on the principle of effective demand and the associated idea that governments could (and should) manipulate their budget stance to generate high levels of employment (rather than aim for a balanced budget) appeared to open up the way for the achievement of permanent full employment in capitalist economies. Kalecki (1943) raised many doubts on the possibilities of achieving prolonged full employment in a laissez-faire capitalist economy. Kalecki introduced an idea which was later interpreted in terms of the political business cycle. Economic activity and employment could be stimulated prior to elections to aid the chances of the governing party being re- elected. But the resulting high level of employment would not last, and at best full employment would be achieved only at the top of the cycle. There were a number of routes through which effective demand could be stimulated. Kalecki argued that the promotion of investment expenditure would be subject to important limits, namely that as investment rose, there would be a tendency for the output to capital ratio to fall (as investment adds to the capital stock) and for the rate of profit to fall. Instead, Kalecki favoured a redistribution of income towards the working class which would stimulate spending, and the acceptance, if necessary, of a budget deficit by the government.

Socialism

Almost all Kalecki's writings on the economics of socialism were undertaken after his return to Poland in December 1954. While much of his writing was of a theoretical nature, the questions tackled and the approach adopted were much influenced by his perceptions of the Polish situation. He was directly involved in many of the debates of the mid-1950s on the development and organization of the Polish economy. His general approach can be summarized by saying that, while he sought a departure from the system of bureaucratic centralism, he thought that the main parameters of development in an economy should be centrally planned, with the market mechanism used in a subordinate role. He advocated a substantial increase in self-management by workers under a system of workers' councils, though he acknowledged that there would be tensions between them and central planning.

Soviet economic planning from the 1920s onwards and eastern European planning in the post-war period placed great weight on rapid industrialization and a heavy industry investment programme. The tendency towards overambitious plans often led to the sacrifice of consumption in favour of investment, when the overall plan could not be implemented but investment was safeguarded. Kalecki's criticisms of heavy industrialization and the sacrifice of consumption to investment brought him into conflict with the prevailing orthodoxy in Poland at the theoretical and at the practical levels.

Kalecki's approach to growth under socialism can be illustrated by reference to the basic relationship in which the growth of output is equal to the impact on productive potential of new investment minus the loss of the production through depreciation plus the change in the utilization of productive capacity. Much of Kalecki's theoretical work stemmed from this equation for the growth of output, with modifications for foreign trade, limited labour supply and technical progress. The emphasis was on the identification, and then pushing back, of the effective constraints on economic growth.

Kalecki viewed the market as involving the inefficient allocation of resources and the cause of insufficient aggregate demand. The socialist system was seen in terms of its ability to solve the problem of effective demand and to involve price–wage flexibility. Although he was critical of the decisions made under central planning, he was opposed to the market socialist alternative.

Development

Kalecki was heavily involved with teaching and research in the area of development planning from the late 1950s to the late 1960s. It is convenient to summarize his writings on development in terms of four themes. The first is that unemployment is seen to arise from a shortage of capital equipment, rather than from a deficiency of effective demand as in industrialized capitalist economies, so that constraints on employment and the pace of development arise more from the supply side than from the demand side. This led Kalecki to an identification of the binding constraints in any concrete situation: difficulties of expanding agricultural production, problems of achieving the desired rate of investment, and shortages of foreign exchange. These essentially economic constraints were generally compounded by the political resistance of powerful groups whose interests would be harmed by economic development.

The second theme is the need for the expansion of agricultural production as a part of the development process, since development and increased incomes leads to an increased demand for food. If that increased demand for food is not satisfied, then the price of food is likely to rise, thereby reducing real wages. But the agricultural sector is likely to suffer from low productivity and outdated techniques. Since there are often powerful obstacles to the development of agriculture, such as feudal or semi-feudal relations in land tenure and the domination of the peasants by merchants and moneylenders, substantial institutional changes would be required to sustain agricultural and economic development.

The third theme is that market mechanisms, left to themselves, are unlikely to produce outcomes that Kalecki would have regarded as

acceptable or desirable. He saw a strong need for planning and direct government intervention, particularly in investment and foreign trade.

The fourth theme is the distributional aspects of growth and development, and in particular a concern that the process of development should benefit the poor. This was combined with an awareness that prospective distributional consequences may block development.

In his work on developing countries, Kalecki developed the concept of an 'intermediate regime'. Countries with intermediate regimes had generally achieved political independence after the Second World War and could not be considered as either socialist or laissez-faire capitalist economies though they sought economic development with government involvement. Kalecki argued that the governments of these intermediate regimes represented the interests of the lower-middle class, rich peasants and managers in the state sector. The poorest strata of society were still unorganized and lacked any political power. He further argued that in order to keep power these representatives of the middle class would have to achieve political and economic emancipation, carry out land reform and assure continuous economic growth. State capitalism develops at the expense of socialism in the economies of intermediate regimes because it helps the middle class to retain power by, for example, aiding faster growth and economic emancipation.

See Also

► Post Keynesian Economics

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Kalman and particle filtering

Jesús Fernández-Villaverde

Abstract

The Kalman and Particle filters are algorithms that recursively update an estimate of the state and find the innovations driving a stochastic process given a sequence of observations. The Kalman filter accomplishes this goal by linear projections, while the Particle filter does so by a sequential Monte Carlo method. With the state estimates, we can forecast and smooth the stochastic process. With the innovations, we can estimate the parameters of the model. The article discusses how to set a dynamic model in a state-space form, derives the Kalman and Particle filters, and explains how to use them for estimation.

Keywords

dynamic stochastic general equilibrium models; extended Kalman filter; Gaussian sum approximations; Kalman filter; Kalman gain; law of large numbers; maximum likelihood; Monte Carlo methods; Particle filter; sequential sampling; state space models; statistical inference

JEL classifications

D4; D10; C22; C32; C51

The Kalman and Particle filters are algorithms that recursively update an estimate of the state and find the innovations driving a stochastic process given a sequence of observations. The Kalman filter accomplishes this goal by linear projections, while the Particle filter does so by a sequential Monte Carlo method.

Since both filters start with a state-space representation of the stochastic processes of interest, Section 1 presents the state-space form of a dynamic model. Section 2 introduces the Kalman filter and Section 3 develops the Particle filter. For extended expositions of this material, see Doucet, de Freitas, and Gordon (2001), Durbin and Koopman (2001), and Ljungqvist and Sargent (2004).

The state-space representation of a dynamic model

A large class of dynamic models can be represented by a state-space form:

$$X_{t+1} = \phi(X_t, W_{t+1}; \gamma) \tag{1}$$

$$Y_t = g(X_t, V_t; \gamma). \tag{2}$$

This representation handles a stochastic process by finding three objects: a vector that describes the position of the system (a *state*, $X_t \in X \subset R^l$) and two functions, one mapping the state today into the state tomorrow (*the transition equation*, (1)) and one mapping the state into observables, Y_t (*the measurement equation*, (2)). An iterative application of the two functions on an initial state X_0 generates a fully specified stochastic process. The variables W_{t+1} and V_t are independent *i.i.d.* shocks. A realization of T periods of observables is denoted by $y^T \equiv \{y_t\}_{t=1}^T$ with $y^0 = \{\varnothing\}$. Finally, γ, which belongs to the set $\Upsilon \subset R^n$, is a vector of parameters. To avoid stochastic singularity, we assume that $\dim(W_t) + \dim(V_t) \geq \dim(Y_t)$ for all t.

This framework can accommodate cases in which the dimensionality of the shocks is zero, where the shocks have involved structures, or where some or all of the states are observed. Also, at the cost of heavier notation, we could deal with more general problems. For example, the state could be a function or a correspondence, and the transition equation a functional operator. The basic ideas are, however, identical.

The transition and measurement equations may come from a statistical description of the process or from the equilibrium dynamics of an economic model. For example, dynamic stochastic general equilibrium models can be easily written in state-space form with the transition and measurement equations formed by the policy functions that characterize the optimal behaviour of the agents of the model. This observation tightly links modern dynamic macroeconomics with the filtering tools presented in this article.

It is important to note that there are alternative timing conventions for the state-space representation of a dynamic model and that, even while the timing convention is kept constant, the same model can be written in different state-space forms. All of those representations are equivalent, and the researcher should select the form that best fits her needs.

The Kalman filter

The Kalman filter deals with state-space representations where the transition and measurement equations are linear and where the shocks to the system are Gaussian. The procedure was developed by Kalman (1960) to transform ('filter') some original observables y_t into Wold innovations a_t and estimates of the state x_t. With the

innovations, we can build the likelihood function of the dynamic model. With the estimates of the states, we can forecast and smooth the stochastic process.

We begin with the state-space system defined by the transition equation:

$$x_{t+1} = Ax_t + G\omega_{t+1}, \omega_{t+1} \sim \mathcal{N}(0, Q)$$

and the measurement equation:

$$y_t = Cx_t + \upsilon_t, \upsilon_t \sim \mathcal{N}(0, R)$$

where A, G, C, Q, and R are known matrices.

There are different ways to derive and interpret the Kalman filter, including an explicitly Bayesian one. We follow a simple approach based on linear least-square projections. The reader will enhance her understanding with the more general expositions in Durbin and Koopman (2001) and Ljungqvist and Sargent (2004).

Let $x_{t|t-1} = E(x_t|\, y^{t-1})$ be the best linear predictor of x_t given the history of observables until $t-1$, i.e., y^{t-1}. Let $y_{t|t-1} = E(y_t|\, y^{t-1}) = Cx_{t|t-1}$ be the best linear predictor of y_t given y^{t-1}. Let $x_{t|t} = E(x_t|\, y^t)$ be the best linear predictor of x_t given the history of observables until t, i.e., y^t. Let $\Sigma_{t|t-1} \equiv E((x_t - x_{t|t-1})(x_t - x_{t|t-1})'\,|\,y^{t-1}$ be the predicting error variance-covariance matrix of x_t given y^{t-1}. Finally, let $\Sigma_{t|t} \equiv E((x_t - x_{t|t})(x_t - x_{t|t})'|\, y^t)$ be the predicting error variance-covariance matrix of x_t given y^t.

How does the Kalman filter work? Let's assume we have $x_{t|t-1}$ and $y_{t|t-1}$, that is, an estimate of the state and a forecast of the observable given y^{t-1}. Then, we observe y_t. Thus, we want to revise our linear predictor of the state and obtain an estimate, $x_{t|t}$, that incorporates the new information. Note that $x_{t+1|t} = Ax_{t|t}$ and $y_{t+1|t} = Cx_{t+1|t}$, so we can go back to the first step and wait for the y_{t+1} next period. Therefore, the key of the Kalman filter is to obtain $x_{t|t}$ from $x_{t|t-1}$ and y_t.

We do so with the formula:

$$\begin{aligned} x_{t|t} &= x_{t|t-1} + K_t\left(y_t - y_{t|t-1}\right) \\ &= x_{t|t-1} + K_t\left(y_t - Cx_{t|t-1}\right), \end{aligned}$$

that is, our new value $x_{t|t}$ is equal to $x_{t|t-1}$ plus the difference between the actual y_t and the forecasted $y_{t|t-1}$, times a matrix K_t, called the Kalman gain. Durbin and Koopman (2001) derive this formula from probabilistic foundations. Ljungqvist and Sargent (2004) find it through an application of a Gram–Schmidt orthogonalization procedure.

Then, if we choose K_t to minimize $\Sigma_{t|t}$, we get $K_t = \Sigma_{t|t-1} C'\left(C\Sigma_{t|t-1}C' + R\right)^{-1}$. This expression shows the determinants of K_t. If we made a big mistake forecasting $x_{t|t-1}$ using past information ($\Sigma_{t|t-1}$ large), we give a lot of weight to the new information (K_t large). Also, if the new information is noisy (R large), we give a lot of weight to the old prediction (K_t small).

Now, note that $\Sigma_{t|t} \equiv E((x_t - x_{t|t})(x_t - x_{t|t})'|\, y_t) = \Sigma_{t|t-1} - K_t C\Sigma_{t|t-1}$. Therefore, from $x_{t|t-1}$, $\Sigma_{t|t-1}$, and y_t, we compute $x_{t|t}$ and $\Sigma_{t|t}$ using K_t. Also, we derive $\Sigma_{t+1|t} = A\Sigma_{t|t}A' + GQG'$, $x_{t+1|t} = Ax_{t|t}$, and $y_{t+1|t} = Cx_{t+1|t}$.

We collect all the previous steps. We start with some estimates of the state $x_{t|t-1}$, the observables $y_{t|t-1}$, and the variance-covariance matrix $\Sigma_{t|t-1}$. Then we observe y_t and compute $x_{t+1|t}$, $y_{t+1|t}$, and $\Sigma_{t+1|t}$.

Thus, the Kalman filter can be recursively written as follows:

- $y_{t|t-1} = Cx_{t|t-1}$
- $K_t = \Sigma_{t|t-1}C'\left(C\Sigma_{t|t-1}C' + R\right)^{-1}$
- $\Sigma_{t|t} = \Sigma_{t|t-1} - K_t\, C\Sigma_{t|t-1}$
- $x_{t|t} = x_{t|t-1}K_t\,\left(y_t - Cx_{t|t-1}\right)$
- $\Sigma_{t+1|t} = A\Sigma_{t|t}\, A' + GQG'$
- $x_{t+1|t} = Ax_{t|t}$

The differences between the observable and its forecast, $a_t = y_t - y_{t|t-1} = y_t - Cx_{t|t-1}$ are, by construction, Wold innovations. Moreover, since the system is linear and Gaussian, a_t is normally distributed with zero mean and variance $C\Sigma_{t|t-1}C' + R$. That is why the Kalman filter is a whitening filter: it takes as an input a correlated sequence yT and it produces a sequence of white noise innovations a_t.

With this last result, we write the likelihood function of $y^T = \{y_t\}_{t=1}^T$ as:

$$\begin{aligned}\log L(y^T|A,G,C,Q,R) &= \sum_{t=1}^{T}\log L(y_t|y^{t-1}A,G,C,Q,R) \\ &= -\sum_{t=1}^{T}\left[\frac{N}{2}\log 2\pi + \frac{1}{2}\log|C\Sigma_{t|t-1}C' \right. \\ &\quad \left. + R| + \frac{1}{2}\sum_{t=1}^{T} a_t'\left(C\Sigma_{t|t-1}C'+R\right)^{-1}a_t\right].\end{aligned}$$

This likelihood is one of the most important results of the Kalman filter. With it, we can undertake statistical inference in the dynamic model, both with maximum likelihood and with Bayesian approaches.

An important step in the Kalman filter is to set the initial conditions $x_{1|0}$ and $\Sigma_{1|0}$. If we consider stationary stochastic processes, the standard approach is to set $x_{1|0} = x^*$ and $\Sigma_{1|0} = \Sigma^*$ such that $x^* = A^*$ and

$$\begin{aligned}\Sigma^* &= A\Sigma^* A' + GQG' \\ &= [I - A \otimes A]^{-1} vec(GQG').\end{aligned}$$

Non-stationary time series require non-informative prior conditions for $x_{1|0}$. This approach, called the diffuse initialization of the filter, begins by postulating that $x_{1|0}$ is equal to:

$$x_{1|0} = \tau + \Phi\delta + G\omega_0, \omega_0 \sim \mathcal{N}(0,Q) \text{ and } \delta \sim \mathcal{N}(0,\kappa Iq)$$

where τ is given and Φ and G are formed by columns of the identity matrix such that $\Phi G' = 0$. This structure allows for some elements of $x_{1|0}$ to have a known joint distribution, while, by letting $\kappa \to \infty$, to formalize ignorance with respect to other elements. Clearly, $x_{1|0} = E(x_{1|0}) = \tau$: To determine the initial variance, we expand $\Sigma_{1|0} = \kappa\Phi\Phi' + GQG'$ as a power series of κ^{-1} and take $\kappa \to \infty$ to find the dominant term of the expansion. Durbin and Koopman (2001) provide details.

The Kalman filter can also be applied for smoothing, that is, to obtain $x_{t|T}$, an estimate of x_t given the whole history of observables, that is, yT. Smoothing is of interest when the state x_t has a structural interpretation of its own. Since smoothing uses more information than filtering, the predicting error variance covariance matrix of x_t given yT will be smaller than $\Sigma_{t|t\ 1}$. Finally, we note that the Kalman filtering problem is the dual of the optimal linear regulator problem.

The Particle filter

The Kalman filter relies on the linearity and normality assumptions. However, many models in which economists are interested are nonlinear and/or non-Gaussian. How can we undertake the forecast, smoothing, and estimation of dynamic models when any of those two assumptions are relaxed?

Sequential Monte Carlo methods, in particular the Particle filter, reproduce the work of the Kalman filter in those nonlinear and/or non-Gaussian environments. The key difference is that, instead of deriving analytic equations as the Kalman filter does, the Particle filter uses simulation methods to generate estimates of the state and the innovations. If we apply the Particle filter to a linear and Gaussian model, we will obtain the same likelihood (as the number of simulations grows) that we would if we used the Kalman filter. Since it avoids simulations, the Kalman filter is more efficient in this linear and Gaussian case.

We present here only the basic Particle filter. Doucet, de Freitas and Gordon (2001) discuss improvements upon the basic filter. Fernández-Villaverde and Rubio-Ramírez (2007) show how this Particle filter can be implemented to estimate dynamic stochastic general equilibrium models. Our goal is to evaluate the likelihood function of a sequence of realizations of the observable yT implied by a stochastic process at a parameter value γ:

$$L(y^T;\gamma) = p(y^T;\gamma). \tag{3}$$

Our first step is to factor the likelihood function as:

$$p(y^T;\gamma) = \prod_{t=1}^{T} p(y_t|\, y^{t-1};\gamma) = \prod_{t=1}^{T} \iint p(y_t|\, W^t,\ X_0, y^{t-1};\gamma) \times p(W^t, X_0/y^{t-1};\gamma)\, dW^t dX_0, \quad (4)$$

where X_0 is the initial state of the model and the p's represent the relevant densities. In general, the likelihood function ((4)) cannot be computed analytically. The particle filter uses simulation methods to estimate it.

Before introducing the filter, we assume that, for all γ, x_0, w^t, and t, the following system of equations:

$$\begin{aligned} X_1 &= \phi(x_0, w_1;\gamma) \\ y_m &= g(X_m, V_m;\gamma) \ \text{ for } m = 1, 2, \ldots t \\ X_m &= \phi(X_{m-1}, w_m;\gamma) \ \text{ for } m = 2, 3, \ldots t \end{aligned}$$

has a unique solution, (vt, xt), and we can evaluate $p(vt;\ \gamma)$. This assumption implies that we can evaluate the conditional densities $p(y^t|\ w^t,\ x_0;\ y^{t-1};\ \gamma)$ for all γ, $x0$, wt, and t. Then, we have:

$$p(y_t|\, w^t, x_0, y^{t-1};\gamma) = |dy(v_t;\gamma)|p(v_t;\gamma)$$

for all γ, x_0, w^t, and t, where $|dy(v_t,\ \gamma)|$ stands for the determinant of the Jacobian of y_t with respect to V_t evaluated at v_t.

Conditional on having N draws of $\left\{\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}\right\}_{t=1}^{T}$ from the sequence of densities $\left\{p[W^t, X_0|\, y^{t-1};\gamma]\right\}_{t=1}^{T}$, the law of large numbers implies that the likelihood function ((4)) can be approximated by:

$$p(y^T;\gamma) \simeq \prod_{t=1}^{T} \frac{1}{N} \times \sum_{i=1}^{N} p\left(y_t|\, w^{t|t-1,i}, x_0^{t|t-1,i}, y^{t-1};\gamma\right).$$

This observation shows that the problem of evaluating the likelihood ((4)) is equivalent to the problem of drawing from $\left\{p[W^t, X_0|\, y^{t-1};\gamma]\right\}_{t=1}^{T}$. Since the algorithm does not require any assumption about the distribution of the shocks except the ability to evaluate $p(y_t\ |\ w^t,\ x_0,\ y^{t\ -\ 1};\ \gamma)$, either analytically or by simulation, we can deal with models with a rich specification of non-Gaussian innovations. But, how do we sample from $\left\{p[W^t, X_0|\, y^{t-1};\gamma]\right\}_{t=1}^{T}$?

Let $\left\{x_0^{t-1,i}, w^{t-1,i}\right\}_{i=1}^{T}$ be a sequence of N *i.i.d.* draws from $p(W^{t-1},\ X_0|y^{t-1};\ \gamma)$.

Let $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{T}$ be a sequence of N *i:i:d:* draws from $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$. We call each draw $\left(x_0^{t,i}, w^{t,i}\right)$ a *particle* and the sequence $\left\{x_0^{t,i}, w^{t,i}\right\}_{i=1}^{T}$ a *swarm of particles*. Also, define the weights:

$$q_t^i = \frac{p\left(y_t|\, w^{t|t-1,i}, x_0^{t|t-1,i}, y^{t-1};\gamma\right)}{\sum_{i=1}^{N} p\left(y_t|\, w^{t|t-1,i}, x_0^{t|t-1,i}, y^{t-1};\gamma\right)}. \quad (5)$$

The next proposition shows how to use $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$, the weights $\left\{q_t^i\right\}_{i=1}^{N}$, and importance sampling to draw from $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$:

Proposition 1 *Let* $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}$ *be a draw from* $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$. *Let the* $\left\{\tilde{x}_0^i, \tilde{w}^i\right\}_{i=1}^{N}$ *sequence* $\left\{\tilde{x}_0^i, \tilde{w}^i\right\}_{i=1}^{T}$ *be a draw with replacement from* $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}$ *where* q_t^i *is the probability of* $\left(x_0^{t|t-1,i}, w^{t|t-1,i}\right)$ *being drawn* $\forall$ *i. Then* $\left\{\tilde{x}_0^i, \tilde{w}^i\right\}_{i=1}^{N}$ *is a draw from* $p(W^t,\ X_0|\ y^t;\ \gamma)$.

Then, with a draw $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}$ from $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$, we get a draw $\left\{x_0^{t,i}, w^{t,i}\right\}_{i=1}^{N}$ from $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$ and we generate a sequence of particles $\left\{\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}\right\}_{t=1}^{T}$ from the sequence $p(W^t,\ X_0|\ y^{t\ -\ 1};\ \gamma)$. Given

some initial conditions, we can recursively apply the idea of the previous proposition as summarized by the algorithm:

Step 0, Initialization: Set $t \nearrow 1$. Initialize $p(W^{t-1}, X_0 | y^{t-1}; \gamma) = p(X_0; \gamma)$.

Step 1, Prediction: Sample N values $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}$ from the conditional density $p\left(W_1^t, X_0 | y^{t-1}; \gamma\right) = p(W_t; \gamma) p\left(W^{t-1}, X_0 | y^{t-1}; \gamma\right)$.

Step 2, Filtering: Assign to each draw $\left(x_0^{t|t-1,i}, w^{t|t-1,i}\right)$ the weight q_t^i as defined in (5).

Step 3, Sampling: Sample N times with replacement from $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}$ with probabilities $\left\{q_t^i\right\}_{i=1}^{N}$. Call each draw $\left(x_0^{t,i}, w^{t,i}\right)$. If $t < T$ set $t \nearrow + 1$ and go to Step 1. Otherwise stop.

With the algorithm's output $\left\{\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}\right\}_{t=1}^{T}$, we obtain the estimate of the states in each period and compute the likelihood:

$$p\left(y^T; \gamma\right) \simeq \frac{1}{N}\left(\prod_{t=1}^{T} \frac{1}{N} \sum_{i=1}^{N} p\left(y_t | w^{t|t-1,i}, x_0^{t|t-1,i}, y^{t-1}; \gamma\right)\right).$$

The **sampling step** is the heart of the algorithm. If we skip it and weight eachdraw in $\left\{x_0^{t|t-1,i}, w^{t|t-1,i}\right\}_{i=1}^{N}$ by $\left\{N q_t^i\right\}_{i=1}^{N}$, we have a sequential importance sampling.

The problem with this approach is that it diverges as t grows. The reason is that, as $t \to \infty$, all the sequences become arbitrarily far away from the true sequence of states (the true sequence being a zero measure set), and the sequence that happens to be closer dominates all the remaining sequences in weight. In practice, after a few steps only one sequence has a non-zero weight. Through resampling, we eliminate this problem as we keep (and multiply) those sequences that do not diverge from the true one.

The algorithm outlined above is not the only procedure to evaluate the likelihood of nonlinear and/or non-Gaussian dynamic models. However, the alternatives, such as the extended Kalman filter, the Gaussian sum approximations, or grid-based filters, are of limited use, and many, such as the extended Kalman filter, fail asymptotically. Consequently, the Particle filter is the most efficient and robust procedure to undertake inference for nonlinear and/or non-Gaussian models, and we will witness many applications of this filter in economics in future years.

See Also

- Bayesian methods in macroeconometrics
- Markov chain Monte Carlo methods
- State space models

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Kantorovich, Leonid Vitalievich (1912–1986)

V. Makarov

Keywords

Economic dynamics; Innovation; Kantorovich, L. V.; Linear programming; Mathematics; Optimal planning; Optimization approach to economics; Socialism

JEL Classifications

B31

Kantorovich made valuable contributions to the theory of welfare and was the founder of the theory of optimal planning of socialist economics. As a professional mathematician, he also made a valuable contribution to a number of sections of modern mathematics. He is regarded (together with G. Dantzig) as the founder of linear programming, the mathematical discipline which has many applications in economics.

L.V. Kantorovich was born on 19 January 1912. He graduated from the department of mathematics of Leningrad University in 1930 at the age of 18. Four years later he became professor of mathematics at Leningrad University. In 1939, through the publishing house of Leningrad University, he published a small booklet, 'Mathematical Methods of Organization and Planning of Production Process'.

This may be considered a historic document, containing the facts about discovery of the linear programming. The mathematical formulation of production problems of optimal planning was presented here for the first time and the effective methods of their solution and economic analysis were proposed. Thus the idea of optimality in economics was founded scientifically. This booklet and a number of subsequent articles establish Kantorovich together with F.P. Ramsey and J. von Neumann as the founders of the optimization approach to the analysis of economic problems.

His fundamental work, *The Best Uses of Economic Resources*, written in 1942 but published for the first time only in 1959, is a brilliant example of the consistent application of the optimization principle to the analysis of a wide variety of economic problems: the planning of production from the level of enterprise to the level of the national economy as a whole; a theory of price formation, which includes the principles of price formation not only for goods and services but also for the factors of production, the time factor, the space factor, natural conditions, the conditions of labour application, and so on; a theory of economic and social-economic efficiency of economic enterprises.

In fact, Kantorovich developed a powerful tool for the analysis of economic problems from the unified position of global optimum and indeed it is not necessary to find this optimum, it is enough to postulate its existence. In a number of his subsequent articles Kantorovich demonstrated the power of his method for the analysis and improvement of the mechanism of economic management of the socialist economy as a whole and its components. He proposed methods for calculating wholesale price levels for the branches of the national economy; the value of the norm of effectiveness of capital investments; the norm of depreciation allowances, and the value of transport tariffs, rent payments, and so on.

For a number of years Kantorovich showed great interest in the problems of economic dynamics. He proposed, analysed and used in practice a dynamic model of optimal planning. On the basis of this model and its different modifications Kantorovich proposed an original theory of economic evaluation of technical ventures. The essence of this theory is that the economic effect of the introduction of a scientific-technical innovation includes three components: a producer effect; a consumer effect; and an effect which is the result of the increase in general scientific-technical economic potential derived from the innovation. The third component is ignored in usual economic practice which leads to a distorted calculation of the real efficiency of innovations.

Kantorovich was also a world-famous mathematician. He made great contributions to a number of different branches of mathematics, among them the descriptive theory of functions and of sets; the constructive theory of functions; a decision method of solving a wide range of problems concerning the best approximation of functions by polynomials; calculus of variations; functional analysis, where he introduced and studied the class of semi-ordered spaces (K-spaces); approximate calculation methods; and developed several effective algorithms as well as a number of other branches of mathematics. This demonstrates his mathematical genius and the vast range of his interests and knowledge.

The author of about 300 scientific works, Kantorovich was awarded the Nobel Prize in economics in 1975.

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Katona, George (1901–1981)

James N. Morgan

Keywords

Consumer confidence; Cowles Commission; Inflation; Katona, G.; Psychological economics

JEL Classifications

B31

Katona developed the theory and substance of psychological economics, with particular attention to the effects of national events on the confidence, expectations, plans and ultimately behaviour of masses of individuals. From a background in Gestalt psychology, he noted that there can be major restructuring of the way people interpret their world and its future, leading to sometimes dramatic shifts in behaviour. And he had a firm belief in people's capacity to learn and to adjust their goals, so that behaviour was more than a simple response to stimuli. Like most great ideas, these were at the same time simple and profound, obvious (that attitudes would affect behaviour) but not accepted, particularly by economists who preferred to keep attitudes and expectations endogenous so they need not be measured or dealt with directly.

The theory argued that the importance of mass psychology was growing as consumers became more affluent, used credit and had to make long-term commitments to levels of investment in housing and cars, and to repayment schedules. Furthermore, he argued, the world was becoming increasingly volatile and unpredictable, so that it was necessary for people to interpret the chaos. The repeated measures of consumer confidence were useful for short-run prediction, but the long-run goal was, and is, to understand mass changes in consumer attitudes and behaviour.

Katona was born in 1901 in Budapest, and was a law student at the University of Budapest when a communist putsch under Bela Kun closed the University. Instead he studied psychology under Mueller at the University of Göttingen. His Ph.D. was on the psychology of perception. While at the University of Frankfurt, he wrote a prize-winning monograph on the psychology of comparison, with an empirical orientation. Hyperinflation drove him to work for a Frankfurt bank and he wrote a widely quoted article on the mass psychological aspects of inflation. There followed a period in Berlin studying Gestalt psychology with his friend Max Wertheimer and writing for Gustav Stolper's *Der Deutsche Volkswirt.* When Hitler closed down the paper, Katonae migrated to New York. An attack of tuberculosis ended his career as an investment counsellor and he turned again to writing. His path-breaking book *Organizing and Memorizing* (1940), showed how organizing material in gestaltsmade it easier to remember and apply to other situations, and could lead to changes in expectations.

Concern with the economic effects of the war led him to write *War without Inflation: The Psychological Approach to the Problems of a War Economy* (1942). After tours at the Cowles Commission for Research in Economics at the University of Chicago, and the Division of Program Surveys of the US Department of Agriculture, he moved with that programme to the University of Michigan to help form the Survey Research Center. There he began the continuing series of surveys measuring mass changes in consumer confidence, building a body of knowledge about how people respond to events and interpret them for their own lives. A series of books starting in 1951 and continuing through 1978 summarized the research.

He died in West Germany on 18 June 1981, the day after receiving an honorary degree from the Free University of Berlin.

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Kautsky, Karl (1854–1938)

Tadeusz Kowalik

Keywords

Business cycles; Cartels; Economic planning; Engels, F.; Guild socialism; Imperialism; Kautsky, K.; Market socialism; Marx, K. H.; Marx's analysis of capitalist production; Money; Peasant economy; Say's Law; Socialism; Stagnation; Tugan-Baranovsky, M. I.; Underconsumptionism

JEL Classifications

B31

Kautsky was born in Prague on 16 October 1854 and died in Amsterdam on 17 October 1938. Marxist thinker and writer, leading theoretician of the German Social Democratic Party (SPD) and the Second International, he studied law and arts in Vienna. Fascinated by the theories of Marx and Engels (both of whom he met and befriended in London in 1881), Kautsky must be credited with the spread and development of their ideas in all his embodiments – as a prodigal and versatile columnist; as founder and editor (1883–1917) of the SPD theoretical journal *Die Neue Zeit*, which soon became the chief Marxist forum in Europe; as editor of Marx's books and unfinished manuscripts (Kautsky edited them in three volumes called *Theorien über den Mehrwert,* which appeared in 1905–10); and also as socialist thinker. Kautsky presented his ideas systematically in *Die materialistische Geschichtsauffassung* (1927), expounding a theory of social development which combined Marx's and Engels's historical materialism with Darwin's naturalism.

Kautsky's first major popular book designed to spread Marxian theories was *Karl Marx' ökonomische Lehren* (1887), which expounds the substance of the first volume of *Das Kapital.*

It went into numerous editions in German and other languages, and in some countries (as in Russia) its effect on the spread of Marxism was significant.

His original contribution to Marxian theory was his *Agrarfrage* (1899), described by Lenin as the most outstanding work since the third volume of *Das Kapital* had appeared in print. In it, Kautsky analyses trends of development in agricultural production against the backdrop of Marx's theory of capitalism, of capitalist development's own specific features and, in particular, of the then much-discussed question of persistence of small peasant holdings. Kautsky studied the causes of small private farms' relative viability, a phenomenon which at that time was often cited as evidence that Marx's concentration theory was wrong. He attributed the survival of small peasant holdings to the undernourishment and excessive toil of peasant families, to the demand for seasonal labour by large landed estates and to their interest in preserving local labour reserves. Kautsky also pointed out that, in agriculture, concentration of production does not necessarily go along with increases of crop area but may result from more intensive cultivation. Generally, though, he believed that the conquest of agriculture by capitalism was just a question of time.

Kautsky's motive for studying the agrarian question was pragmatic; he wanted to answer the question of whether or not the SPD needed an agricultural policy of its own. In particular, it was unclear whether the SPD ought to defend peasants on their own holdings against the adverse effects of capitalism. Kautsky came to believe that such a move would only hamper what was an inexorable social process, namely, the emergence of large capitalist farms relying on hired labour, and hence would hamper the ascent of socialism. Without compromising its own tenets and aspirations, Kautsky said, the SPD could demand the abolition of all vestiges of feudalism in the countryside and defend peasants as working people, as semi-proletarians. But he thought the idea of defending peasants as smallholders a reactionary utopia. He used the same logic to interpret the role of the capitalist metropolitan countries in subjugating colonies.

Kautsky wrote the *Agrarfrage,* as well as his studies concerning crises, as polemics against 'revisionists', who argued that the spread of cartels and trusts, along with the expansion of bank activities, eliminated the anarchy in capitalist production and hence was likely to allay or forestall crises in the future. Kautsky opposed these theories in a series of articles (1901–2) in *Die Neue Zeit* which he wrote in reaction to a German translation of Mikhail Tugan-Baranovsky's *Studien zur Theorie und Geschichte der Handelskrisen in England* (1901). Tugan-Baranovsky reinterpreted Marx's reproduction models in terms of Say's Law and attributed the causes of crises to the disproportions of capitalist development. The spread of cartels, Tugan-Baranovsky argued, eliminated those disproportions and hence also forestalled crises.

Kautsky defended the theory of underconsumption as the basis of business cycles and argued that cartels and other similar organizations of capitalists, keen as they were on maximizing profits, were unable to keep control of production and demand on a national scale, to say nothing of the world economy. He countered the optimistic picture presented by the 'revisionists' with his own hypothesis of capitalism's inexorable drift toward 'a chronic depression'. That was one of the first-ever theories of stagnation. Later (1910), Kautsky was inclined to attribute the principal cause of 'recent' crises to the circumstance that agricultural growth was slower than and lagging behind industrial growth. He also cited this particular disproportion in his concept of imperialism as the expansion of advanced industrial countries into agrarian markets. During the First World War Kautsky formulated his well-known hypothesis portraying ultra-imperialism as an alliance of previously rival imperialist powers for a joint exploitation of world resources.

In many studies Kautsky returned to the political and economic problems of the transition to socialism and to the organization and operation of the socialist economy. At first, those problems were overshadowed by the dominant question of political revolution to seize power and of proletarian dictatorship, and Kautsky's casual remarks indicate he regarded a socialist economy simply

as the negative of a market- dominated capitalist economy. But from the war onwards, especially in the 1920s, he interpreted socialism and the socialist economy as a continuation and further development of capitalist accomplishments not only in economics but also in terms of social advancement and political progress. His writings are pervaded by a concern for freedom and democracy. Accordingly, he views the transition period as a long process of socialization of production during which those accomplishments would be preserved and economic efficiency would be maintained.

Kautsky was one of the first socialist writers to dispute the idea of a natural, that is money-free, socialist economy. Already at the turn of the century (1902) he argued that money and market were indispensable if freedom of choice in consumption and jobs was to be preserved. Two decades later, when the wave of revolution in Germany, but especially in the Soviet Union, made the construction of socialism a topical question, Kautsky considered the question in a systematic manner (1922). Apart from reaffirming the advantages of money and prices, Kautsky acknowledged the importance of money as a measure of value which permitted the quantitative assessment of production by means of accounting techniques and as a device for identifying benefits that may be gained from trade transactions. However, he failed to furnish a clear picture of how he interpreted economic choice in the allocation of resources. He was probably not quite consistent on this point. On the one hand, he wrote in the spirit of 'market socialism' that socialist society would be governed by the law of value. On the other hand, he overrated the benefits of economies of scale, that is, the supremacy of large-scale over small-scale production, and he was adamant in his faith in vertical and horizontal integration. If his beliefs came true, the integration was bound to lead to ubiquitous monopolistic practices on the part of socialist industrial giants.

He also believed that full socialization of production and of the bank credit system would render the latter superfluous. He accepted that interest rates might be charged by the socialized banks, but solely in order not to deprive them of their competitive edge in relations with capitalist banks and only in the transition period. His idea of economic planning also seems incompatible with 'market socialism'. In his view, economic planning would amount to the entire community of consumers negotiating output volumes and prices with the branch producers. Since this implied that a lot of time would be needed to build an efficient system of statistical records, Kautsky believed full economic planning was a remote prospect. But what would a fulfilment of those plans actually guarantee? Kautsky failed to realize how complex a question that was, although some of his remarks, such as his comments about the important part that talented production organizers, who are as rare as talented artists, might play in socialism, sound quite up-to-date.

Opposed as he was to total state control. Kautsky was an advocate of a plurality of ownership forms in socialism. Apart from a certain scope for state ownership of production (which would not be managed by state-employed functionaries), he saw in socialism room for production cooperatives, for municipal enterprises, and for union-sponsored autonomous enterprises similar in character to those advocated by Guild Socialists. He regarded the general idea of guild socialism as excellent and inspiring, but he thought that this school focused its attention too much on producers to the detriment of consumers, and he resisted in particular attempts to present guild socialism as the only feasible production organization model for socialism.

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Kelley, Augustus Maverick (Born 1913)

Jay M. Gould

From 1950 to 1975, as publisher of the Reprints of Economics Classics series, Kelley made over 1000 titles available to libraries all over the world to foster the study of the development of economic thought. His reprints covered not only the works of major economists from Smith, Malthus, Ricardo and Mill to Thorstein Veblen, but also of such lesser-known economists as Bentham, Carey, Commons, Cournot, Davenport, Godwin, Hobson, Jevons, Pareto, W.C. Mitchell and others.

Born in New York, Kelley was the great grandson of William Kelley, one of President Lincoln's staunchest Radical Republican Congressional supporters, and whose daughter, Florence Kelley, became the first female lawyer in the US, though she had to go abroad to get her degree. She translated and prepared the first American edition of Engels' *Condition of the English Working Class* and *Origin of the Family.* Under Governor Altgeld of Illinois, she was responsible for the first labour legislation for women and children passed in the US. On his mother's side, Kelley was a great grandson of Samuel Maverick of Texas, whose offbeat reputation made 'maverick' a synonym for 'an individual who does not go along with a group'. Kelley's father, Nicholas, as general counsel to Chrysler, negotiated the historic automotive strike settlement in the 1930s that led to the establishment of the Congress of Industrial Organization (CIO). Kelley thus grew up surrounded by books and family memoriabilia attesting to several generations of involvement with important periods of American history. After his father's death, Kelley donated to Columbia University Florence Kelley's papers, which included correspondence with Friedrich Engels, Jane Addams, Henry Demerest Lloyd, Theodore Roosevelt and W.E.B. Dubois. (She was one of the founders of the Association for the Advancement of Colored People.)

Educated at Harvard and the University of Chicago, Kelley began his graduate work in history at Columbia in 1935, but fell under the spell of Wesley C. Mitchell, whose courses in the Business Cycle and the Development of Economic Thought had attracted hundreds of graduate students to Columbia from all over the world in the 1920s and 1930s. Mitchell's pioneer statistical work on the business cycle, published in 1913 led him to a lifelong study of ways in which various economic theories could explain business fluctuations. In his lectures on types of economic theories, he treated each theory as reflecting contemporary economic, political and social issues, a kind of 'materialist' emphasis particularly congenial to Kelley, and indeed to many graduate students in the depression years.

After four years of military service, Kelley opened the Turtle Bay Bookshop in 1945 to specialize in rare economics books after acquiring the library of Irving Fisher, to accommodate his interests as both an economist and bibliophile. Because of the scarcity of rare books, he turned to reprinting, after securing permission from Mitchell just before his death in 1945, to reproduce the stenographic notes of Mitchell's popular course on types of economic theory. These lectures had been transcribed and

circulated by a student in 1933 very much in the manner in which Adam Smith's lectures on ethics had been preserved for posterity. The mimeographed Mitchell notes were highly prized by graduate students not only because of their wit and charm, but because Mitchell's unique historical treatment of each economic theory greatly facilitated preparing for oral exams in economic theory. Kelley's initial publication of the Notes sold out immediately, and eventually, with the help of Mrs Mitchell, he secured the voluminous notes underlying the lectures, which under the editorship of Joseph Dorfman finally resulted in the publication of the two-volume edition of *Types of Economic Theory* in 1969. The book contains hundreds of references to economists whose works have been preserved in the Reprints Series. In this way, Mitchell's lifelong study of the development of economic thought has both inspired and informed the content and spirit of Kelley's reprints.

See Also

► Mitchell, Wesley Clair (1874–1948)

Kemmerer, Edwin Walter (1875–1945)

P. Drake

Kemmerer was born in Scranton, Pennsylvania on 29 June 1875. After earning a PhD at Cornell under Jeremiah W. Jenks in 1903, he became a professor of economics and finance at Princeton University for most of his career. Kemmerer pioneered in the application of statistical methods to the study of money, and wrote widely on that topic as well as on banking and financial reforms. Joining the debate over the quantity theory of money, he exerted enormous influence in defence of the gold standard and central banking. Kemmerer assisted in the creation of the Federal Reserve System in 1911, helped edit the *American Economic Bulletin* and the *American Economic Review*, and then served as president of the American Economic Association in 1926. More noteworthy as an extraordinary international economic advisor than as a theorist, he achieved fame around the world as the 'money doctor' in the 1920s.

His installation of the gold exchange standard and central banks abroad began with the United States Philippine Commission in 1903–6. From 1917 to 1934, Kemmerer conducted similar inflation-fighting missions to Mexico, Guatemala, Colombia, Germany, Chile, South Africa, Poland, Ecuador, Bolivia, China, Peru and Turkey. His teams of experts were hired independently by those countries to stabilize exchange, modernize financial and fiscal institutions, and render the economies more attractive to foreign investors. Kemmerer's fame faded in the 1930s, as he continued to espouse monetary stability based on the gold standard. After retiring from Princeton in 1943, he died in New Jersey on 16 December 1945.

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Kendall, Maurice George (1907–1983)

J. R. N. Stone

Kendall was born on 6 September 1907 in Kettering, and died on 29 March 1983 in London. He was made a Fellow of the British Academy in 1970 and knighted in 1974. He was educated at the Central School, Derby, and St John's College, Cambridge (Wrangler 1929). From 1930 to 1941 he was a civil servant in the Ministry of Agriculture, and a statistician in the Chamber of Shipping from 1941 to 1949. From 1949 to 1961, he held the position of Professor of Statistics at the London School of Economics. He joined Scientific Control Systems Ltd (SCICON) in 1961, and was chairman from 1967 to 1972. From 1972 to 1980 he held the position of Director of the World Fertility Survey. Among his other activities, from 1958 to 1959 he was President of the Operational Research Society, and the Royal Statistical Society from 1960 to 1962.

Kendall was a brilliant mathematical statistician and a prolific writer on his subject. His first important work was the revised eleventh edition of G.U. Yule's *Introduction to the Theory of Statistics* (Yule and Kendall 1937). This was followed by two monumental volumes on the advanced theory of statistics (Kendall 1943–6), which he later revised and expanded to three in collaboration with A. Stuart (Kendall and Stuart 1958–66). He published monographs on rank correlation, n-dimensional geometry, time series and multivariate analysis (Kendall 1948, 1961, 1973, 1975), a dictionary of statistical terms (Kendall and Buckland 1967) and a bibliography of statistical literature (Kendall and Doig 1962–8), as well as several edited collections and a large number of papers. His writings of particular interest to economists range from his work on the analysis of time series to his historical essays on index-numbers and the role of political arithmetic as the true ancestor of modern statistics.

He was an energetic member of the Statistics Department of the LSE and established a new research division there.

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Kernel Estimators in Econometrics

Aman Ullah

Abstract

The kernel estimation method is a nonparametric procedure for analysing economic models. It is a data-based procedure which avoids the a priori parametric specification of the economic model, and it has become popular because of its wide applicability and well-developed theory. A substantial literature has developed where the local polynomial kernel estimator has been proposed to analyse various economic models, which include regression models, single-index models, dynamic time series models and panel data models. The frontier of this subject is expected to develop further in both theory and applications, especially with advances in computer technology.

Keywords

Bootstrap; Convergence; Cross-section econometrics; Curse of dimensionality; Kernel estimators in econometrics; Linear models; Local modelling; Nonlinear models; Nonlinear time-series analysis; Nonparametric regression; Time-series econometrics

JEL Classifications

C14

For empirical research, we draw from economic theory the types of variables which can be used in the economic relationship (model) under consideration. But theory usually does not provide the functional form of the economic model. Empirical and theoretical work in econometrics is, therefore, often carried out by assuming linear or nonlinear parametric functional forms of the economic models (see Gallant 1987, for work on nonlinear models by econometricians sparked by the work of statisticians Hartley 1961, and Jennrich 1969). However, these parametric models may often be mis-specified and hence they may provide biased and misleading conclusions. With this in view, econometrics moved in the direction of local modelling (local averaging), which is a data-based approach, for studying the economic relationships of unknown forms. In the regression framework this approach is also called 'nonparametric regression' or 'nonparametric smoothing'. Here our focus is on nonparametric kernel regression.

Nonparametric kernel regression methods are becoming increasingly popular for applied data analysis; they are best suited to situations involving large data-sets for which the number of variables involved is manageable. A kernel is simply a weighting function. The kernel estimation procedure was developed in the seminal published work of Rosenblatt (1956) on the density function, and later in the context of the regression function, by Nadaraya (1964) and Watson (1964). A detailed development on this subject in statistics was first presented by Prakasa Rao (1983), and then Härdle (1990) and Fan and Gijbels (1996), followed by the work of Pagan and Ullah (1999) in econometrics. There are other ways to do local modelling – for example, spline methods, series methods, differencing methods, and neural network methods (see Pagan and Ullah 1999) – but the kernel smoothing procedure has become popular because of its vast applicability, simplicity, and well-developed theoretical underpinnings for both time-series and cross-section data. Nonparametric kernel methods essentially involve local averaging in a regression context: we can obtain a consistent estimate of the conditional mean by locally averaging those values of the dependent variable which are 'close' in terms of the values taken on by the regressors. The amount of local information used to construct the average is determined by a window width, also known as a 'bandwidth' or a 'smoothing parameter'.

Suppose one wished to estimate the function m in the regression equation:

$$y_i = m(x_i) + u_i, \quad i = 1, \ldots, n \tag{1}$$

where y_i is the dependent variable, x_i is a vector of q regressors, and u_i is an additive error.

A parametric approach intends to fit the data to a parametric model $m(x_i) = m(x_i, \theta)$, often a linear model with $m(x_i, \theta) = \alpha + x_i\beta$, where θ is a parameter set of the model. But from the perspective of economic theory many economic models tend to be nonlinear. This makes the linear model specification inappropriate for understanding economic relationships. A way to capture the nonlinearity in data is to model the regression function locally, that is, to obtain the regression function $m(x)$ at a given point x by applying the linear regression technique to the data in a window width of size h using the linear model

$$y_i = \alpha(x) + (x_i - x)\beta(x) + u_i, \text{for } x_i \text{ in } x \pm \frac{h}{2} \tag{2}$$

This local linear regression method leads to the following locally weighted minimization problem:

$$\min \sum_{i=1}^{n} (y_i - \alpha(x) - (x_i - x)\beta(x))^2 \; K\left(\frac{x_i - x}{h}\right) \tag{3}$$

where $K(\cdot)$, a non-negative weight (kernel) function, is a decreasing function of distances of x_i from the point x, and h is a window width that determines how rapidly the weights decrease as the distance of x_i from x increases. Let $\hat{\alpha}(x)$ and $\hat{\beta}(x)$ be the estimated local linear least squares estimators, which are the solutions of (3). Then the estimated regression function at the point $x_i = x$ is $\hat{m}(x) = \hat{\alpha}(x)$ and $\hat{\beta}(x)$ is the estimator of $\beta(x) = \partial m(x)/\partial x$ which is the local slope. If $\beta(x) = 0$ in (2) and (3), then the resulting estimator of $m(x) = \alpha(x)$ is the Nadaraya (1964) and Watson (1964) kernel regressor estimator. The local linear regression approach in (2) amounts to considering a linear Taylor series expansion of $m(x_i)$ around x in model (1). This approach can be extended to a local polynomial regression by taking a polynomial expansion of order, say p, of $m(x_i)$ around x. This provides the local polynomial least squares estimator of $m(x)$ (Stone 1977). The local linear estimators ($p = 1$) perform better than the Nadaraya–Watson estimator ($p = 0$) with respect to bias reduction, absence of boundary effects, and the adaptation to various design situations; for $p \geq 1$ the local polynomial estimators may suffer singularity problems in applied settings.

The principle of local regression estimators can be generalized to other parametric regression settings such as local logit and probit, local proportional hazards, local quantile, robust regression, and nonlinear time-series models. For example, if we let $m(x_i,\theta)$ be a parametric model and $L_i(y_i, x_i, m(x_i, \theta))$ be the loss or the log-likelihood of the i-th observation, then we can minimize (if a loss) or maximize (if a likelihood) the objective function given by

$$L(\theta) = \sum_{i=1}^{n} L_i(y_i, x_i, m(x_i, \theta))K\left(\frac{x_i - x}{h}\right) \tag{4}$$

The $m(x_i, \theta)$ is now locally estimated by $m\left(x_i, \hat{\theta}(x)\right)$, for example, when $m(x_i, \theta) = \alpha + x_i\beta$ then $m(x_i, \theta(x)) = \alpha(x) + \beta(x)x_i$ and $L_i(y_i, x_i, m(x_i, \theta(x)) = (y_i - \alpha(x) - (x_i - x)\beta(x))^2$, or $L(\theta)$ is maximized with L_i written presuming normality of errors. Similarly, in a single index econometric model $L_i(y_i,x_i,m(x_i,\theta)) = \log\left[F(x_i\beta)^{y_i}(1-F(x_i\beta))^{1-y_i}\right]$ where $y_i = 1$ or 0 and $F(\cdot)$ is a cumulative distribution function, and in the case of a local linear $k - th$ quantile regression $L_i = u_i(k - I(u_i < 0))$ where $u_i = y_i - \alpha(x) - (x_i - x)\beta(x)$, $0 < k < 1$, and $I(\cdot)$ is the usual indicator function.

The selection of window width h is by far the most important issue of nonparametric kernel estimation. When h is arbitrarily small, the bias of the estimator is small but the variance is large. Conversely, when h is large, the estimator has a lower variance and a higher bias. Much of the literature on the methods of window width selection can really be viewed as attempts to balance this classic bias–variance trade-off. Overall, the selection rules fall into roughly three broad categories: (*a*) reference rules that would be optimal from a reference data generating process, (*b*) plug-in, penalizing, and cross-validation methods, and (*c*) bootstrap methods (see Pagan and Ullah 1999, and Marron 1992).

The asymptotic properties of the local polynomial estimators are well established (see Fan and Gijbels 1996, for cross-section data and Masry 1996, for the time-series case). The implication of these results is that the rate of convergence of the pointwise estimator of the $r-th$ derivative of $m(x)$ is the inverse of $\left(nh^{q+2r}\right)^{\frac{1}{2}}, r \geq 0$, which is slower than the parametric rate of $\sqrt{n}$. In fact, as the dimensions of the regressors q for a given r increase, the rates become worse, which is the well-known 'curse of dimensionality' problem. However, the rate of convergence of the average of the pointwise estimators (global estimators) of these derivatives is widely known to have $\sqrt{n}$ rate of convergence. One of the most popular ways to deal with the 'curse of dimensionality' is to consider the nonparametric additive regression model which can be written as $y_i = \beta_0 + \sum_{j=1}^{q} m\left(x_{ij}\right) + u_i$. Imposing this additivity provides an estimator having a one-dimensional nonparametric rate of convergence.

In recent years the kernel regression estimation methods have progressed in various directions. These include testing for the significance of a regressor or group of regressors, consistent testing for the correct parametric functional form, estimation of the so-called 'structural relationship' among endogenous (dependent) variables, and the estimation of various types of semiparametric models consisting of a combination of parametric and nonparametric models (see Pagan and Ullah 1999). Extensive work on the empirical applications of the kernel regression estimation have begun to appear in both cross-section econometrics and time-series econometrics, especially in labour economics and empirical finance. Although some related work is being done, several challenging research issues remain to be worked out. The first is the development of a unified approach towards a data-driven window width, and the development of software that permits fast computation of kernel-based estimators and test statistics for large data-sets in a desktop environment. The second is the development of kernel-based estimation of time-series models for non-stationary data. Third is the systematic development of the work on kernel estimation of panel-data models with heterogeneity parameters, especially when the time-series component of the data is large. Finally, the development of the theory of kernel estimation of various econometric models with both continuous and discrete variables is important, especially for the empirical applications of the kernel regression methods (see Racine and Li 2004).

The nonparametric kernel regression method is a dynamic area, and there are rapid ongoing theoretical advances. With advances in computer technology, applications of the kernel regression approach continue to increase. The developments described above provide the dimensions in which the kernel-estimation procedures have been explored in econometrics and statistics. In a broad sense, the frontier of this research area has moved on, and is expected to continue with further developments in both its theory and applications.

K

See Also

- Econometrics
- Non-linear Time Series Analysis
- Non-parametric Structural Models
- Robust Estimators in Econometrics

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Kessel, Reuben Aaron (1923–1975)

Armen A. Alchian

Born and reared in Chicago, Kessel earned a doctorate at the University of Chicago Graduate School of Business in 1949, after serving as a US Army meteorologist in World War II. Kessel's professional career started at the University of Missouri, after which he was a member of the research staff of the RAND Corporation in Santa Monica, California (1952–6). In 1957 he was an assistant professor in the Graduate School of Management, University of California, Los Angeles, before returning to the University of Chicago Graduate School of Business, earning the rank of Professor (1965), and also serving as a director of the Bell Federal Savings and Loan Association.

Kessel's initial work concerned the effects of inflation on the distribution of wealth. In a series of theoretical and empirical papers, he attributed the wealth redistribution effects of unanticipated inflation to the net monetary creditor or debtor status and refuted other commonly purported explanations, such as wage lags. He later turned to research on the term structure of interest rates and the consequences of legislative restrictions on competition (such as the medical profession, the dairy industry, blood banks and the underwriting of new security issues).

Kessel was exceptional in his dedication to applying economic analysis in seeking to explain what appeared at first sight to be individual non-optimizing or non-equilibrium behaviour. His appreciation of the power of economic analysis induced an intense impatience with economists who propounded unverifiable theorems or assumed the validity of unvalidated propositions.

See Also

► Chicago School

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Keynes, John Maynard (1883–1946)

Don Patinkin

Abstract

J. M. Keynes was the greatest political economist of the first half of the 20th century. This article traces the development of his thinking about economic theory and policy. It focuses largely on the inter-war trilogy, the *Tract on Monetary Reform* (1923), the *Treatise on Money* (1930), and the *General Theory of Employment, Interest and Money* (1936), in which Keynes's monetary thought evolved from the quantity-theory tradition he had inherited, changed the face of monetary theory, laid the foundation for its development into macroeconomic theory, and defined the analytical framework and research programme of this theory for decades to come.

Keywords

Beveridge, W.; Bretton Woods agreement; Business cycles; Cambridge Circus; Cheap money; Clark, C.; Credit cycle; Demand for money; Econometric Society; Effective demand; Fisher, I.; Fundamental equations; Gold standard; Harrod, R.; Hawtrey, R.; Hicks, J.; Inflation; International Monetary Fund; Kahn, R.; Kalecki, M.; Keynes, J. M.; Keynes, J. N.; Kuznets, S.; Leontief, W.; Lerner, A.; Liquidity preference; Liquidity premium; Liquidity trap; Macmillan Committee on Industry and Finance; Marginal efficiency of capital; Marshall, A.; Mathematical economics; Meade, J.; Modigliani, F.; Myrdal, G.; National-income estimates; Ohlin, B.; Paradox of thrift; Partial equilibrium theory; Patinkin, D.; Pigou, A.; Public works; Purchasing power parity; Quantity theory of money; Robertson, D.; Robinson, A.; Robinson, J.; Say's Law; Shackle, G.; Sraffa, P.; Stockholm School; Stocks and flows; Tinbergen, J.; Unemployment equilibrium; Velocity of circulation; Viner, J.; Wage rigidity; Walras, L.; Wicksell, K.; World Bank

JEL Classifications

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John Maynard Keynes was one of the great intellectual innovators of the first half of our century, and certainly its greatest political economist. He was born in Cambridge on 5 June 1883, and died at Tilton (in Sussex) on 21 April 1946. His father was John Neville Keynes, also an economist, author of *The Scope and Method of Political Economy* (1891), and later registrary of Cambridge University.

With the help of a scholarship, Keynes was educated at Eton. He then went on to King's College, Cambridge, where he took a degree in mathematics in 1905. Afterward he spent an additional year at Cambridge studying economics under the then-doyen of British economics, Alfred Marshall, as well as under the latter's student and successor-to-be as Professor of Political Economy at Cambridge, Arthur Pigou. Keynes then entered the Civil Service, where he worked for over two years in the India Office, though he never actually visited India. Out of this work grew his first book in economics, *Indian Currency and Finance* (1913), which was largely descriptive in nature, and whose main concern was not the Indian monetary system as such – and *a fortiori* not the Indian economy – but with this system as an example of the workings of a gold-exchange standard. This work also led to Keynes's first major participation in public life as a member of the Royal Commission on Indian Finance and Currency (1913–14).

In 1908 Keynes returned to Cambridge as a Lecturer in Economics (some of Keynes's notes for his lectures during this period have survived and are reproduced in *JMK* XII, pp. 689–783). During that year he continued his work on *A Treatise on Probability*, which he successfully submitted to King's College as a fellowship dissertation in 1909. This dissertation was published in a revised form in 1921 and continues to be recognized as a pioneering work in the field.

Shortly after the outbreak of World War I, Keynes took a leave of absence from Cambridge to enter the Treasury. Here his exceptional ability and capacity for work led to his rapid advancement, and by 1919 he was principal Treasury representative at the Peace Conference at Versailles. His passionate disagreement with what he considered to be the harsh clauses of the Versailles Peace Treaty led to his resignation from the British delegation and to the writing of his vehement denunciation of the treaty in his *Economic Consequences of the Peace* (1919), which was translated into many languages and overnight made him a world celebrity. From then on Keynes was an international figure whose voice was heard on all major economic problems that arose in interwar Britain and, indeed, in the Western world as a whole.

In 1925 Keynes married the Russian ballerina Lydia Lopokova, a leading member of Diaghelev's company in the early 1920s. They had no children.

(The present essay is devoted almost entirely to the development of Keynes's thinking about economic theory and policy. For full biographical studies of Keynes, see Austin Robinson 1947; Harrod 1951; Milo Keynes 1975; Moggridge 1980; and Skidelsky 1983, 1992, 2000.)

1. In our profession, Keynes is known primarily for his fundamental contributions to monetary economics. The *Tract on Monetary Reform* (1923; henceforth *Tract*), the *Treatise on Money* (1930; henceforth *Treatise* or *TM*), and the *General Theory of Employment, Interest and Money* (1936; henceforth *GT*): this is the inter-war trilogy that marks the development of Keynes's monetary thought from the quantity-theory tradition that he had inherited from his teachers at Cambridge; to his subsequent systematic attempt to dynamize and elaborate upon this theory and its applications; and, finally, to the revolutionary work (as Klein 1947, so rightly termed it) which he wrote under the constant stimulus and criticism of his colleagues and students – and with which he changed the face of monetary theory, laid the foundation for its development into macroeconomic theory, and defined the analytical framework and research programme of this theory for decades to come.

(The following discussion draws freely on the material in Patinkin 1976a, 1977, 1982, to which the reader is referred for further details; all references to Keynes's writings are to the form in which they appear in the relevant volumes (most of which were edited by Donald Moggridge) of the Royal Economic Society's edition of his *Collected Writings,* referred to henceforth as, e.g., *JMK* IX, *JMK* XIII, and so forth. Though it has its faults (see Patinkin 1975, section I; 1980. pp. 2–3(especially n.2 and n.6), p. 8 (n.14), and pp. 14–15 (n.22 and n.23); see also Schefold 1980, and section 3 below), this edition – to paraphrase one of the famous passages of the *Treatise* – is verily a widow's cruse from which students of the development of Keynes's thought will continue to draw materials for years to come, without diminution in the profits to scholarship.)

Though I have referred to Keynes's three books on monetary theory as a trilogy, they differ from each other greatly not only in substance (a difference that has, of course, been a major theme of all studies of the development of Keynes's thought) but also in form and purpose. Thus the *Tract* is not really a book, but in large part a revision and elaboration of the series of article on postwar economic policy that Keynes first published in 1922 in the 'Reconstruction Supplements' (which he edited) of the *Manchester Guardian Commercial,* with the addition of material that is not always integrated with that from the series.

Thus chapters 1 and 3:2 of the *Tract* are based on these articles and deal with the pressing problems of inflation, deflation, and the resulting exchange rate disequilibrium that then beset Europe. Keynes analysed this disequilibrium in terms of the purchasing-power-parity theory, which he expounded in detail and tested with contemporary data from the countries involved. In the new material presented in chapter 4, he then provided a lucid analysis of the basic dilemma between the 'alternative aims' of stability of the internal price level and stability of the exchange rate – and strongly argued the view that he was to reaffirm in the *Treatise* of giving precedence to the aim of internal price stability. Similarly, the brief, formal presentation of monetary theory that

appears in chapter 3:1 of the *Tract* – and which, as Keynes tells us (*Tract,* p. 63, n.1) 'follows the general lines of Professor Pigou ... and of Dr Marshall'– is part of the material that Keynes added to these articles in making up the book.

In this context, Keynes presents the 'famous quantity theory of money' in the following terms:

> Let us assume that the public, including the business world, find it convenient to keep the equivalent of k consumption units in cash and a further k' available at their banks against cheques, and that the banks keep in cash a proportion r of their potential liabilities (k') to the public. Our equation then becomes
>
> $$n = p(k + rk')$$
>
> [where n is the quantity of money and p the price level]. So long as k, k' and r remain unchanged, we have the same result as before, namely, that n and p rise and fall together (*Tract*, p. 63).

This equation is nothing but a minor variation on the famous 'Cambridge equation' that Pigou had first presented in print in his classic 1917 article (p. 166), to which Keynes at this point refers.

Similarly, when he goes on to explain the determinants of k and k', Keynes states that the matter cannot be summed up better than in the words of Dr Marshall:

> In every state of society there is some fraction of their income which people find it worthwhile to keep in the form of currency; it may be a fifth, or a tenth, or a twentieth. A large command of resources in the form of currency renders their business easy and smooth, and puts them at an advantage in bargaining; but on the other hand it locks up in a barren form resources that might yield an income of gratification if invested, say, in extra furniture; or a money income, if invested in extra machinery or cattle.' A man fixes the appropriate fraction 'after balancing one against another the advantages of a further ready command, and the disadvantages of putting more of his resources into a form in which they yield him no direct income or other benefit.' 'Let us suppose that the inhabitants of a country, taken one with another (and including therefore all varieties of character and of occupation), find it just worth their while to keep by them on the average ready purchasing power to the extent of a tenth part of their annual income, together with a fiftieth part of their property; then the aggregate value of the currency of the country will tend to be equal to the sum of these amounts (*Tract,* p. 64).

The words are from Marshall's *Money, Credit and Commerce* (1923), pp. 44–5. In this source, however, Marshall indicates that in large part they go back to his testimony before the Indian Currency Committee in 1899 (reproduced in Marshall's *Official Papers* [1926], esp. pp. 267–9).

Just as this theoretical material was (by Keynes's 'revealed preference') not necessary for an understanding of the original articles in the *Manchester Guardian*, so is it not really necessary for the book: its deletion would interfere very little with an understanding of the argument of the *Tract* at other points, as indeed Keynes indicated (*Tract,* p. 61n). Conversely (and this is one of the clearest manifestations of the failure of the *Tract* to be an integrated whole) this added theoretical material in chapter 3:1 barely reflects the penetrating and elegant analysis of inflation as a tax on real money balances (including the notion of an optimum rate of inflation!) that Keynes reproduces from the aforementioned articles in chapter 2:1 of the *Tract* – and that can be read with both profit and pleasure even today.

Nor does the *Tract* incorporate the dynamic analysis of the way in which an influx of gold operates through the banking system – and thence on prices – that Keynes (basing himself on Marshall) had summarized in his long 1911 review of Irving Fisher's *Purchasing Power of Money* (1911), a review that I would essentially consider to be Keynes's first published work on monetary theory. Thus the *Tract* – as a theoretical work – is not only not integrated within itself, but even fails to reflect some major aspects of Keynes's thinking about monetary problems at the time it was published.

2. On both of these scores the *Treatise* (on which Keynes began working less than a year after the appearance of the *Tract*) is the exact opposite. It is as specifically designed for a professional audience whose major concern was with the latest developments in monetary theory as the *Tract* was designed for a general audience whose major concern was with current policy. Indeed, from the viewpoint of traditional scholarship, the *Treatise* is Keynes's most ambitious and weighty work: the two-volume work – on 'The Pure Theory of Money' and 'The Applied Theory

of Money' – designed to endow him with an academic reputation that would match the public one he had already achieved. At its core (in Books III–IV of Volume I) is a formal, rigorous presentation of a theory of money that deals in detail with both the static and dynamic aspects of the problem. And in the slow, stately, and systematic manner in which an academic treatise customarily proceeds – but in which Keynes of the interwar period so rarely proceeded – it leads up to this core, first, by defining the nature of money and describing its historical origins (Book I); and then (in Book II) describing at length the various index numbers that can be used to measure the value of money, which (to use one of Keynes's favourite terms) is the quaesitum of monetary theory. And afterwards comes Volume II, which begins with a lengthy description of the respective empirical magnitudes of the critical theoretical variables described in the preceding volume – as well as the institutional features of the financial sectors which bear upon these variables (Books V–VI). Only when all this is completed does Keynes finally proceed (in Book VII) to a systematic presentation of the monetary policy, both domestic and international, that he derives from his theory.

The basic problem that Keynes set out to analyse in the *Treatise* was that of the 'credit cycle' and the fluctuations in employment and output which characterize it. His analysis was essentially a simple one: profits – by which Keynes means profits above those representing a normal return on capital – are the motive force of the economy (*TM* I, pp. 126, 163). The existence of profits causes firms to expand their respective outputs and hence their demands for the inputs of productive services – and conversely for losses. Now (in the Marshallian terms that Keynes used: *Principles*, Book III, ch. III and Book IV, ch. I), profits are the difference between the 'demand price' (i.e. market price; cf. *TM* I, pp. 186, 189) of a unit of output and its 'supply price' (i.e. cost of production). Hence the study of cyclical movements of output reduces to a study of the causes of the differential movements of prices and costs.

It is these movements that Keynes then tries to analyse rigorously by means of his 'fundamental equations'. These are derived (in Chapter 10 of the *Treatise*) after first distinguishing between 'consumption goods' and 'investment goods' and then defining the following basic variables of the analysis, where all variables refer to total or aggregate quantities. (For simplicity, and since my main concern is to compare the *Treatise* with the *General Theory*, I disregard the variables relating to foreign investment, which actually plays an important role in the *Treatise*):

E = current money income = factor earnings (including normal return on capital) = costs of production; all exclusive of abnormal profits;
O = the same, at base-period prices;
I' = that part of E earned in the investment-goods sector = current money costs of producing investment goods;
C = the same, at base-period prices;
I = the same, at current market prices, i.e. the current market value of investment goods produced;
$E–I'$ = that part of E earned in the consumption-goods sector = current money costs of producing consumption goods; and R = the same, at base-period prices.

Keynes then proceeds to define the price variables
P = current price level of consumption goods;
P' = the same, for investment goods; and
Π = the same; for output as a whole = the weighted average of P and P' = the general price level.

Keynes implicitly (and sometimes explicitly) assumes that the base period is one of the equilibrium – defined as a situation in which per-unit price = per-unit costs in both the consumption-goods and investment-goods sectors. Hence there is no difference between evaluating current output at base-period prices and evaluating it at base-period costs of production. He then defines what are effectively (1) an index of the money wages per unit of labour, W (where labour represents factors-of-production-in-general) and (2) an index of output per worker, e (or the 'coefficient of efficiency'); and he implicitly assumes that both of these indexes change

in exactly the same way in both sectors. From these definitions it then follows that the change in the cost of production with respect to the base period in both the consumption and investment sectors is

$$E/O = W/e = W_1,$$

where W_1 (which Keynes calls 'the rate of efficiency earnings') is accordingly an index of costs of production per unit of output.

From all this, Keynes then derives his two fundamental equations in the following alternative forms:

$$P = (E/O) + (Q_1/R) = (W/e) + (Q_1/R) = W_1 + (Q_1/R) \quad \text{(i)}$$

$$\Pi = (E/O) + (Q/O) = (W/e) + (Q/O) = W_1 + (Q/O) \quad \text{(ii)}$$

where Q_1 and Q represent profits in the consumption sector and in the economy as a whole, respectively. Thus all that fundamental equation (i) consists of is the quite obvious statement that the change (with respect to the base period) in the price of consumption goods equals the change in the per-unit costs of production of these goods (the first term of equation (i)) plus the change in the per-unit (abnormal) profits, assumed zero in the base period (the second term); and equation (ii) makes a correspondingly obvious statement for output as a whole.

The deeper meaning that Keynes attributed to these equations stemmed from his demonstration that profits Q_1 and Q were related to savings and investment. In particular, he first defined current savings S as the difference between income (defined, it will be recalled, as exclusive of abnormal profits) and consumption, or

$$S = E - PR,$$

where all variables are defined in current money terms. From this definition and those listed above, it follows that (abnormal) profits in the consumption sector are

$$Q_1 = PR - (E - I') = I' - S,$$

whereas total (abnormal) profits in the economy are

$$Q = (PR + I) - E = I - S.$$

Thus one of the distinguishing features of the *Treatise* is that as a result of its special definition of income, savings and investment need not be equal even ex post. The fundamental equations can then be written as

$$P = E/O + (I' - S)/R \quad \text{(i′)}$$

and

$$\Pi = E/O + (I - S)/O \quad \text{(ii′)}$$

–and this, indeed, is their primary form in the *Treatise* (I, pp. 122–3). In this way a change in the general price level – which for Keynes of the *Treatise* (like other monetary economists of that time and earlier, such as Knut Wicksell, Irving Fisher, A.C. Pigou) was the central concern of monetary theory – was directly related to the excess of investment over savings. When $I' = I = S$, the second terms of (i′) and (ii′) respectively, disappear, so that price = cost of production (including normal return on capital), and the economy is in equilibrium.

It must be emphasized that though the relation between savings and investment plays a central role in the *Treatise,* this relation served there (in sharp contrast with the subsequent *General Theory*) to analyse in the first instance not changes in output, but changes in prices. Correspondingly, though as indicated, Keynes does discuss changes in output in the *Treatise*, he considers these to be derivative from the changes in prices.

Keynes recognized that his equations were identities, and indeed said so; but he also claimed that they were identities that were useful for classifying causal relationships (*TM* I, p. 125; see also p. 120). In particular, the causal relationship to which he assigned a crucial role in his theory was that connected with the rate of interest. Thus, if we start from a position of equilibrium, a (say)

decrease in this rate would cause investment to increase and savings to decrease, thus generate an excess of the former over the latter, thus generate profits, and thus – as indicated by the second term of the second fundamental equation – cause prices to rise. In this way, says Keynes, a decrease in the rate of interest would 'in itself' cause a price rise – and not only (as in the traditional quantity theory) as the result of its first generating an increase in the quantity of money (*TM* I, pp. 167–76, esp. p. 171). Conversely, an increase in the rate of interest would directly cause prices to fall. Explicitly following Wicksell, Keynes denotes the rate of interest that would equate savings and investment (and thus generate equilibrium in the system) 'the natural rate of interest'; and the rate which actually prevails, 'the market rate' (*TM* I, p. 139).

Keynes made use of the causal interrelationship of interest and prices to provide a dynamic analysis of the change in the price level generated by a change in the quantity of money – by which Keynes meant currency *plus* total bank deposits, which because of the relative unimportance of the former in a modern economy can be conveniently approximated by these deposits alone (*TM* I, p. 27). For this purpose he first decomposes total deposits into 'the industrial circulation' (roughly, demand deposits) and 'the financial circulation' (roughly, savings or time deposits) (*TM* I, chs 15 and 17). These in turn roughly correspond to what were to become the transactions and precautionary-speculative balances of the *General Theory* (pp. 167 n.l, 194–6).

Similarly, the *Treatise* contains some of the major features of what was to become the liquidity-preference theory of the *General Theory.* The presentation in the *Treatise* is less precise in that it does not adequately analyse the nature of the 'liquidity premium' and explicitly present the corresponding *functional* relationship between the demand for money and the rate of interest. On the other hand, it is more precise with respect to the distinction between stocks and flows: between the stock of wealth on whose asset composition the individual must decide; and the flow of income, with respect to which the individual decides on how much to consume and how much to save, i.e. to add to his wealth (*TM* I, p. 127). (The emphasis on the distinction between stocks and flows and the specification of a functional relationship are the two major features which distinguish the liquidity-preference theory of the *Treatise* and *General Theory* from the Cambridge cash-balance theory which Keynes espoused in his *Tract*; cf. Patinkin 1974.) In any event, Keynes explains that the volume of savings deposits (i.e. the financial circulation) is determined by the decision of individuals as to what proportion of their wealth to hold in the form of such deposits as compared with the alternative of holding securities, a decision that depends (*inter alia*) on the rate of interest (*TM* I, ch. 10, s.3). Insofar as the industrial circulation is concerned, this is determined by the basic relationship $M_1V_1 = E$, where M_1 is the volume of demand deposits, V_1 their velocity of circulation, and E the level of aggregate money income = aggregate money costs of production (or W_1O). In the real world, V_1 is largely determined by institutional factors and hence remains more or less constant in the short run.

Let us now start from an initial position of equilibrium in which, by definition, the market rate of interest equals the natural rate, so that $I' = I = S$. Assume that this equilibrium is disturbed by an increase in the quantity of money. Initially, only part of this increase will be absorbed in the industrial circulation; part will be used to bid up the price of securities and thus lower the rate of interest. Furthermore, the increase in the quantity of money will have increased the reserves of the banks, thus inducing them to lower the rate of interest at which they lend. As a result, entrepreneurs will increase their borrowings in order to finance the undertaking of new projects, so that investments will begin to exceed savings, thus generating excess profits and an increase in the price of output. But as a result of these profits, firms will begin to expand their outputs, thus generating an increased demand for labour inputs, hence an increase in the wage rate and thereby in the per-unit cost of production. That is, $E = W_1O$ will increase, and with it the need for the industrial circulation. This process will continue until money wages have risen sufficiently to

eliminate excess profits and until all of the new money has been absorbed in the increased demand for the industrial circulation generated by the increase in W_1 and hence in E. In Keynes's words:

> This [process] must continue until $(M_1V_1)/O$ has settled down at a higher figure, which is in equilibrium with the new total quantity of money and also with values of P and P' which are enhanced relatively to their old values in a degree corresponding to the amount by which $(M_1V_1)/O$ has been increased (*TM* I, p. 241).

This conclusion has the unmistakable ring of the quantity theory. And indeed Keynes explains that his second fundamental equation can be rewritten as

$$\Pi = (M_1V_1)/O + (I - S)/O \qquad (\text{ii}'')$$

which in equilibrium (i.e. when $I = S$) reduces to the Fisherine

$$M_1V_1 = \Pi O.$$

Thus (emphasizes Keynes) for the purpose of comparing equilibrium positions (i.e. for purposes of comparative statics), the traditional quantity theory does indeed remain valid. The purpose of the *Treatise* in this context, however, is, first, to extend this theory to an economy with a developed banking system, and then to analyse the dynamics of the movement from one equilibrium position to another in such an economy. And this is the role of the interest-rate savings-investment mechanism as it manifests itself in the fundamental equations (*TM* I, pp. 120, 131–3, 137–8). Indeed, at the beginning of Volume II of the *Treatise,* Keynes summarizes the dynamic workings of his second fundamental equation by first writing the quantity equation in the form $M_1V' = \Pi O$ and then stating that the purpose of his new theory is to explain how 'during the transition from one position of equilibrium to another' the overall velocity of circulation V' deviates upwards or downwards from its normally constant level, V_1, in accordance with whether $I - S > 0$ or $I - S < 0$, respectively (*TM* II, pp. 4–5; Patinkin 1976a, p. 46, n.2). Thus Keynes regarded his *Treatise* not as a refutation of the quantity theory, but as an extension of it.

The general policy proposal of the *Treatise* follows directly from its theoretical analysis: if the 'credit cycle' is generated by the alteration of prices with respect to costs, thus generating profits (losses) and hence increases (decreases) in output and employment, then, claimed Keynes (as had Wicksell, Fisher and Pigou before him – and the Chicago School of the 1930s afterwards: Patinkin 1969), the way to stabilize the economy was to stabilize the price level. And, continued Keynes, the major policy variable for achieving this objective is the Bank Rate as fixed by the central bank, which should be raised when prices tend to rise and lowered when they tend to fall.

At the same time, Keynes recognized that in the gold-standard world which then existed, an undue lowering of the rate of interest in one country relative to others might generate a capital outflow and consequent dangerous loss of gold reserves; hence such 'international complications' might prevent the central bank from lowering the rate of interest sufficiently to deal with a depression. And Britain – which was a major centre of international trade and finance – was particularly vulnerable in this respect. For this reason, in the *Treatise* (II, pp. 337–38), as in the 'private evidence' that he gave before the Macmillan Committee when he was in the final stages (February–March 1930) of preparing this book (*JMK* XX, pp. 71, 125–32), and as in his earlier political pamphlet *Can Lloyd George Do It?: An Examination of the Liberal Pledge* (1929; *JMK* IX, pp. 118–19, 123–4) – Keynes's policy advice for Britain at that time was to combat the depression that beset it not by further reductions in the rate of interest, but by an increase in government expenditures on public works. On the other hand, the United States – which was in much less danger of loss of gold reserves due to international capital movements – should indeed combat its depression by means of a central-bank policy of lowering the rate of interest. This policy difference between Britain and the United States was repeatedly and most explicitly stressed by Keynes in his contributions to the roundtable discussions at the 1931 Harris Foundation lectures in Chicago (1931b, pp. 84, 92, 303; see Patinkin 1979a, pp. 292–3).

Accordingly, when in September 1931 Britain abandoned the gold standard, Keynes immediately advocated that it reduce the rate of interest, thus laying the basis for the well-known 'cheap-money' policy of subsequent years (Moggridge and Howson 1974; Howson and Winch 1977, pp. 57–8; Patinkin 1979b).

3. Keynes had great hopes for the *Treatise.* Thus shortly after its publication, in his June 1931 Harris Foundation lecture on 'An Economic Analysis of Unemployment', he explicitly made use of the analysis of this book and proclaimed, 'That is my secret, the clue to scientific explanation of booms and slumps (and of much else, as I should claim) which I offer you' (*JMK* XIII, p. 354). But these hopes were not to be fulfilled. For it rapidly became clear that the theoretical part of the book was not a success and was indeed subjected to severe criticism. To a certain extent this was due to the fact (which Keynes had only in part and somewhat grudgingly recognized (see *TM* I, pp. 176–8, especially p. 177, n.3, and p. 178, n.2) that this theory, as well as the corresponding policy proposal, had been largely adumbrated at the turn of the century by Wicksell (1898, 1906, 1907) – which brought on Gunnar Myrdal's (1933, pp. 8–9) chiding remark about 'the attractive Anglo-Saxon kind of unnecessary originality, which has its roots in certain systematic gaps in the knowledge of the German language on the part of the majority of English economists'. (In point of fact, Keynes – at least before World War I – knew German well enough to review in the *Economic Journal* several books written in that language (see the reviews reprinted in *JMK* XI, pp. 400–403, 562–74); it is, however, not difficult to believe that in the course of fifteen years, Keynes might have lost a good deal of his proficiency in that language). But the most telling criticism of the *Treatise* was that, on the one hand, its 'fundamental equations' were actually tautologies, and, on the other, that the book had explained the forces that caused output to expand or contract, but had not explained what determines its actual level during any period. (See the end of section 8 below for a discussion of circumstances connected with the writing of the *Treatise* that also contributed to its lack of success.)

As a result of this criticism, Keynes began within a relatively short time after the appearance of the *Treatise* to work on a new book which ultimately developed into the *General Theory* (1936). The chronology of this development can in part be traced by means of the materials (including correspondence, fragments of earlier drafts, and galleys of successive proofs) that Moggridge has reproduced and annotated in *JMK* XIII–XIV and XXIX. There can, however, be legitimate differences of opinion about the dating of some of these fragments (cf. Patinkin 1976a, p. 71, n.7; 1980, pp. 14–15, n.22 and n.23, and pp. 18–19); so we are extremely fortunate to be able to supplement them with the precisely dated materials in the unique 'archaeological' record of the successive 'strata' of Keynes's thought provided by Robert Bryce's notes on Keynes's weekly lectures during the autumn terms of the years 1932, 1933, 1934 and Lorie Tarshis's notes for these years as well as 1935 (reproduced in Rymes 1988). The first year after the publication of the *Treatise* (viz., 1930–31) was devoted to a criticism of this book, greatly aided by the detailed comments of Ralph Hawtrey and the extensive discussions that took place in the so-called 'Cambridge Circus' (in the sense of 'circle') – or what today would probably be called the 'Cambridge Colloquium'. The major participants of this legendary 'Circus' were Keynes's younger colleagues, Richard Kahn, James Meade, Austin Robinson, Joan Robinson and Piero Sraffa, with his former student Kahn serving as the channel of communication between Keynes and the group (*JMK* XIII, pp. 337–43; Kahn 1984, pp. 105–11: Keynes at that time was in his late forties, whereas the members of the 'Circus' were mostly in their mid-twenties). The aforementioned lecture notes, however, show that the central message of the *General Theory* (explicated below) was not fully developed until sometime in 1933, well after the activities of the 'Circus' as such had come to an end (Patinkin 1976a, chs 7–8; 1977; 1982, ch. 1). However, from some of the younger members of the 'Circus' (especially Kahn and Joan Robinson) – as well as from his contemporaries, Ralph Hawtrey and Dennis Robertson – Keynes continued to seek out and

benefit from criticisms throughout the process of working through and revising the successive drafts of the *General Theory* (cf. *JMK* XIII, ch. 5; *JMK* XXIX, ch. 3; Patinkin and Leith 1977, *passim*).

Like the *Treatise*, the *General Theory* is – in Keynes words of his preface – 'chiefly addressed to ... fellow economists'. It differs from the *Treatise* in being almost exclusively concerned with theory. Indeed, this is the whole purpose of the book, as indicated by its very title. Thus the *General Theory* contains practically no description of institutional details. And for a work that is credited with having initiated a revolution in fiscal policy, it contains surprisingly few explicit discussions of the policy implications of its analysis. Indeed, the major new policy conclusion of the *General Theory* as compared with the *Treatise* – namely, that monetary policy directed at lowering the interest rate, though an essential component of a full-employment policy, might not be enough even in the absence of 'international complications' to achieve this goal, so that an effective policy for this purpose may well require direct government spending – this conclusion is never developed systematically and in detail. Indeed, it is only referred to on one or two occasions in passing (e.g. *GT,* p. 164) and in brief 'Concluding Notes' of a general nature (*GT*, pp. 372–84). Thus, the advocacy per se of public-works expenditure was not the purpose of the *General Theory*; rather it was to provide a theory which would, among other things, rationalize such a policy – with the actual advocacy of the policy being left for Keynes's public activities of the period (see section 11 below).

Similarly, the problem of the relation between internal price levels and exchange rates – and indeed the whole problem of the international monetary system and its relation to domestic policies, which were a major concern of Keynes in the *Treatise*, as they had been in the *Tract*, and were again to be at Bretton Woods toward the end of World War II – are not discussed in the *General Theory.* The explanation for this fact too probably lies in the situation that prevailed in the Western world during the period that the *General Theory* was being written. In particular, this was the new world ushered in by England's abandonment of the gold standard: a world of flexible exchange rates and/or severe restrictions on the flow of international trade, in which the aforementioned problems had accordingly largely lost their relevance. Correspondingly, the analysis of the *General Theory* is carried out almost entirely on the implicit assumption of a closed economy.

I should, however, emphasize that if from these viewpoints the *General Theory of Employment, Interest and Money* was more narrowly conceived than the *Treatise on Money*, from another viewpoint it is – as its title indicates – much broader. For 'monetary theory' in the *Treatise* means, first and foremost, a theory that explains the determination of the price level. Accordingly, if the argument of the *Treatise* revolves about Keynes's 'fundamental equations', these are (as the title of its chapter 10 makes clear) 'The Fundamental Equations *for the Value of Money'* (*TM* I, p. 151, italics added). Again, Keynes prefaces Book VI of the *Treatise,* 'The Rate of Investment and Its Fluctuations', with the statement that it is 'in the nature of digression, which is doubtfully in place in a treatise on money' (*TM* II, p. 85). In conformity with this view – and in sharp contrast with the systematic attempt of the *General Theory* to base its analysis on the marginal concepts of value theory and thus integrate monetary and value theory (*GT*, pp. 292–3) – the term 'marginal productivity' (of labour or of capital) does not appear in the *Treatise.* Thus though, as noted above, Keynes attributes the term 'natural rate of interest' to Wicksell, he does not follow the latter in associating this term with the marginal productivity of capital (Wicksell 1898, pp. 102–4, 171; 1906, pp. 192–3; 1907, pp. 214–19). Finally, and as a corollary of the primary concern of the *Treatise* with prices, whereas that book deals with output only as derivative from changes in price and in this context indicates only the direction of change of output and employment, the *General Theory* presents a theory of the determination of the equilibrium levels of these variables.

A more precise specification of the basic contention of the *General Theory* can be obtained by letting Keynes speak for himself, as he did in a letter to Roy Harrod in August 1936, commenting

on a draft of the latter's review article of the *General Theory* – a letter whose first and most important point largely repeats what Keynes had written to Abba Lerner two months earlier on his review (see *JMK* XXIX, pp. 214–16):

> You don't mention *effective demand* or, more precisely, the demand schedule for output as a whole, except in so far as it is implicit in the multiplier. To me the most extraordinary thing, regarded historically, is the complete disappearance of the theory of demand and supply for output as a whole, i.e., the theory of employment, *after* it had been for a quarter of a century the most discussed thing in economics [presumably, the quarter-century between the beginning of the Ricardo–Malthus debate on the possibility of a 'general glut in the market' in 1820 and the appearance of J.S. Mill's *Principles of Political Economy* in 1848; see also the reference to this period in the *General Theory* (pp. 32–4)]. One of the most important transitions for me, after my *Treatise on Money* had been published, was suddenly realizing this. It only came after I had enunciated to myself the psychological law that, when income increase, the gap between income and consumption will increase, – a conclusion of vast importance to my own thinking but not apparently, expressed just like that, to anyone else's. Then, appreciably later, came the notion of interest being the measure of liquidity preference, which became quite clear in my mind the moment I thought of it. And last of all, after an immense amount of mudding and many drafts, the proper definition of the marginal efficiency of capital linked up one thing with another (cited from the 'Editorial Introduction' to the *General Theory JMK* VII, p. xv, italics in original; there are significant errors of transcription in this passage in the full text of this letter as reproduced in *JMK* XIV, pp. 83–6: see Patinkin 1976a, p. 66, n.3).

Now, in the *General Theory* (p. 141) Keynes himself had attributed priority for the notion of the marginal efficiency of capital to Irving Fisher. Insofar as the theory of liquidity preference is concerned, this is clearly a contribution of Keynes, but (as noted above) it is one whose basic features had already been presented in the *Treatise.* This leaves the theory of effective demand as the distinctive analytical contribution of the *General Theory* and its central message (on the meaning and significance of this last term, see Patinkin 1982, chs 1 and 4).

That this is its central message is also clear from the *General Theory* itself. Thus Keynes tells us in its preface that, in contrast with his earlier *Treatise*, his new work is 'primarily a study of the forces which determine changes in the scale of output and employment as a whole'; gives chapter 3 of 'Book I: Introduction' the title 'The Principle of Effective Demand', and presents in it a 'summary of the theory of employment' that he will develop in the book (*GT*, p. 27); and devotes most of the remaining chapters of the *General Theory* to this development.

Figure 1 reproduces the familiar diagram which has served to transmit the central message of the *General Theory* to generations of economics students. I wish, however, to refine the usual analysis which accompanies this diagram in one respect. In particular, what I mean by the theory of effective demand is not only that the intersection of the aggregate-demand curve $E = F(Y)$ with the 45° line determines equilibrium real output Y_0 at a level that may be below that of full employment Y_F not only (as Leijonhufvud (1968) has also emphasized) that disequilibrium between aggregate demand and supply causes a change in output and not price; but also (and this is the distinctively novel feature) that the change in output (and hence income) itself acts as an equilibrating force. That is, if the economy is in a state of excess aggregate supply at (say) the level of output Y_1, then the resulting decline in output, and hence income, will depress supply more than demand and thus eventually bring the economy to equilibrium at Y_0. Or, in terms of the equivalent savings = investment equilibrium condition, the decline in income will decrease savings and thus eventually eliminate the excess of savings over investment that exists at Y_1. In Keynes's words,

> The novelty in my treatment of saving and investment consists, not in my maintaining their necessary aggregate equality, but in the proposition that it is, not the rate of interest, but the level of incomes which (in conjunction with certain other factors) ensures this equality (1937, p. 211; cf. also *GT,* p. 31, lines 16–23; p. 179, lines 2–6).

In more formal terms (which Keynes himself did not use), the theory of effective demand is concerned not only with the mathematical solution of the equilibrium equation $F(Y) = Y$, but with demonstrating the stability of this equilibrium as

determined by the dynamic adjustment equation $dY/dt = G[F(Y)–Y]$, where $G' > 0$.

Correspondingly, as Keynes emphasizes in his letter to Harrod and elsewhere, a crucial assumption of his (Keynes's) analysis is that the marginal propensity to consume is less than unity, which in turn implies that the marginal propensity to save is greater than zero. For, if the marginal propensity to consume were equal to unity, no equilibrating mechanism would be activated by the decline in output. Specifically, as income (output) decreased, spending would decrease by exactly the same amount, so that any initial difference between aggregate demand and supply would remain unchanged. Alternatively, as income decreased, the initial excess of desired saving over investment would remain unchanged. Thus the system would be unstable. This is the major novel feature of the *General Theory* and its central message: the theory of effective demand as a theory which depends on the equilibrating effect of the decline in output itself to explain why 'the economic system may find itself in stable equilibrium with N [employment] at a level below full employment, namely at the level given by the intersection of the aggregate demand function with the aggregate supply function' (*GT*, p. 30).

Since most economists today probably learned the theory of effective demand as just another chapter in their introductory course in economics, it may be difficult for them to conceive of the intellectual shock wave that this theory created when Keynes first presented it. Testimony to this impact has, however, been given by many elders of our profession who (in Samuelson's words) were 'born as economists prior to 1936' (1946, p. 315). And though my 'birthyear' was about a decade after this date, I began my studies before the theory of effective demand had percolated down to the introductory course in the field. So I, too, can still remember how strange and even difficult it was during my later graduate studies to have to learn to think in terms of a demand for aggregate output as a whole – a demand that was in some way conceptually different from actual aggregate income, as if national income expended could somehow differ from national income received!

Similarly, under the influence of Marshall's *Principles* (which was then still being used as a textbook), it had been thoroughly ingrained into us that the demand function for a good could be defined only under the assumption of 'ceteris paribus'. Indeed, in order to insure that this assumption was fulfilled in practice, the more punctilious economists of those days were only willing to speak of the demand function for a good the total expenditure on which was small, so that variations in these expenditures as price varied would not significantly affect the 'marginal utility of money' (i.e. the marginal utility of money expenditures: see ibid., Bk. III, chs iii and vi). How then could one validly speak of a demand function for the aggregate of all goods? How was it possible for 'other things to be held constant' in such a case?

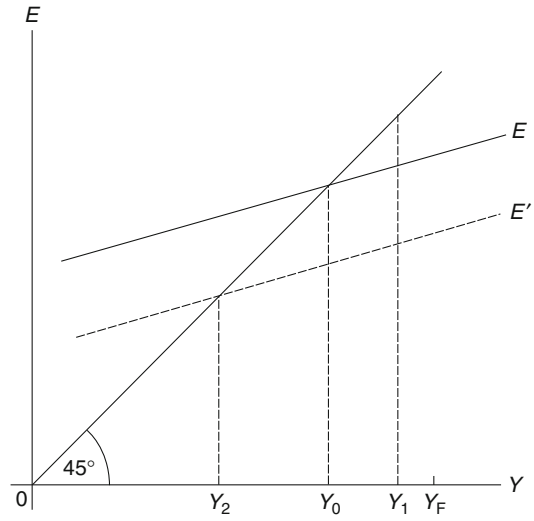
(The foregoing diagram does not appear in the *General Theory* – a fact which has in recent years led certain circles to contend that it does not represent Keynes's theory. This, however, is an invalid inference: for with one exception, Keynes did not use analytical diagrams in any of his writings. And that one exception is the diagram which appears on p. 180 of the *General Theory* – a diagram which in the accompanying footnote, Keynes attributes to Harrod. Furthermore, in his later 'How to Pay for the War' (1940; *JMK*IX, pp. 416–17), Keynes analysed the expected inflationary gap in Britain by means of the C + I = Y rubric, which is of course the arithmetical counterpart of the 45° diagram. See also section 5 below for a conjecture about why Keynes presented his theory of effective demand in terms of the level of employment, and not of national income, as in the diagram.)

Needless to say, there are other interpretations of the novelty and central message of the *General Theory.* The preceding and following discussions implicitly (and sometimes explicitly) explain why I do not accept some of the leading ones: namely, the interpretations which contend that this message is the analysis of an economy caught in the 'liquidity trap' (Hicks 1937) and/or one in which money wages are completely inflexible downwards (Modigliani 1944); that it is the proposition that unemployment is caused by the inadequacy of aggregate demand; that it is the analysis of the

way expectations are formed and influence behaviour in an uncertain world whose uncertainty is not subject to the probability calculus (Shackle 1967, ch. 11; Davidson 1972); that it is the multiplier; that it is the crucial role of fluctuating investment in generating business cycles; that it is the theory of effective demand (and particularly of the aggregate supply function) as a determinant of the wage and price levels (Weintraub 1961); and that it is the advocacy of public works as a means of combatting unemployment (the implicit interpretation of various writers who have regarded such advocacy as an anticipation of the *General Theory*; cf. e.g., Garvy 1975 and Backhaus 1985). Insofar as Leijonhufvud (1968) is concerned, he himself has subsequently admitted that his book was about 'theoretical problems that were current problems in the early or mid-sixties .... What Keynes might have meant etc. was not one of the problems. Doctrine history was not what the book was about' (Leijonhufvud 1978). (For further details, see Patinkin 1976a, pp. 141–2; 1982, pp. 5–7, 84 fn. 8, 153–8; 1984, pp. 101–2.)

To bring out the central message of the *General Theory* more sharply, let me contrast Keynes's discussion in this book with the corresponding one of the *Treatise.* In the *General Theory*, a decrease in consumption – or, equivalently, an increase in savings – is represented by a downward shift of the aggregate-demand curve in Fig. 1 to *E';* the resulting decline in output will then cause a corresponding decline in the amount consumed – and hence in the amount saved – until a new equilibrium is necessarily reached at Y_2 (cf. *GT,* pp. 82–5, 183–4). Contrast this with Keynes's 'parable' in the *Treatise* of a simple 'banana plantation' economy in an initial position of full-employment equilibrium which is disturbed because (in Keynes's words) 'into this Eden there enters a thrift campaign'. Making use of the analytical framework of the *Treatise*, Keynes explains that the resulting increased savings, unmatched by increased investment, will cause entrepreneurs to suffer losses (i.e. $Q = I - S < 0$) and they

> will seek to protect themselves by throwing their employees out of work or reducing their wages. But even this will not improve their position, since the spending power of the public will be reduced by just as much as the aggregate costs of production. By however much entrepreneurs reduce wages and however many of their employees they throw out of work, they will continue to make losses so long as the community continues to save in excess of new investment. Thus there will be no position of equilibrium until either (a) all production ceases and the entire population starves to death, or (b) the thrift campaign is called off or peters out as a result of the growing poverty; or (c) investment is stimulated by some means or other so that its cost no longer lags behind the rate of saving (*TM* I, pp. 159–60).



Keynes, John Maynard (1883–1946), Fig. 1

In brief, it seems to me that – to make anachronistic use of a concept of the *General Theory* – Keynes is implicitly assuming here that the marginal propensity to spend is unity, so that a decline in output cannot reduce the excess of saving over investment and thus cannot act as an equilibrating force. Instead, the decline in output continues indefinitely; or alternatively, the decline might end as the result of some exogenous force that closes the gap between saving and investment – 'the thrift campaign is called off', or 'investment is stimulated by some means or another'. In brief, none of these alternatives indicates that Keynes of the *Treatise* understood that the decline in output itself acts directly as a systematic endogenous equilibrating force.

4. The foregoing is the essence of the theory of effective demand as presented in 'Book I: Introduction' of the *General Theory* under the explicit simplifying assumptions of a constant level of investment (which presupposes a constant rate of interest) and a constant money wage-rate (*GT*, pp. 27–9). (For deficiencies in this presentation – and particularly in that of the aggregate supply function – stemming primarily from Keynes's failure to apply the marginal concept correctly, see Patinkin 1982, pp. 142–57. In this connection it should be noted that according to Joan Robinson's own testimony (1969, p. xi), 'Keynes was not much interested in the theory of imperfect competition' that she was developing in the early 1930s, and in which marginal analysis played a central role (J. Robinson 1933a). See also the similar statement by Austin Robinson in Patinkin and Leith 1977, p. 79.) After a 'digression' from the 'main theme' (*GT*, p. 37) in 'Book II: Definitions and Ideas' for the purpose of clarifying various concepts, Keynes then devotes most of the reminder of the book to an elaboration of the theory of effective demand which (inter alia) is free of these restrictive assumptions.

In 'Book III: The Propensity to Consume' he elaborates upon the determinants of the consumption component of aggregate demand and also discusses the related multiplier (*GT*, pp. 114–15), referring in this context to the 1931 article of his former student, Kahn. (This article was actually the successful outcome of Kahn's efforts – with his mentor's encouragement – to provide a precise formula for measuring the 'indirect effects' of an increase in government expenditures, effects which Keynes in his 1929 election pamphlet *Can Lloyd George Do It?,* had described as of 'immense importance', but impossible of measurement 'with any sort of precision' (*JMK* IX, pp. 106–7; cf. Howson and Winch 1977, pp. 48–9; Patinkin 1978)).

In 'Book IV: The Inducement to Invest', Keynes drops the assumption of a constant level of investment and explains how this level is determined by the marginal-efficiency-of-capital schedule in conjunction with the rate of interest, which rate is determined in turn by the liquidity-preference schedule in conjunction with the quantity of money. I might note that Keynes's liquidity-preference function $-M = L_1(Y) + L_2(r)$, where M and Y respectively represent nominal money and nominal income (*GT*, p. 199) – actually (though in all probability, inadvertently) reflects money illusion (see Patinkin 1956, 1965, chapter XI:1 and Supplementary Note K:2).

Chapter 12 ('The State of Long-Term Expectations') elaborates upon the argument of Book II, chapter 5 ('Expectations as Determining Output and Employment'). The crucial influence of uncertainties on both the aforementioned schedules – and hence the necessity to make decisions with respect to them on the basis of expectations – is emphasized. As Samuelson (1946, p. 320) has however noted, Keynes's discussion 'paves the way for a theory of expectations, but it hardly provides one' (see also the detailed critique by Hart 1947). In any event, Keynes emphasizes that the uncertainties in question are not subject to a probability calculus, so that long-run investment decisions in particular may instead be the result of 'animal spirits' (*GT*, p. 161; see also Keynes's 1937 *QJE* article as reproduced in *JMK* XIV, p. 114). (The distinction between risk, which is subject to such a calculus, and uncertainty which is not, was the major point of Knight's classic 1921 work on *Risk, Uncertainty, and Profit*; there may also be a hint of this distinction in chapter 6 of Keynes's *Treatise on Probability,* published the same year, to which Keynes refers (*GT*, p. 148, n.1); see also Lawson and Pesaran 1985.) These uncertainties are a major source of the effectively low interest-elasticity of the first of these schedules, as well as the source of the speculative demand for money, and hence the effectively high (though not infinite) interest-elasticity of the second of them. (Keynes does not always distinguish between a movement along a demand curve and a shift of the curve itself, and it is the combined result of these two changes that I denote by 'effective elasticity'.)

Thus the many interpretations to the contrary notwithstanding, Keynes did not base his theory on the so-called 'liquidity trap'. In his words, 'whilst this limiting case might become practically important in future, I know of no example of its hitherto' (*GT*, p. 207. See also Keynes's brief

description of the way in which, after Britain abandoned the gold standard in 1931 (see concluding paragraph of section 2 above), the monetary authorities had succeeded in gradually driving down the rate of interest. But see Patinkin 1976a, pp. 111–13 for some indications of ambivalence in the *General Theory* about the relevance of the 'liquidity trap'.) It is because of these elasticities that monetary policy may well be inadequate to the task of eliminating unemployment: for an increase in the quantity of money will not significantly reduce the rate of interest; and to the extent that there is such a reduction, it will not generate a significant increase in investment and hence in aggregate demand (cf. *GT,* pp. 164, 168–70). Book IV also includes chapter 17 on 'The Essential Properties of Interest and Money', with all of its confusions and obscurities (see Lerner 1952; see also Hart 1947, p. 416 and Hansen 1953, p. 159).

Keynes concludes Book IV with a summary chapter (18) entitled 'The General Theory of Employment Re-Stated'. In substance, though not in form, and certainly not with intent (see section 9 below and Patinkin 1976a, pp. 98–100), this chapter (like the diagram on p. 180 of chapter 14) provides a general equilibrium analysis of the determination (as of a given money-wage rate and nominal quantity of money) of the equilibrium level of national income by the interactions between the commodity (consumption- and investment-goods) and money markets (*GT*, pp. 246–7). Thus a basic contribution of the *General Theory* is that it is in effect the first practical application of the Walrasian theory of general equilibrium: 'practical', not in the sense of empirical (though the *General Theory* did provide a major impetus to empirical work), but in the sense of reducing Walras's formal model of n simultaneous equations in n unknowns to a manageable model from which implications for the real world could be drawn. Furthermore, like Walras's model in the *Eléments* (1926, lessons 29–30), Keynes's model in the *General Theory* is one that integrates the real and monetary sectors of the economy. It is this general-equilibrium aspect of the *General Theory* that Hicks (1937) was subsequently to develop and formalize in his influential IS–LM interpretation of the book – with respect to which Keynes wrote him that 'I found it very interesting and really have next to nothing to say by way of criticism' (*JMK* XIV, p. 79).

Finally, in ' Book V: Money-Wages and Prices', Keynes drops the assumption of a constant money-wage rate and applies the theory of effective demand that he had developed in Books I–IV to an analysis (in the first chapter of this Book, 'Chapter 19: Changes in Money Wages') of the effects of a decline in this rate. It should be emphasized that Keynes regarded such a decline not as an abstract theoretical possibility, but as what had actually happened to money wages in the years immediately preceding the *General Theory.* Thus from 1925–33, money wages had declined in Britain by 7 per cent, whereas in the United States they had declined over the much shorter period 1929–33 by 28 per cent (sic!) (see Keynes's allusion to the former on p. 276 of the *General Theory*, and to the latter on p. 9; on the sources of the above data, see Patinkin 1976a, pp. 17 and 121). During these periods, however, real wages in both countries actually rose, which was the background of Keynes's oft-cited enigmatic statement (to which I shall return below) that 'there may exist no expedient by which labour as a whole can reduce its *real* wage to a given figure by making revised *money* bargains with the entrepreneurs' (*GT*, p. 13, italics in original).

Keynes's basic argument in chapter 19 is that a decline in money wages (which in practice would, because of the resistance of workers, take place only very slowly: *GT,* p. 267; see also ibid., pp. 9, 251, 303) can increase the level of employment only by first increasing the level of effective demand; that the primary way it can generate such an increase is through its effect in increasing the quantity of money in terms of wage units, thereby decreasing the rate of interest and stimulating investment; that accordingly the policy of attempting to eliminate unemployment by reducing money wages is equivalent to a policy of attempting to do so by increasing the quantity of money at an unchanged wage rate and is accordingly subject to the limitations as the latter; namely, that a moderate change 'may exert an

inadequate influence over the long-term rate of interest', while an immoderate one ('even if it were practicable') 'may offset its other advantages by its disturbing effect on confidence' (*GT*, pp. 266–7).

Indeed, the possible adverse effect on confidence is greater in the case of a wage (and price) decline than in that of a monetary expansion, and this for two reasons: first, the decline may create the expectation of still further declines, thus leading firms to postpone carrying out any decision to increase their demand for labour; second, 'if the fall of wages and prices goes far, the embarrassment of those entrepreneurs who are heavily indebted may soon reach the point of insolvency – with severely adverse effects on investment' (GT, p. 264). This adverse effect will be reinforced by the fact that the ' expectation that wages are going to sag by, say, 2 per cent in the coming year will be roughly equivalent to the effect of a rise of 2 per cent in the amount of interest payable for the same period' (*GT*, p. 265). (This use of what is essentially Fisher's distinction between the real and nominal interest rates is somewhat inconsistent with reservations that Keynes expressed about it earlier in the *General Theory,* pp. 141–3.) Hence Keynes's major conclusion – and indeed the negative component of his central message – that 'the economic system cannot be made self-adjusting along these lines' (*GT*, p. 267). In this way Keynes finally supplies the theoretical basis for his claim in chapter 2 of 'Book I: Introduction' that, contrary to the 'classical' view, 'a willingness on the part of labour to accept lower money-wages is not necessarily a remedy for unemployment'– a claim he had promised would be 'fully elucidated ... in Chapter 19' (*GT*, p. 18).

The analysis of chapter 19, together with Keynes's acceptance in chapter 2 of the 'classical postulate' that 'the wage is equal to the marginal product of labour'(*GT*, p. 5), enables us to understand the enigmatic statement cited three paragraphs above. Specifically, if the effect of a decline in the money wage rate on the level of effective demand, hence output, and hence employment is indeterminate, then so too is its effect on the marginal product of labour and hence real wages. Thus Keynes's statement is simply a reflection of his basic view that

> the propensity to consume and the rate of new investment determine between them the volume of employment, and the volume of employment is uniquely related to a given level of real wages – not the other way round (*GT*, p. 30).

And since Keynes also accepts the classical law of diminishing returns (*GT,* p. 17), he contends that if a sharp decline in money wages should generate only a slight increase in the level of employment – hence only a slight decrease in the real wage rate – then it must also generate a sharp (though proportionately smaller) decrease in the price level (however, Keynes never explains the dynamic market forces that bring this about; see the discussion below of chapter 21). In Keynes's words at the end of chapter 19:

> It follows, therefore, that if labour were to respond to conditions of gradually diminishing employment by offering its services at a gradually diminishing money-wage, this would not, as a rule, have the effect of reducing real wages and might even have the effect of increasing them, through its adverse influence on the volume of output. The chief result of this policy would be to cause a great instability of prices, so violent perhaps as to make business calculations fultile in an economic society functioning after the manner of that in which we live (*GT*, p. 269).

Accordingly, Keynes concludes chapter 19 with the policy recommendation that 'the money-wage level as a whole should be maintained as stable as possible, at any rate in the short period' (*GT*, p. 270).

This is an appropriate point to note that though in Book III, Keynes take account of what might be called the capital-gains effect on consumption (*GT*, pp. 92–4), he does not do so with reference to the wealth effect as such, and in particular does not do so with reference to the real-balance component of this effect. Correspondingly, his analysis in chapter 19 does not take account of the positive real-balance effect generated by a wage and price decline. But since the operation of this effect in this deflationary context suffers from the same limitations described in this chapter, I do not believe that taking account of it would have

affected Keynes's basic conclusion about the inefficacy of a wage decline as a means of increasing employment (Patinkin 1951, pp. 272–8; 1956, pp. 234–7; 1965, pp. 336–40; 1976a, pp. 110–11).

Thus chapter 19 is the climax of the *General Theory.* And it is clear from it that, the many contentions to the contrary notwithstanding, the analysis of this book does not depend on the assumption of absolutely rigid money wages. What is, however, true is that, because of the aforementioned adverse effects of flexibility, the relative stability of money wages is the concluding policy recommendation of the chapter. I must also emphasize that were the *General Theory* to depend on the assumption of wage rigidity, there would be no novelty to its message: for the fact that such a rigidity can generate unemployment was a commonplace of classical economics. Needless to say, this does not mean that Keynes went to the opposite extreme of assuming wages to be perfectly flexible. Instead, his view of the real world was that 'moderate changes in employment are not associated with very great changes in money-wages' (*GT*, p. 251). At the same time, Keynes emphasizes that there exists an 'asymmetry' between the respective degrees of upward and downward wage flexibility: that, in particular, 'workers are disposed to resist a reduction in their money-rewards, and that there is no corresponding motive to resist an increase' (*GT*, p. 303).

I might note that Keynes's lack of faith in the efficacy of the market-equilibrium process in a macroeconomic context also manifests itself in such earlier writings as *The Economic Consequences of Mr Churchill* (1925; *JMK* IX, pp. 227–9 *et passim*) and the *Treatise* (I, pp. 141, 151, 244–5, 265). Nor (I conjecture) would Keynes have been impressed by the contention of some exponents of the 'new classical macroeconomics' that the market would not permit a situation of unemployment to persist because contracts could then be made which would make everyone better off. Indeed, I would conjecture that, as one who had seen how the most civilized countries of the world had engaged for four long years of stalemated trench warfare in the mutual slaughter of the best of their young men, Keynes was not predisposed to believe in natural forces that always brought agents to generate a mutually beneficial situation. Because of the uncertainty of how other react to our actions, the actual world for Keynes was one that – in a macroeconomic context – could readily lead to the globally irrational' results of the prisoner's dilemma; not to the rational results of the Walrasian auctioneer.

Book V also contains 'Chapter 21: The Theory of Prices'. In 'Book I: Introduction', Keynes had stated that 'we shall find that the Theory of Prices falls into its proper place as a matter which is subsidiary to our general theory'(*GT*, p. 32). In particular, as already noted, the level of effective demand determines the level of employment, hence the marginal productivity of labour, and hence the real wage rate; for any given money wage rate, then, the price level is determined. In the words of chapter 21, 'The general price-level (taking equipment and technique as given) depends partly on the wage-unit [i.e., on the money wage rate] and partly on the volume of employment' (*GT,* p. 295). It should again be noted that Keynes's discussion here is completely mechanical and provides no explanation of the dynamic market forces that cause the price level to change as a consequence of a change in money wages.

Chapter 21 also includes a discussion of the quantity theory of money. In the *Treatise,* as noted above, Keynes regarded this theory to be deficient only because of the absence of a dynamic analysis – which he then supplied. In the *General Theory,* however, Keynes saw himself as providing a new theory that replaced the quantity theory entirely. For, he claimed, the quantity theory holds only on two unrealistic conditions: first, that the speculative demand for money 'will always be zero in equilibrium' (actually, this is not a necessary condition; see Patinkin 1956, 1965, ch. XII:1); second, that the level of output is constant at full employment (*GT*, pp. 208–9). Thus Keynes may well have regarded the *General Theory* as the culminating chapter in The Saga of Man's Struggle for Freedom from the Quantity Theory. Indeed, in his preface to the French edition of the *General Theory*, Keynes wrote that 'the

following analysis [of money and prices] registers my final escape from the confusions of the Quantity Theory, which once entangled me' (*JMK* VII, p. xxxiv).

The last Book of the *General Theory* – 'Book VI: Short Notes Suggested by the General Theory' – is, as its title indicates, essentially an appendage to it, one that could have been omitted without affecting the logical integrity of the book as a whole. The Book begins with 'Chapter 22: Notes on the Trade Cycle'. Here Keynes contends that the cycle is generated by changes in the marginal efficiency of capital – which changes, for reasons discussed in this chapter, 'have had cyclical characteristics'. He claims no novelty for this interpretation ('these reasons are by no means unfamiliar either in themselves or as explanations of the trade cycle') and explains that the purpose of the chapter is 'to link [these reasons] up with the preceding theory' (*GT*, pp. 314–15). Chapter 23 is entitled 'Notes on Mercantilism, the Usury Laws, Stamped Money and Theories of Under-Consumption'– whose omnibus title is a further indication that the material of Book VI is not an integral part of the book. The last chapter of the Book – and of the *General Theory* as a whole – is 'Chapter 24: Concluding Notes on the Social Philosophy towards Which the General Theory Might Lead'. Only to a minor extent, however, is this chapter concerned with the question of short-run, full-employment policy – and in this context Keynes reiterates his scepticism of sole reliance on monetary policy and his corresponding belief 'that a somewhat comprehensive socialisation of investment will prove the only means of securing an approximation to full employment' (*GT*, p. 378). Most of the chapter is devoted to the long-run implications of a successful full-employment policy for the accumulation of capital, hence the rate of interest and the distribution of income; for the future of laissez-faire versus state socialism; and for the prospects of war and peace.

In chapter 24, Keynes also expresses his belief in the efficacy of the market mechanism, once the 'socialisation of investment' has assured the maintenance of full employment. Under these conditions, says Keynes,

> there is no objection to be raised against the classical analysis of the manner in which private self-interest will determine what in particular is produced, in what proportions the factors of production will be combined to produce it, and how the value of the final product will be distributed between them. Again, if we have dealt otherwise with the problem of thrift, there is no objection to be raised against the modern classical theory as to the degree of consilience between private and public advantage in conditions of perfect and imperfect competition respectively. Thus, apart from the necessity of central controls to bring about an adjustment between the propensity to consume and the inducement to invest, there is no more reason to socialise economic life than there was before (*GT*, pp. 378–9).

(In a similar way, Keynes was to argue in his posthumously published article on 'The Balance of Payments in the United States' (1946) that it was important to establish a framework for international trade and finance 'which allows the classical medicine to do its work' in establishing equilibrium in this context (*JMK* XXVII, pp. 444–5; see also Cairncross 1978. But see Keynes's 1926 essay on 'The End of Laissez-Faire' (reproduced in *JMK* IX, pp. 272–94) for some reservations à la Knight's classic 1923 paper on 'The Ethics of Competition' about the workings of the market economy.)

5. From the foregoing it is clear that the primary concern of the *General Theory* is theory and not policy, though Keynes does make brief use of the theory to explain the necessity for public-works expenditures to combat severe unemployment; that the primary concern of its theory is output (or employment) and not prices; and that the primary concern of its theory of output is the explanation of equilibrium at less-than-full-employment and not cyclical variations in output.

Another point which is clear from this summary is that Keynes's repeated use of the term 'unemployment equilibrium' (*GT*, pp. 28, 30, 242–3, 249) in the first 18 chapters of the *General Theory* must, strictly speaking, be understood as referring to a Marshallian short-period equilibrium (*Principles*, Book V, ch. v) that is attained under the provisional assumption of a constant money-wage rate (*GT*, pp. 27, 247). Clearly, such an equilibrium no longer obtains once Keynes drops this assumption in the climactic

chapter 19, proceeds to analyse the effects on the economy of a decline in the money wage rate, and shows that such a decline will not necessarily lead to an increase in employment and *a fortiori* not to the establishment of full-employment equilibrium (see above). Thus in the strict sense of the term, the *General Theory* is a theory of unemployment disequilibrium: it analyses the workings of an economy in which money wages and hence the rate of interest may be slowly falling, but in which 'chronic unemployment' (*GT*, p. 249) nevertheless continues to prevail, albeit with an intensity that may be changing over time (cf. Patinkin 1951, part III; 1956, chs XIII:1, XIV:1, and Supplementary Note K:3, reproduced unchanged in the 1965 edition; 1976a, pp. 113–19).

This interpretation would seem to be in contradiction to Keynes's emphasis that one of his major accomplishments in this book was to have demonstrated the possible existence of 'unemployment equilibrium' (*GT*, pp. 30, 242–3). I would like to suggest that the answer lies in a letter that Keynes wrote to Roy Harrod in August 1935, in reply to the latter's criticism that Keynes's discussions of the classical position were carried out in an unduly polemical style that exaggerated the differences between the two positions. In Keynes's words:

> the general effect of your reaction ... is to make me feel that my assault on the classical school ought to be intensified rather than abated. My motive is, of course, not in order to get read. But it may be needed in order to get understood. I am frightfully afraid of the tendency, of which I see some signs in you, to appear to accept my constructive part and to find some accommodation between this and deeply cherished views which would in fact only be possible if my constructive part has been partially misunderstood. That is to say, I expect a great deal of what I write to be water off a duck's back. I am certain that it will be water off a duck's back unless I am sufficiently strong in my criticism to force the classicals to make rejoinders. I *want,* so to speak, to raise a dust; because it is only out of the controversy that will arise that what I am saying will get understood (*JMK* XIII, p. 548; italics in original).

And what could 'raise more dust' than a seemingly frontal attack on the 'deeply cherished' classical proposition that there could not exist a state of unemployment equilibrium? Conversely, what could be more easily 'accommodated' within the classical framework than the statement that a sharp decline in aggregate demand would, despite the resulting decline in the wage-unit, generate a prolonged period of disequilibrium which would be marked by a continuous state of unemployment?

It also seems to me that it is precisely the attempt to interpret the *General Theory* as presenting a theory of unemployment equilibrium in the fullest sense of the term that has led to its interpretation (despite the internal evidence to the contrary, and despite the facts to the contrary that existed at the time that the book was being written) as being based on the special assumptions of absolutely rigid money wages and/or the 'liquidity trap'. For by definition there cannot be a state of long-run unemployment equilibrium in the sense that nothing in the system tends to change unless wages are rigid. Alternatively, if money wages are not rigid, then a necessary condition for equilibrium – in the sense of the level of employment remaining constant over time – is that the rate of interest remain constant; and a necessary condition for the rate of interest to remain constant in the face of an ever-declining money-wage and hence ever-increasing real quantity of money is that the economy be caught in the 'liquidity trap'. Correspondingly, once we recognize that the *General Theory* is concerned, strictly speaking, with a situation of unemployment disequilibrium, we also understand that the validity of its analysis does not depend on the existence of either one of these special assumptions.

Three further observations about the *General Theory*: First, I have already noted that the exposition of the theory of effective demand in Book I is carried out, not in terms of national income – to which concept Keynes even expresses what he regards as methodological objections (*GT*, pp. 38, 40) – but in terms of the level of employment. In part, this was undoubtedly due to the fact that the level of employment was indeed his major concern. But I also feel that this provides an instructive instance in our discipline of a basic characteristic of the physical sciences: namely, the relationship between the development of theory and the development of tools of measurement.

In particular, I conjecture that Keynes's ambivalence toward the use of the national-income concept in the *General Theory* (for he did make use of it in his chapters on the consumption function (ch. 10) and liquidity-preference function (ch. 15), respectively) was not unrelated to the fact that at the time national-income estimates had not yet become the household concept they are today; indeed there did not then even exist current official estimates of British national income. In contrast, ever since the early 1920s, estimates of British employment – or rather unemployment, as measured by the 'Number of Insured Persons Recorded as Unemployed' – were being published monthly in the *Ministry of Labour Gazette.* Similarly, I conjecture that the change in Keynes's view as manifested in his 1940 *How to Pay for the War* (*JMK* IX, pp. 416–17, 429; see the discussion of Fig. 1 in section 3 above) – and his willingness (albeit with reservations) to make use in it of Colin Clark's national-income estimates, about which he had earlier expressed much scepticism – reflected in part the exigencies of wartime, and in part the increased respectability and acceptability of national-income estimates as a result of their publication (based on the work of Simon Kuznets) on an official, current annual basis by the United States beginning with 1935 (cf. Patinkin 1976b, pp. 129–30, 243–5, 248–54; cf. also the discussion of Keynes and national-income statistics in section 7 below).

Second, in the *General Theory*, Keynes also appears as a historian of economic thought. Thus chapter 2 is entitled 'The Postulates of the Classical Economics' and references to 'classical theory' are strewn throughout the book. Similarly, most of chapter 23 is devoted to his 'Notes on Mercantilism', which are largely based on Heckscher's (1935) classic work. In a comment thirty-odd years later on his 1936 review of the *General Theory,* Viner, (1964, p. 254) – who had in 1930 published what was essentially a monograph on mercantilism (reprinted in Viner, 1937, chs 1–2; see ibid., p. xiv) – explained that the terms of reference of his original review did not include the doctrinal aspects of the book, and went on to express reservations about the 'objectivity and judiciousness' of Keynes 'as a historian of thought in areas in which he was emotionally involved as a protagonist and prophet'. Viner did not specify the areas he had in mind, but Heckscher (1946) explicitly referred to Keynes's treatment of mercantilsm and charged him with citing from his (Heckscher's) work 'only ... those parts of mercantilist theory that happen to coincide with his own analysis of economic behaviour' (ibid., p. 340; actually, most of Heckscher's article is devoted to a criticism of Keynes's theory itself). However, Hutchison (1978, pp. 127–35) and Walker (1986, part IV), basing themselves on more recent studies of mercantilism and its period, have largely supported Keynes's treatment, particularly with respect to his emphasis on the mercantilists' concern with the problem of unemployment, and his corresponding contention that they advocated a positive balance of trade and resulting inflow of gold not as a fetish, but as a rational means of dealing with this problem (*GT*, pp. 346–48). But Hutchison (1978, p. 128) also cites Blaug's (1962, p. 15; 1964, pp. 114–15) dissenting opinion, and Walker (1986, p. 28) notes that Keynes was nevertheless guilty of 'excessively broad generalizations' about the mercantilist literature.

Insofar as Keynes's treatment of 'classical economics' is concerned, both Hutchison and Walker conclude that Keynes's discussion of Ricardo and Say's Law, on the one hand, and Malthus's concern with the possibility of the inadequacy of aggregate demand, on the other (*GT*, pp. 18–21, 32–4) constitute important contributions to the history of economic thought, though here too they indicate some inaccuracies (see also Patinkin 1956, 1965, Supplementary Note L, on Keynes's misrepresentation of the passage in Mill's discussion of Say's Law which Keynes cites on p. 18 of the *General Theory*). At the same time, both Hutchison and Walker reject Keynes's contention that classical economics in this sense continued unchallenged through the second half of the 19th century on into the 20th. In particular, Hutchison (1978, pp. 165–6, 175–99) conclusively shows that Keynes was not justified in including Pigou among the 'classical economists' (*GT*, p. 3, n1; see also Corry 1978, pp. 8–11; see also Walker 1985, for a favourable view (though it too with some

reservations) of Keynes as a historian of thought in his 1933 *Essays in Biography*).

In sum, though Keynes in the *General Theory* provided valuable and stimulating insights with respect to certain points in the history of economic thought, Viner did not err in saying that the balanced scholarly treatment of this subject was not Keynes's forte (cf. also Hutchison 1978, p. 173 and Walker 1986, p. 29).

My third and last observation is that in order to understand why the *General Theory* had such a revolutionary impact on the profession – and indeed on the general public – we must take account of the circumstances that prevailed when it burst on the scene. In the early 1930s, the Western world was desperately searching for an explanation of the bewildering and seemingly endless depression that was creating untold misery for millions of unemployed and even threatening the viability of its democratic institutions. Indeed, largely as a result of the widespread social unrest caused by the mass unemployment, a totalitarian government had already taken power in Italy and a far more evil and oppressive one was doing so in Germany. And the appearance of the *General Theory* in 1936 offered not only an explanation, but also a confident and theoretically supported prescription for ending depressions within a democratic framework by proper government policies. Thus the *General Theory* provided an answer not only to a theoretical problem, but to a burning political and social one as well. I might also add that the fact that the theoretical revolution embodied in the Keynes's *General Theory* took place concurrently with the Colin Clark–Simon Kuznets revolution in national-income measurement further increased its impact on the profession: for those measurements made possible the quantification of the analytical categories of the *General Theory*, hence the empirical estimation of its functional relationships, and hence its application to policy problems (cf. Patinkin 1976b).

Despite the many criticisms and discussions of the *General Theory* that followed its publication (cf. e.g., the review articles by Harrod, Hicks, Leontief, Lerner, Meade, Pigou, Viner et al. reprinted in Lekachman 1964 and Wood 1983), its basic analytical structure not only remained intact, but also defined the research programme for both theoretical and empirical macroeconomics for the following three decades and more. Truly a scientific achievement of the first order. And as with the passage of time we gain a more critical view of the accomplishments – and deficiencies – of 'monetarism' and of 'the new classical macroeconomics' of the last two decades, an appropriately modified Keynesian model that will take advantage of what we have learned from these developments may yet regain its place as the leading one for macroeconomic analysis (Howitt 1986; for some conjectures about what Keynes might have thought of these developments, see Patinkin 1984).

6. Any great work brings in its wake claims of priority for other writers – and the *General Theory* was no exception. Thus within a year after its publication, Bertil Ohlin (1937) claimed that there were 'surprising similarities' between the analysis in this book and that which had been developed in the writings (in Swedish) of what he called the 'Stockholm school', under which rubric he included Erik Lindahl and Gunnar Myrdal as well as himself. Similarly, in a review article on the *General Theory,* the Polish economist Michal Kalecki (1936) claimed that he had anticipated its main arguments in a 1933 monograph in Polish on the business cycle (the 'essential part' of which was published many years later in English translation in Kalecki 1966, pp. 1, 3–16). Ohlin's claim was presented in the *Economic Journal,* then the leading journal of the economics profession, and gained immediate attention – so much so that the claim of the Stockholm School became a 'perennial of doctrinal history' (in Gustafsson's 1973, apt phrase). In contrast, Kalecki's claim was published in *Ekonomista* – the professional journal of Poland's economists, published, of course, in their own language – and so received no attention outside that country. (An English translation of this review has only recently been published; see Targetti and Kinda-Hass 1982.) Fifteen years later, however, the claim of Kalecki was brought to the attention of the profession as a whole by Lawrence Klein (1951) and Joan Robinson (1952), and has in certain quarters received increasing support ever since.

A detailed examination of these claims, however, has led me to reject them on the grounds that the respective central messages of these writers were different from that of the *General Theory* (Patinkin 1982, chs 1–4). In particular, the central message of the Stockholm school (like that of Keynes's *Treatise*) was a further development of that of Wicksell, and had to do with the interrelationships of the rate of interest and prices, and only indirectly with output. And though Kalecki's central message had to do with output, its concern was not with the forces that generate equilibrium at low levels of output, but with the forces that generate cycles of investment and hence output: more specifically, not with the feedback mechanism of the *General Theory* that equilibrates planned saving and investment via declines in output, but with the cyclical behaviour of investment in a capitalist economy on the implicit assumption that there always exists equality between planned savings and investment. At the same time I must emphasize that in his primary concern with quantities as against prices; in his concentration on national-income magnitudes and functional relations among them; and in his corresponding emphasis on analysing the relationship between investment and other macroeconomic variables, Kalecki came significantly closer to the *General Theory* than did the Stockholm School, and this was particularly true of his semi-popular 1935 paper 'The Mechanism of the Business Upswing'.

7. The foregoing discussion has highlighted the differences between the respective volumes of Keynes's trilogy. There are, however, also important similarities. Thus a common element of these books is their concern with practical policy problems, and their related concern with the empirical aspects of these problems. At the same time I must emphasize that Keynes (like the great majority of his contemporaries) largely used empirical data for illustrative purposes, or at most as a basis for rather impressionistic observations about the relations between the variables described by the data. Though there are partial exceptions (see the second paragraph below), Keynes practically never carried out a systematic statistical analysis of empirical data as a basis for conclusions.

Thus, for example, Keynes's excellent presentation of the purchasing-power-parity theory in the *Tract* is supported by charts and diagrams showing the generally corresponding movements of the actual exchange rates of England, France and Italy with those respectively predicted by the theory (*Tract,* pp. 81–6). Similarly, Keynes's aforementioned analysis of inflation as a tax on real cash balances – and his explanation that this tax will decrease the volume of these balances that individuals will be willing to hold – is illustrated by data from the postwar hyperinflations of Germany, Austria, and Russia (*Tract,* pp. 45–6). Similarly, in the second, 'applied' volume of his *Treatise*, Keynes presents empirical estimates of the variables that play a key role in the theory he developed in the first volume: namely, the quantity of money, the velocity of circulation, the volume of working capital – and he even adds a long chapter (30) providing historical illustrations of his theory.

Though there is less emphasis on empirical data in the *General Theory,* it is noteworthy that Keynes was quick to make use in it (though somewhat carelessly; see the correspondence reproduced in *JMK* XXIX, pp. 187–206) of Simon Kuznets's (1934) preliminary estimates of net investment in the United States in order to illustrate his (Keynes's) basic contention about the critical role of wide fluctuations in this variable in generating business cycles (*GT*, pp. 102–5). What is even more noteworthy is Keynes's use of these data in order to make an empirical estimate (crude as it was) of the magnitude of the multiplier in the United States – and thence of the marginal propensity to consume of that country (*GT*, pp. 127–8). Thus Keynes not only made the marginal propensity to consume a central component of macroeconomic theory, but also provided the first estimate of its magnitude that was based on an examination of statistical time series!

I must, however, immediately add that there are many problematic aspects of this estimate, not least of which is the mystery of the source of the national-income data which Keynes used (together with Kuznets' aforementioned data on investment) to estimate the multiplier.

Furthermore, despite the fact that he was one of the founding members of the Econometric Society in 1933 and even served as its President during 1944–45, Keynes was actually extremely skeptical of econometric methods. Thus his oft-cited critical review (1939) of Tinbergen's classic work was devoted not to the much better known second volume of this study on *Business Cycles in the United States of America, 1919–1932* (1939), but to the first volume (published a few months earlier), *A Method and Its Application to Investment Activity,* in which Tinbergen set out and exemplified the principles of multiple-correlation analysis. Accordingly, the criticisms Keynes presented in this review were levelled not at Tinbergen's ambitious 46-equation model of the United States economy, but at the use of correlation analysis to estimate a regression for even a single equation! It should, however, be noted that though not all of Keynes's criticisms were well taken, some raised problems that continue to trouble econometricians: namely (though obviously not in the terms that Keynes used), the problems of specification bias and of simultaneous-equation bias (Patinkin 1976b, sections 1, 3; cf. also Lawson and Pesaran 1985).

Another aspect of Keynes's interest in the empirical aspects of our discipline was his concern with improving the scope and reliability of economic data. Thus in the course of presenting the aforementioned estimates in the second volume of the *Treatise,* Keynes repeatedly complains about the inadequacy of the data (*TM* II, pp. 78, 87). Keynes was also responsible for the final chapter in the Macmillan Report (1931), which was devoted to proposals for extending and improving available economic statistics in Britain. It is, however, noteworthy that these proposals did not include one for the construction of current national-income statistics. Similarly, in the years that followed, Keynes failed to support Colin Clark's pioneering work in this field (1932, 1937). It was only after the outbreak of World War II that this attitude changed, and then Keynes played an important role in promoting the publication of the famous 1941 White Paper, *Analysis of the Sources of War Finance and an Estimate of the National Income and Expenditure in 1938 and 1940* (Cmd. 6261), for which James Meade and Richard Stone were primarily responsible, and which marked the beginning of official British national-income statistics (Patinkin 1976b, pp. 230–31, 244–5, 248–54).

Though all three of Keynes's books are concerned with policy issues, they nevertheless differ in the extent and sense of immediacy with which their policy discussions are presented. In view of the origin of the *Tract* in articles in the *Manchester Guardian,* it is not surprising that discussions on current policy issues are paramount in it. Indeed, having only a short time before dealt so successfully with prime ministers in his *Economic Consequences of the Peace* (1919, *JMK* II) and in his *Revision of the Treaty* (1922, *JMK* III), Keynes had no hesitations in dispensing advice on current problems directly from the pages of the Tract to the finance ministers (or their equivalent), not only of England and the United States, but also of Czechoslovakia (p. 120), Germany (pp. 50–52), and France (pp. xxi–xxii).

In contrast – as befits a comprehensive, scientific work – Keynes's policy recommendations of the *Treatise* are for the most part of a more general nature, though here too there are references to specific, immediate issues (e.g., *TM* II, pp. 270 ff. 348 ff). Least specific in its policy proposals, for reasons indicated in section 3 above, is the *General Theory.*

What were the policy problems that concerned Keynes? The major one was obviously unemployment. This had plagued Britain in the two years that preceded the publication of the *Tract* (1923) and it continued to be a serious problem in the five years that he was writing the *Treatise* (1930). In contrast, those were years of boom and prosperity in the US; and when in the early 1930s – the period of writing the *General Theory* (1936) – prosperity gave way to depression in the US as well, unemployment in Britain became even more serious. A common characteristic of all three of these books is Keynes's opposition to attempts to combat unemployment by reducing the nominal wage rate. However, it seems to me that there is a difference between the *Treatise* and the *General Theory* on this point: for my

impression is that in the *Treatise*, Keynes believed that such a reduction could theoretically help but practically could not be carried out; whereas in the *General Theory*, he opposed it on theoretical grounds as well. In part this difference may have stemmed from the fact that Keynes in 1930 was writing under the influence of the relative inflexibility of British money wages in the years that had preceded, whereas in 1936 he also had before him the United States experience of the sharp reduction in money wages during 1929–33 that had not succeeded in solving the unemployment problem (note again Keynes's allusion to this experience on p. 9 of the *General Theory*).

At the same time, a recurrent theme of Keynes's discussion of unemployment was that if by agreement or decree money wages could be instantaneously and uniformly reduced in all sectors of the economy, then the problem would be solved (cf. *Economic Consequences of Mr. Churchill,* 1925, *JMK* IX, pp. 211, 228–9; *TM* I, pp. 141, 151, 244–5, 265, and 281; *GT,* pp. 265, 267, and 269). For such an instantaneous reduction would be accomplished before it could create adverse expectations, and it would also not change relative wage rates as between workers in different industries (see *JMK* IX, p. 211 and *GT,* p. 14 for Keynes's emphasis on the resistance of workers to such relative changes). Thus in the *General Theory* Keynes writes:

> To suppose that a flexible wage policy is a right and proper adjunct of a system which on the whole is one of *laissez-faire,* is the opposite of the truth. It is only in a highly authoritarian society, where sudden, substantial, all-round changes could be decreed that a flexible wage-policy could function with success. One can imagine it in operation in Italy, Germany or Russia, but not in France, the United States or Great Britain (*GT*, p. 269).

This is a somewhat naive notion of what even a totalitarian government can do. In any event, this passage – and the context in which it and the other passages cited above appear – makes it clear that Keynes's purpose was not to advocate the policy of wage flexibility, but to provide a 'negative proof' of its impracticability for a democratic society. (Today's version of Keynes's statement in the foregoing passage would be that if equilibrium prices and wages were established by means of a stable recontracted *tâtonnement* carried out by a Walrasian auctioneer, then, by definition, full employment would always obtain).

At the other extreme from the problem of unemployment was that of avoiding inflation. It is not surprising that this was a basic concern of Keynes during the period of the disastrous hyperinflations in Europe that followed World War I, which experience led him in his *Economic Consequences of the Peace* (1919, p. 148) to write that 'Lenin is said to have declared that the best way to destroy the capitalist system was to debauch the currency' (a statement that was actually due to Preobrazhensky; see Fetter 1977, p. 78). Similarly, the adverse effects of inflation was a theme which Keynes most eloquently and forcefully presented in his *Tract on Monetary Reform* (1923). Thus in the preface to this book Keynes wrote: 'Unemployment, the precarious life of the worker, the disappointment of expectation, the sudden loss of savings, the excessive windfalls to individuals, the speculator, the profiteer – all proceed in large measure from the instability of the standard of value.' I must, however, add that in this book, as well as in his subsequent writings, Keynes consistently regarded the harm caused by deflation and its accompanying unemployment to be significantly greater than that of inflation.

It was probably the traumatic post-World War I experience – still fresh in his mind – that led Keynes, even in his 1930 *Treatise,* after more than five years of deflation and unemployment in Britain, to continue to be concerned with the dangers of inflation. It is also noteworthy that in his *Essays in Persuasion* (*JMK* IX, pp. 57–75) – published a year later – Keynes reproduced excerpts of the discussion of the destructive effects of inflation that had appeared in his *Economic Consequences of the Peace* and in his *Tract* – including the alleged statement of Lenin's (ibid., p. 57).

Perhaps because of the increasing severity of the depression in Britain in the years between the *Treatise* and the *General Theory* – and, even more so, because the depression had then become world-wide – the latter work is little concerned with the problems of inflation, though it does emphasize the undesirability of 'great instability of prices' (*GT*, p. 269; see the discussion of

chapter 19 in section 4 above). It should also be noted that a recurrent theme of the *General Theory* (pp. 173, 249, 253, 296 and 301) is that as the level of employment in an economy increases as a result of an increase in effective demand, the money wage rate begins to rise even before full employment is reached. This view may be interpreted as something of an adumbration of one aspect of the later Phillips-curve analysis: namely the coexistence of inflation and unemployment.

It is also significant that after Britain began its rearmament programme early in 1937 – and when unemployment was still around 12 per cent – Keynes expressed concern with the possible inflationary outcome of such a programme that might be generated by the geographical immobility of labour. In particular, in two articles in the *Times* in the spring of 1937, Keynes argued (inter alia) that in order to avoid such pressures, the increased defence expenditures should be directed toward the distressed areas of the economy (*JMK* XXI, p. 407; see also ibid., pp. 385–6; cf. also Hutchison 1977, pp. 10–14). And once war broke out, Keynes wrote his influential pamphlet on *How to Pay for the War* (1940), whose major purpose was to present a programme for financing the war without generating inflation – the main component of the programme being a proposal to adopt compulsory savings.

Two points should be made about the relationship between theory and policy in the *Treatise* and in the *General Theory.* First, in both cases the major contribution of the book is with respect to theory – and the purpose of the theory is to provide a rigorous underpinning for a policy position which already had many adherents. As Keynes himself indicated in chapter 13 of the *Treatise*, this was certainly true for the bank-rate policy he advocated in that work. And it is also true of the public-works-expenditure policy advocated in the *General Theory*, a policy which had been advocated by other British and American economists as well during the 1920s and early 1930s (cf. Hutchison 1953, pp. 409–23 and 1978, pp. 175–99; Patinkin 1969; Stein 1969, chs 2, 7; Winch 1969, pp. 104–46; and Davis 1971). Indeed, as noted above, Keynes himself had already advocated this policy in his 1929 *Can Lloyd George Do It?*, and even here he was basically repeating views he had expressed five years earlier in the *Nation and Athenaeum* (*JMK* XIX, pp. 221–3). Accordingly, as also noted above, the major revolution effected by the *General Theory* was in the field of theory, and not of policy. And if (unlike the *General Theory*) the *Treatise* did deal at length with policy, it was not because it made any basic, new contribution to this question (at least in a domestic context), but because it was – as its name indicated – a comprehensive treatise, designed, inter alia, to describe the state of the art with respect to both theory and practice.

Second, and relatedly, it seems to me that the change in Keynes's policy views between the *Treatise* and the *General Theory* stemmed less from the transition from the fundamental equations to the $C+I+G=Y$ equation than from British economic developments in the quinquennium between the appearance of those two books. For, as we have seen, Keynes advocated public-works expenditures for the purpose of combating unemployment even in the *Treatise*, albeit as a second-best policy to be carried out in special circumstances. And what caused him to advocate such expenditures as a necessary addition to interest-rate policy (which, as in the *Treatise*, he continued to regard as an essential component of full-employment policy; cf. *GT,* p. 316) was the experience of five additional years of deep depression in the face of a 'cheap-money' policy that had brought the rate of interest down to unprecedented lows. In brief, I conjecture that it was this experience that led Keynes of the *General Theory* to conclude:

> For my own part I am now somewhat sceptical of the success of a merely monetary policy directed towards influencing the rate of interest. I expect to see the State, which is in a position to calculate the marginal efficiency of capital-goods on long views and on the basis of the general social advantage, taking an ever greater responsibility for directly organizing investment; since it seems likely that the fluctuations in the market estimation of the marginal efficiency of different types of capital, calculated on the principles I have described above, will be too great to be offset by any practicable changes in the rate of interest (*GT*, p. 164).

8. Just as Keynes's trilogy is bound together by a common concern with the problem of unemployment, so is it bound by a common lack of concern with the problem of economic growth. With respect to the *Treatise* and the *General Theory,* this omission is an understandable characteristic of the economic literature of the depression years. For at a time when a dismaying percentage of the existing productive potential was idle, it would have taken an unrealistic soul indeed to have concerned himself with the problem of assuring the further growth of this potential. But I think that this lack of concern reflected an additional element in Keynes's thought – and probably in that of many of his contemporaries as well.

In particular, I think that Keynes originally viewed economic growth as a process that would emerge naturally – and at a satisfactory pace – from a free-market system in which households saved, and then used these savings to purchase the securities which firms issued in order to finance their expansion. 'For a hundred years [before World War I] the system worked, throughout Europe, with an extraordinary success and facilitated the growth of wealth on an unprecedented scale' (*Tract,* p. 6) – and Keynes, like his contemporaries, was not much concerned with things outside Europe, in the broad sense of Western civilization. Now, what had seriously interfered with the growth process of Europe after the World War were the disastrous inflations, which had wiped out the real value of past savings and had accordingly discouraged further saving. Correspondingly, a necessary – and sufficient – condition to reactivate the growth process at a satisfactory pace was to reestablish the confidence of the public in the future real value of its savings (*Tract,* pp. 16–17).

The *General Theory* introduced another factor that interferes with steady growth: unemployment. And parallel to his view in the *Tract*, Keynes felt that once this disturbing factor was eliminated, growth would again proceed at a satisfactory pace. Indeed, if full employment could be maintained, 'a properly run community equipped with modern technical resources, of which the population is not increasing rapidly, ought to be able to bring down the marginal efficiency of capital in equilibrium approximately to zero within a single generation' (*GT,* p. 220): the 'zero' of the classical stationary state.

In brief, I would conjecture that in Keynes's view at this time there was no need for any special analysis of the process of economic growth. All that one had to do was to ensure the maintenance of two necessary preconditions: a stable value of money and full employment. And growth – to the extent that the economy was interested in it (cf. *GT,* p. 377) – would take care of itself.

(Though Keynes did not concern himself with the problem of growth, the analytical framework of the *General Theory* served as the point of departure for the growth models which were subsequently developed. In this context it is interesting to note the transformation that took place over the years in the attitude toward saving: whereas the spirit of the *General Theory* hovers over the early contributions by Harrod (1939) and Domar (1946), which regard the increase in potential savings generated by increasing income as a threat to full employment, and growth as the means (via the acceleration principle) of generating the level of investment necessary for absorbing these savings and thus eliminating this threat, the later contributions regard savings as a desirable act necessary for financing the additional investment required for the growth process. Correspondingly, growth was transformed from being a means to an end to being an end in itself.)

Another common bond of the *Treatise* and *General Theory,* in quite a different plane, is the fact that the highly novel theoretical developments which mark both works were first presented to the profession at large as finished products, i.e. in the form of published books. In neither case did Keynes attempt to exploit the relatively long period of preparation that was involved (roughly, five years) in order to publish articles in the leading scientific journals on the salient features of his new theories and thus to benefit from the exposure of these theories to the criticism of the profession at large before formulating them in final book form. It is true that such a 'research strategy' was much less customary at the time Keynes wrote than it became later. But I would conjecture that Keynes's failure to follow such a

strategy also reflected his belief that the quintessence of economic knowledge was in Cambridge – which geographical point need at most be extended to a triangle that would include London and Oxford. So why bother publishing articles in order to benefit from criticism, if the most fruitful criticisms could be reaped more conveniently and efficiently simply by circulating draft-manuscripts and galley proofs among his colleagues in this fertile triangle?

And as the materials in *JMK* XIII show us, this is indeed the procedure that Keynes employed in the writing of the *General Theory.* On the other hand, there is little if any evidence that the *Treatise* was subjected to much effective pre-publication criticism even within this triangle. And this is particularly true for what Keynes considered to be its major theoretical innovation – the fundamental equations (Patinkin 1976a, pp. 20–21, 29–32). Correspondingly, there are many serious deficiencies in the *Treatise* which were pointed out immediately after its publication and which (I conjecture) would have been avoided if only it had been subjected to such criticism. I would also conjecture that it was precisely this unfortunate experience with the *Treatise* that Keynes had in mind when in the preface to the *General Theory* he wrote that 'It is astonishing what foolish things one can temporarily believe if one thinks too long alone, particularly in economics (along with the other moral sciences), where it is often impossible to bring one's ideas to a conclusive test either formal or experimental' – and that accordingly made him so eager to seek out criticism at every stage of the writing of the *General Theory.*

Might I also digress to suggest that another cause of the deficiencies in the *Treatise* was the simple but frequently neglected fact that Keynes too was of flesh and blood, subject like all mortals to the inexorable constraint that there are only 24 hours in the day; and there can be little doubt that Keynes just did not have enough hours to devote to the writing of the book, and especially of its final version. In particular, in August 1929, Keynes informed his publisher that he felt he had to 'embark upon a somewhat drastic rewriting' of what was then a one-volume book, for the most part already in galley and page proof (*JMK* XIII, pp. 117–18). But three months later Keynes was appointed to the famous Macmillan Committee and proceeded to play a leading role in its deliberations. Then at the beginning of 1930, he became a member – and a most active one – of the newly appointed Economic Advisory Council (see section 11 below). All this makes it difficult to believe that Keynes could have had enough time during 1930 to devote to the rewriting of the *Treatise* that he deemed necessary.

Another indication of this pressure of time is the fact that though Hawtrey had provided Keynes with basic criticisms of the *Treatise* before its publication (specifically, in the spring and summer of 1930), Keynes did not take account of them and did not even answer Hawtrey until a month after the book was published in October 1930. Keynes apologised then for this delay by explaining that he was, as we can well believe, 'overwhelmed' with work of the Macmillan Committee, the Economic Advisory Council 'and a hundred other matters' (*JMK* XIII, p. 133). And I suspect that this was also the reason that in 1930 Keynes did not give the series of lectures on monetary economics that it was his custom to give every autumn term at Cambridge (see section 11 below), and that in autumn 1931 he deferred his lectures to the following spring.

And though it may sound like a morality play – like a didactic reaffirmation of the victory of good scientific procedures over bad – I would like to point out that in the writing of the *General Theory* this pressure of time was much less evident. In particular, after the completion of the Macmillan Report in June 1931, Keynes seems to have been much less occupied than before with activities on behalf of the government. Similarly, after 1933 there was (to judge from an enumeration of the relevant entries in Hudson's unpublished and admittedly incomplete bibliography of Keynes's writings) a falling-off in the intensity of his journalistic activities. Correspondingly, I would conjecture that in the last two years before their respective publication, Keynes was able to concentrate far more on the writing of the *General Theory* than he had been able to on the writing of the *Treatise.*

9. I turn now to some observations on Keynes's style – both analytical and literary. Insofar as the analytical style is concerned, let me again note Keynes's failure to make use in his writings of graphical techniques – and this despite the fruitful precedent on this score set by his teacher Marshall, and despite the many passages (see, e.g., the reference on pp. 25 and 30 of the *General Theory* to the 'intersection of the aggregate demand function with the aggregate supply function') that almost cry out for a diagram. Here and there in the trilogy there are diagrams of a statistical or schematic nature (*Tract,* pp. 83, 87; *TM* I, pp. 290–91; II, p. 317). But, as noted above, in all of these books there is only one diagram of an analytical nature – and that diagram is due to Harrod (*GT*, p. 180, n. 1). Similarly – to judge from the student notes that have survived (reproduced in Rymes 1988) – Keynes made practically no use of diagrams in his lectures.

Keynes's failure to use graphical techniques in the *General Theory* is even more puzzling in light of the fact that his chief disciples and critics during the formative period of writing the book – namely, Richard Kahn and Joan Robinson – played a leading role in the breakthrough that was then taking place in the use of such techniques! I am, of course, referring to Joan Robinson's *Economics of Imperfect Competition* (1933a), in the writing of which she acknowledged the 'constant assistance of Mr R.F. Kahn' (ibid, p. v).

Marshall's influence on Keynes did, however, manifest itself in the fact that the analysis of both the *Treatise* and the *General Theory* is carried out in terms of 'demand price' and 'supply price' (see sections 2 and 3 above). It has also been contended in section 5 above that Keynes's 'unemployment equilibrium' in the *General Theory* must be understood in terms of Marshall's short-period equilibrium. A more subtle manifestation of Marshall's influence is the fact that the formal organization of the argument of the *General Theory* is that of partial-equilibrium analysis. In particular, if this argument had been organized in accordance with the Walrasian general-equilibrium approach, then (as in present-day textbooks of macroeconomics), Book III of the *General Theory* would have been devoted to the market for goods (both consumption and investment) and Book IV in a parallel fashion to that for money, and there would then follow a discussion of the interaction between these two markets. In point of fact, however, both Book III ('The Propensity to Consume') and Book IV ('The Inducement to Invest') are formally devoted to the market for goods, with the market for money being discussed in Book IV not as an equal partner, but as the source of an influence (via the rate of interest) on the market for investment goods. Nevertheless, as emphasized in the discussion in section 4 above of chapter 18 of the *General Theory,* the analysis of this book is essentially that of general equilibrium. The voice is that of Marshall, but the hands are those of Walras. And in his IS–LM interpretation of the *General Theory,* Hicks quite rightly and quite effectively concentrated on the hands.

In connection with Keynes's analytical style, I should also note his oft-cited criticism in the *General Theory* of 'symbolic pseudo-mathematical methods of formalizing a system of economic analysis ... which allow the author to lose sight of the complexities and interdependencies of the real world in a maze of pretentious and unhelpful symbols' (*GT*, pp. 297–8). Let us, however, not take this statement too seriously. First of all, Keynes's own analysis in his earlier *Treatise on Money* (1930) was, in fact, largely based on fairly mechanical applications of the so-called fundamental equations. Similarly, an entire chapter (20) of the *Treatise* is devoted to 'An Exercise in the Pure Theory of the Credit Cycle', in which Keynes explored in a very formalistic manner – and under a variety of alternative assumptions – the mathematical properties of his model of the cycle. Thus, if ever an author made use of 'a maze of pretentious and unhelpful symbols', that author was Keynes of the *Treatise.*

Furthermore, I strongly suspect that a comparison of the *General Theory* (and a fortiori the *Treatise*) with other works on economic theory that were written during that period would actually show Keynes's works to be among the more mathematical of them. Indeed, in his review of the *General Theory*, Austin Robinson commented

that 'even for the ordinary economist, the argument, being largely in mathematical form, is difficult' (1936, p. 472).

It may have been Keynes's lack of success with formal model building in the *Treatise* that led him to the more critical attitude expressed in the passage from the *General Theory* just cited. In any event, it is significant that in the *General Theory* – in contrast with the *Treatise* – Keynes did not attempt to provide a formal mathematical model of the theory of employment that constitutes the central message of the book. This was left for the subsequent exegeses of such writers as Hicks (1937) and Lange (1938). Instead, to the extent that Keynes made use of mathematical analysis in the *General Theory*, he did so with respect to such secondary themes as the relationship between the own-rates of interest of different goods (ch. 17, section II) and the theory of prices (ch. 21, section VI). And even in these instances, the mathematical formulation adds little to the exposition, and so could be deleted without much loss of continuity. Indeed, in a letter he wrote a year after the publication of the book in response to criticisms of the formulas in the first section of his chapter on 'The Employment Function' (chapter 20), Keynes himself admitted:

> I have got bogged [sic] in an attempt to bring my own terms into rather closer conformity with the algebra of others than the case really permits. When I come to revise the book properly, I am not at all sure that the right solution may not lie in leaving out all this sort of stuff altogether, since I am extremely doubtful whether it adds anything at all which is significant to the argument as a whole (*JMK* XXIX, p. 246).

Actually, the *General Theory* reveals an ambivalent attitude toward the role of mathematical analysis in economics; for with all his reservations about the usefulness of such analysis, Keynes (as one who had once been bracketed Twelfth Wrangler; see Harrod 1951, p. 103) could not resist the temptation to show that he too could employ it. Thus the foregoing quotation from the *General Theory* so critical of mathematical analysis actually occurs in section III of the same chapter 21 that I have just cited as providing an instance of the use of such analysis – and indeed this quotation appears as part of Keynes's apologia for nevertheless going ahead and resorting to it in section VI of that chapter!

Furthermore, judging from the critical literature that subsequently grew up around chapters 17 and 21, I think it fair to say that the mathematical analysis that appears in these chapters is not only not essential to the argument, but sometimes even incorrect (thus see Palander (1942) as cited by Borch (1969), as well as Naylor (1968, 1969), on the incorrect elasticity formula used to analyse the implications of the quantity theory in chapter 19 of the *General Theory* (p. 305); see also Patinkin (1982, p. 151, n.33) on the erroneous formula in n.2 on p. 126). And this fact, together with the ineffectualness of the fundamental equations of the *Treatise,* makes it clear that whatever may have been Keynes's attitude toward the proper role of mathematical methods in economic analysis, his strength did not lie in the use of such methods.

Nor in general did Keynes's analytical strength lie in rigour and precision: indeed, we run the risk of distorting the original intention of Keynes's writings – and reading meaning into them – if we try to view them through analytical lenses that are more sophisticated and more finely ground than those that he was wont to use. Thus in both the *Treatise* and the *General Theory* Keynes frequently failed to specify the exact nature of the assumptions that underlay his argument. Furthermore, there are many ambiguities in these books. And the best evidence of the existence of such ambiguities and obscurities is the fact that fifty years later disagreements continue about the role played in the *General Theory* by such crucial assumptions as wage rigidities, the liquidity trap, the interest elasticity of investment, unemployment equilibrium, and the like – not to speak of the protracted debate about the meaning of Keynes's aggregate supply function.

Instead, Keynes's analytical strength lay in his creative insights about fundamental problems that led him to make major breakthroughs, leaving for those that followed him to correct, formalize, and complete his initial achievements. In the *Treatise*, Keynes thought (erroneously, as it turned out) that his fundamental equations constituted such a breakthrough. In the *General Theory,* he saw his

breakthrough as lying in his theory of effective demand – and this time he was undeniably right.

In view of this basic aspect of Keynes's analytical style, I should in all fairness also emphasize that the aforementioned lack of rigour and completeness in part reflects the natural deficiency of many a pathbreaking work. As Keynes wrote to Joan Robinson: 'My own general reaction to criticisms always is that of course my treatment is obscure and sometimes inaccurate, and always incomplete, since I was tackling completely unfamiliar ground, and had not got my own mind by any means clear on all sorts of points' (*JMK* XIII, p. 270). Keynes made this comment in 1932 with reference to the *Treatise;* it is even more relevant for the *General Theory.*

Another characteristic of Keynes's style that should be noted is his constant striving to present the conclusions of his analysis in the form of paradoxes. Sometimes this is very effective, as in the case of the 'paradox of thrift' in the *General Theory.* Sometimes, however, Keynes's love for the paradoxical tempts him into extreme statements that do not stand up under critical scrutiny, as in the case of the paradox of the widow's cruse in the *Treatise* (I, p. 125; see Joan Robinson 1933b). And sometimes it tempts him into delphic pronouncements, such as his oft-cited contention that ' there may exist no expedient by which labour as a whole can reduce its real wage to a given figure by making revised money bargains with entrepreneurs' (*GT*, p. 13, italics in original; but see the discussion of chapter 19 of the *General Theory* in section 4 above for an interpretation).

A related characteristic of his style are occasional seemingly profound statements that upon closer examination lose much (if not all) of their profundity and are sometimes even involved in error. Thus consider the following passage from the *Treatise*:

> We have claimed to prove in this treatise that the price level of output depends on [1] the level of money incomes relatively to efficiency, on [2] the volume of investment (measured in cost of production) relatively to saving, and on [3] the 'bearish' or 'bullish' sentiment of capitalists relatively to the supply of savings deposits available in the banking system (*TM* II, p. 309, bracketed numbers added).

This is simply a verbal rendition of the second fundamental equation (itself a tautology) written as the weighted average of the respective prices of consumption goods (P) and investment goods (P')

$$\Pi = (P \cdot R + P' \cdot C)/O$$

where, by definition,

$$O = R + C$$

(*TM*I, p. 123). More specifically, the first fundamental equation in section 2 above can be written as

$$P = (W/e) + (I' - S)/R \qquad (\mathrm{i}'')$$

(*TM* I, p. 122); expressions [1] and [2] in the foregoing passage thus correspond to the first and second terms, respectively, of this equation. And expression [3] in turn is a brief summary of Keynes's explanation of the determination of P' (*TM* I, pp. 127–9, 229–30). (For other instances of obscure statements in the *Treatise* which are simply verbal renditions of the fundamental equations, see *TM* I, pp. 144 and 248–9; for further details, see Patinkin 1976a, ch. 6).

Or consider the following well-known passage at the end of chapter 19 of the *General Theory*:

> If, as in Australia, an attempt were made to fix real wages by legislation, then there would be a certain level of employment corresponding to that level of real wages; and the actual level of employment would, in a closed system, oscillate violently between that level and no employment at all, according as the rate of investment was or was not below the rate compatible with that level; whilst prices would be in unstable equilibrium when investment was at the critical level, racing to zero whenever investment was below it, and to infinity whenever it was above it (*GT*, pp. 269–70).

As at other points in the *General Theory,* Keynes assumes here that there is a fixed consumption function, so that the level of effective demand and hence employment is determined by that of investment. In the case where that level is greater than the level of employment corresponding to the fixed real wage rate, the argument is a straightforward application of the

analytical framework of the book: viz, there will then be an excess demand for goods which will drive their price higher; but since the real wage rate is being held constant, the money wage rate must increase in the same proportion. Thus prices will 'race to infinity', unless (Keynes goes on to say) the resulting decrease in the real quantity of money and consequent increase in the rate of interest will decrease investment, and hence effective demand and employment to the level corresponding to the fixed real wage rate.

It is, however, not clear why – in the case where the level of effective demand and hence employment is less than that corresponding to the fixed real wage rate – the economy should be driven down to a situation of 'no employment at all'. For the firms' marginal productivity of labour corresponding to that lower level of employment is higher than the fixed real wage rate; on the other hand, that fixed rate is higher than the minimum one upon which workers insist in order to provide that level of employment. Hence this lower level can constitute a stable equilibrium in Keynes's sense of the term. Correspondingly, there is no reason in this situation for prices to 'race to zero'. (See the discussion at the beginning of section 5 above of Keynes's use of the term 'unemployment equilibrium'.)

Note the key to interpreting the above passages: each is a mechanical application of the basic formula of the book in question (the fundamental equations in the case of the *Treatise,* and the theory of effective demand which determines employment hence the real wage rate in the case of the *General Theory*) – combined with Keynes's propensity to shock (see his letter to Harrod cited at the beginning of section 5 above).

Obscurities such as these, as well as those mentioned above, frequently impede the flow of the reading. But despite these difficulties, there are constant reminders throughout the trilogy that we are in the presence of a master of English style. The language is generally rich and incisive, enhanced occasionally by well-turned phrases and apt literary allusions. For Keynes's objective is to appeal not only to the intellect but also to the sense of literary appreciation.

This is particularly true of the *Tract,* and for two related reasons: because it is the least technical of the three books and because of its origin as a series of articles on current policy in the *Manchester Guardian,* where Keynes could give full expression to his brilliant journalistic style.

Least enjoyable as a reading experience is the *Treatise*, whose generally heavy and constrained style reflects the stately scientific objective that Keynes set for himself in it. Indeed, when one reads the *Treatise* against the background of Keynes's other writings, one cannot escape the feeling that it represents a Keynes out of character, a Keynes attempting to act the role of a Professor, and a Germanic one at that.

In the *General Theory* we once again find the true Keynes. Here (as in so many of Keynes's writings) is the stirring voice of a prophet who has seen a new truth and who is convinced that it – and only it – can save a world deep in the throes of crisis. It is a sharp, polemical voice directed at converting economists all over the world to the new dispensation and combating the false prophets among them who perversely continue with the erroneous teachings of the gods of classical mythology whom Keynes had already abandoned.

And so it is that these writings of Keynes are famous not only for their basic scientific contributions but also for having become part of the literary heritage of every economist. For who does not know that 'in the long run we are all dead'(*Tract,* p. 65)? Or that

> The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back. . . . The power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas (*GT*, p. 383).

10. The foregoing discussion of similarities and differences among the volumes of Keynes's trilogy brings us finally to the question of the justification for reading them today. From the substantive viewpoint, all of these volumes are now in the domain of the history of monetary

doctrine: their basic scientific contributions have long since been incorporated in the current literature, so that, by definition, the volumes themselves are of importance only to students of this history.

From a broader viewpoint, however, there are sharp differences among these volumes in this respect too. Thus, in these times of worldwide inflation, one can still read with both pleasure and profit Keynes's brilliant discussion of this problem in the *Tract.* On the other hand, the recent revival of interest in the *Treatise* notwithstanding, I can (from the viewpoint of macroeconomic theory) see little profit (and certainly no pleasure) in reading it today. Nor do I think that the *Treatise* is important as a key to an understanding of the major innovation of the *General Theory*, namely, the theory of effective demand. What the *Treatise* does help us understand are certain terminological aspects of Keynes's presentation of this theory (viz., his exposition in terms of 'demand price' and 'supply price'; cf. *GT,* pp. 24–6 and *TM* I, pp. 186, 189); but it contributes little towards an understanding of the substance of the theory itself, which differs so fundamentally from that of the *Treatise.*

As for the *General Theory*: the work over the years of students of Keynes's thought has deepened our understanding of this book, but has also brought to light deficiencies and errors. Some of these are due to the stylistic excesses described in section 9 above; some are inconsequential mathematical ones, like those noted in the same section; but some (e.g., the ambiguities and errors in Keynes's discussion of the aggregate supply curve referred to in section 3 above) are more significant. But even these last should be regarded as the kind that naturally occur in a pioneering work that breaks new ground and develops a radically different analytical framework. We do no service to the place of Keynes in the history of economic thought – and *a fortiori* not to the history itself – by ignoring these errors. At the same time, they do not change the basic fact that this is the book that made the revolution which has continued to mould our basic ways of thinking about macroeconomic problems. And so the reading of it – at least in part – is an intellectual experience that no aspiring economist even today can afford to forego.

To this I must add the following related plea. In reading the *General Theory,* let us do so in order to acquaint ourselves with one of the classics of our discipline, and, more generally, in order to enjoy the pleasures of intellectual history: not in order to invoke Keynes's alleged authority with respect to further developments in macroeconomic theory. Thus, for example, if we feel that this theory should provide a more detailed analysis of the way expectations and hence behaviour decisions are formed under conditions of uncertainty; or of the role of money wages and prices in the equilibriating process generated by the interaction between aggregate demand and supply; or of the influence of the structure of interest rates on the respective markets for money and commodities – then let us by all means devote ourselves to the analysis of these important questions. At the same time, let us make a clear distinction between this objective and that of the history of thought – and thereby do a service both to Keynes and to the further development of macroeconomic theory: for we then permit the study of Keynes's thought to concern itself not with what Keynes might have said or should have said about current theoretical questions, but with what he actually did say; and we permit the attempts to improve upon the current state of macroeconomic theory to be judged substantively, on their own merits, without confusing the issue with arguments about 'what Keynes really meant'. As Keynes said in concluding a long and tiresome correspondence in 1938 on a note that some economist had sent him on an aspect of the *General Theory,*'... the enclosed, as it stands looks to me more like theology than economics! ... I am really driving at something extremely plain and simple which cannot possibly deserve all the exegesis' (*JMK* XXIX, p.282; cf. also Patinkin, 1984, pp. 100–101).

11. Having devoted so much attention to Keynes's trilogy, I must emphasize that it would be a serious mistake to think of Keynes as devoting his major efforts in the interwar period to writing these books in the quiet halls of academe.

On the contrary, after he became a public figure in the wake of his *Economic Consequences of the Peace* (1919), he resigned his lectureship at Cambridge (though he continued as an active Fellow of King's College) and earned his living from his publicistic writings and from speculation on the stock market (Johnson and Johnson 1978, pp. 1–37; Harrod 1951, pp. 288, 294–304). Correspondingly, Keynes's normal routine became one in which he divided his time between London and Cambridge, living in the former during most of the week and coming down to Cambridge for long weekends. In London he was absorbed in his publicistic and political activities; during the weekends at Cambridge he dealt with both academic and (as bursar of King's) business matters. On Monday mornings of the autumn term during most of the interwar years he also gave a course of lectures on monetary economics which were widely attended by students, faculty and visitors, and in the process of which he expounded his new theories as he developed them. It is of these lectures that we have the notes of Bryce, Tarshis and others mentioned at the beginning of section 3 above. On Monday evenings Keynes would then preside over his famous Political Economy Club, whose participants were drawn from the most promising undergraduates, and at which one of them would read a paper which would then be discussed (Harrod 1951, pp. 149–52, 327–30; see also the reminiscences of Bryce and Tarshis of both the lectures and the Club in Patinkin and Leith 1977, pp. 39–63, 73–74). And the following morning he would be back in London.

Keynes's intensive public activity with respect to the policy discussions of the interwar period was reflected in the more than three-hundred articles he wrote for the 'highbrow' news magazines of the time (particularly the *Nation and Athenaeum* – of whose board Keynes was chairman in the 1920s – and its successor, *The New Statesman and Nation*) as well as for the popular press. Many of the latter articles were syndicated in newspapers all over the world. A selection from these and similar writings was reissued by Keynes in 1931 under the title *Essays in Persuasion.* These are marked by a brilliant style, truly the work of a literary craftsman.

There was one pressing and recurrent politico-economic issue of the postwar world of the 1920s – German reparations – which Keynes discussed not only in books addressed to the general public (1919, 1922) and in numerous magazine articles (reproduced in *JMK* XVII–XVIII), but also in the pages of the *Economic Journal* (which Keynes edited from 1912 to 1944; some of the interesting correspondence which he carried out in this capacity is reproduced in *JMK* XII, pp. 784–868). The reference is, of course, to Keynes's 1929 debate with Ohlin about the possibility of Germany's carrying out the payments imposed upon it by the Versailles Treaty: the famous debate about the 'transfer problem'. In light of the central role that the notion of effective demand was a few years later to play in the *General Theory,* it is ironic to note that in this debate it was Ohlin who emphasized the role of 'buying power' in carrying out the reparations, and Keynes who overlooked it. One cannot help suspecting that Keynes's thinking here was coloured by his violent objections to the Treaty itself (see introductory section of this essay). It should, however, be noted that a similar neglect of 'buying power' characterizes Keynes's other writings of this period: namely, his discussion of the effects of public-works expenditures in both *Can Lloyd George Do it?* (1929) and the *Treatise* (1930) (see Patinkin 1976a, p. 129).

Keynes's accomplished literary style also characterizes his *Essays in Biography* (1933b), in which Keynes reprinted his impressions of the leading political figures he had known, as well as his biographical essays on various British economists. Most notable among the latter are his stimulating essay on Thomas Malthus and his perceptive and evocative memorial essay on his teacher, Alfred Marshall.

At various critical junctures in the interwar period, Keynes also published influential pamphlets in which he analysed the questions at issue and proclaimed his prescriptions. Such were his *Economic Consequences of Mr Churchill* (1925), in which he criticized the decision of the

then Chancellor of the Exchequer to return to the gold standard at prewar parity, claiming that the resulting overvaluation of the pound generated depression in British export industries which then spread to the rest of the economy; *Can Lloyd George Do It?* (1929) (written with Hubert Henderson), in support of the Liberal Party's pledge in the 1929 election campaign to reduce unemployment by means of public works; *The Means to Prosperity* (1933a), in further support of public works (this time making use of the newly developed notion of the multiplier) as the depression deepened in the early 1930s; and *How to Pay for the War,* as in 1940 the problems of depression gave way to those of wartime inflationary pressures. (All of these pamphlets have been reproduced in *JMK* IX.)

I should, however, note that already in 1943 Keynes also began to concern himself with postwar problems and wrote a memorandum on 'The Long-Term Problem of Full Employment' advocating a programme in which 'two-thirds or three-quarters of total investment is carried out or can be influenced by public or semi-public bodies' (*JMK* XXVII, p. 322). And in reply to a comment on it by James Meade, he wrote (letter of 27 May 1943):

> It is quite true that a fluctuating volume of public works at short notice is a clumsy form of cure and not likely to be completely successful. On the other hand, if the bulk of investment is under public or semi-public control and we go in for a stable long-term programme, serious fluctuations are enormously less likely to occur (*JMK* XXVII, p. 326).

Similar views were expressed by Keynes in an unpublished February 1944 'Note on Postwar Employment' and in a December 1944 letter to Beveridge (*JMK* XXVII, pp. 365, 381). Thus to the end of his days, Keynes continued to advocate public-works expenditures as a necessary component of a full-employment policy. It should, however, also be emphasized that – as in the *General Theory* and *a fortiori* the *Treatise* – Keynes also continued to stress the essential role of a low rate of interest in carrying out this policy. Indeed, in a series of articles in the *Times* which he published in 1937 entitled 'How to Avoid the Slump', he wrote that 'we must avoid it [i.e., 'dear money'] as we would hell-fire' (*JMK* XXI, p. 389).

Keynes influenced policy not only through his publicistic activities, but also by his active membership in various official government bodies. Thus he was the leading figure of the Committee on Finance and Industry (the Macmillan Committee, 1929–31) and of the Economic Advisory Council (1930–39), and he also served as chairman of the Committee of Economists (1930) – all of which were charged with advising the British government on different aspects of the policies it should follow in order to overcome the serious depression in which Britain, together with the rest of the Western world, then found itself (cf. Howson and Winch 1977). Similarly, at the outbreak of World War II, Keynes was appointed adviser to the Chancellor of the Exchequer, a position he held until his death. He also played a leading role in the negotiations with the United States government, first for lend-lease support in 1941 and again in 1944, and then for a special postwar loan in 1945. Keynes was also one of the architects of the Bretton Woods agreement (1944), which established the International Monetary Fund and the International Bank for Reconstruction and Development (the World Bank). Indeed, the Fund's original policy of fixing par values for the various exchange rates, but permitting fluctuations of up to 10 per cent about them, is clearly reminiscent of Keynes's advocacy in the *Treatise* (II, p. 303) of maintaining the fixed exchange rates of the international gold standard, but widening the gold points so as to permit fluctuations of the rates within a range of two per cent. In the foregoing capacities, Keynes wrote countless letters, memoranda, reports, draft proposals, and the like, the major ones of which are reproduced in the relevant Activities volumes of his *Collected Writings* (*JMK* XX–XXVI; see also Kahn (1976), Williamson (1983) and Moggridge (1986) on Keynes's views on the international monetary system from his earliest writings up to and including the IMF).

As indicated above, Keynes's concern with policy questions also exerted a strong influence on the direction of his scientific writings. This was

clearly the case for his *Tract on Monetary Reform* (1923), which had its origins in newspaper articles that Keynes had written on current economic problems. Similarly, the predominant emphasis of the *Treatise on Money* (1930) on the problems of unemployment and of the workings of the international gold standard reflected the major economic concerns of the period. By the time the *General Theory* (1936) was being written, however, the gold standard had collapsed, while the problem of unemployment had become increasingly severe. Correspondingly, the *General Theory* is concerned almost exclusively with the problem of mass, long-run unemployment in a closed economy: that is, one not subject to the restrictions imposed by the gold standard.

Keynes's interests ranged far beyond the confines of economics. He was for many years a member of the famous Bloomsbury Circle. His cultural activities included the theatre, dance, paintings, and rare-book collecting. He was instrumental in establishing the Arts Council, which provided state patronage of the arts. In all these ways Keynes played a prominent role in the cultural and intellectual life of the Britain of his day (see Harrod 1951; White 1974; Milo Keynes 1975; Crabtree and Thirlwall 1980; and Skidelsky 1983 and 1988).

See Also

► Keynes, John Maynard (New Perspectives)

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Keynes, John Maynard (New Perspectives)

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Abstract

Since Don Patinkin's article on Keynes appeared in the first edition of *The New Palgrave,* two major biographies have increased our understanding of Keynes's life. There has developed a large literature on the relation between his work on probability and his involvement in the Bloomsbury group, and the relation to both of these to his economics. This article reviews and assesses that literature along with more recent work on his economics.

Keywords

Aggregate demand; Behaviourial economics; Clarke, P. F.; Expectations; Forced saving; Gold standard; Harrod, R. F.; Induction; Inflation; International Monetary Fund; Keynes and Bloomsbury; Keynes and philosophy; Keynes, J. M.; Liberalism; Liquidity preference; Meade, J. E.; Mill, J. S.; Moggridge, D.; Moore, G. E.; New Keynesian macroeconomics; Ohlin, B. G.; Patinkin, D.; Pigou, A. C.; Post Keynesian economics; Probability;

Psychology and economics; Public works; Ramsey, F. P.; Robertson, D.; Rules of conduct; Skidelsky, R.; Statistics and economics; Stone, J. R. N.; Subjective probability; Uncertainty; Unemployment; Utilitarianism; Utility maximization

JEL Classifications
B31

Patinkin on Keynes

Don Patinkin's article on John Maynard Keynes, reproduced here from the first edition of *The New Palgrave,* is a classic. Patinkin had first grappled with Keynesian theory as a student in Chicago in the 1940s, going on to write *Money, Interest and* Prices (1956), which was the leading graduate textbook in macroeconomics from the 1960s until the early 1970s. Apart from offering a theoretical interpretation of Keynesian economics, as the economics of disequilibrium, the book contained detailed appendices on the history of many of the concepts with which he was working. When the publication of the volumes of Keynes's *Collected Writings* (cited here as *JMK*) made available extensive correspondence and other previously unpublished material, Patinkin turned to this to provide an account of how Keynes had reached the ideas that he (Patinkin) and others had struggled so long to understand. Patinkin's scholarship was meticulous, and his ideas on Keynes were documented in a series of books published between 1974 and 1982. It was a case of one outstanding theorist exploring the mind of another, which explains the questions he chose to ask: how did the Marshallian quantity theorist of the early 1920s become the author of the *General Theory?* What were the theoretical innovations that marked the *General Theory* apart from works by others seen as having 'anticipated' Keynesian ideas? Patinkin's article sums up the results of this thinking, which explains why, at the start, he wrote that he was not going to offer a biography but would reflect on the development of Keynes's thinking on economic theory and policy.

When Patinkin made that remark, the only biography available was the official biography by Sir Roy Harrod (1951). The first volume of Skidelsky's biography (1983) had appeared, but it covered only the period up to 1920, a long way short of the work for which Keynes is now famous. Since then, Skidelsky has concluded his biography with two further volumes (1992, 2000) and has produced a one-volume abridgement, of a mere 1,000 pages (2003). The co-editor of the *Collected Writings,* Don Moggridge, has also written an important biography (1992: for two useful comparisons that explain why both need to be read, see Dimand 1993; Blaug 1994). Apart from these, Keynes has been the subject of an earlier short biography by Moggridge (1976) as well as ones by Charles Hession (1984), David Felix (1999), and a short study by Skidelsky (1996). There has also been extensive research on the Keynesian revolution and Keynes's role in it, some prompted by Patinkin's conclusions, others by other concerns. Here, the work of the Peter Clarke (1988, 1998) is worth noting, being the result of a political historian taking the time to get to grips with circumstances that produced Keynesian economics.

A further development was that in the mid-1980s scholars were beginning to see Keynes not simply as an economist but as a philosopher, exploring the philosophical grounding of his King's College Fellowship Dissertation which later became the *Treatise on Probability* (1921; *JMK,* VIII) and the relationship of these ideas to his discussion of uncertainty in the *General Theory* (notably Chapter 12) and in the article in 1937 where he argued that his main thesis was the fact that we know virtually nothing about the future *(JMK,* X, pp. 108–23). The appearance, within a very short period, of three studies of Keynes's philosophical development (Carabelli 1988; O'Donnell 1989; Bateman 1987, 1988, 1996) was an important factor behind the rapid growth of a very detailed 'Keynes and philosophy' literature during the late 1980s and early 1990s. The first volume of Skidelsky's biography also located Keynes, much more firmly than Harrod's had

done, in the artistic and literary environment of the Bloomsbury group, stimulating further reassessments of the context in which Keynes's economics should be interpreted.

During the 1970s, the foundations were laid for a transformation in macroeconomics by the work of Phelps, Lucas, Sargent, Barro and others. Keynes was reinterpreted, many times, and the theoretical framework within which Patinkin had worked ceased to define the questions that became of primary concern to macroeconomists, which now concerned problems such as dynamics, expectations, and strategic decision-making. Though Keynes still had some relevance (witness the New Keynesian macroeconomics), it became much easier to see Keynesian economics as a historical episode than had been the case for members of Patinkin's generation. Studies such as Dimand (1988), Young (1987), Meltzer (1988), Littleboy (1991) and Laidler (1999) reflected this new perspective: it had become much easier to see Keynes apart from the theoretical context that Patinkin and his contemporaries had developed.

Keynes's Life: Bloomsbury, Art and Economics

When Patinkin wrote his account of Keynes's economics, he had two contrasting accounts of Keynes's early life on which he could have drawn had he considered it relevant to his task. Harrod's biography had been constrained not only by older Victorian conventions about biography but also by his view that it was important that nothing should be revealed about Keynes that would threaten the acceptance of Keynesian economics. He thus ignored Keynes's homosexuality and minimized Keynes's involvement with Bloomsbury. In contrast, Skidelsky's first volume presented a Bloomsbury Keynes. His was a psychological biography in the Bloomsbury tradition, in which Keynes's sexuality and personal relationships were to the fore. Where Harrod had portrayed Keynes's sense of duty – the famous 'presuppositions of Harvey Road', combining a strong sense of duty and a belief in the power of social science – as constraining any immoralism, Skidelsky emphasized the influence on Keynes of G. E. Moore, mentor to the group of Cambridge undergraduates who would ultimately form the male corps of the Bloomsbury group. Skidelsky attached much more importance than Harrod to Keynes's essay 'My Early Beliefs' (*JMK*, X, ch. 39, first written in 1938), creating a picture of someone dominated by a very private set of values, significantly insulated in his youth from the world of public affairs into which he was later thrust. The story ended in 1919, with the book that Keynes wrote when he resigned from the Treasury in protest over the impending outcome of the Paris peace negotiations, *The Economic Consequences of the Peace* (*JMK*, II). Not only did this thrust Keynes into the public arena, but it marked the shift from a Victorian belief in automatic economic progress to a world in which prosperity would need to be fought for. Skidelsky writes of Keynes fearing not the material but the organizational and moral destruction wrought by the war: prior to the war, it had been liberating for Keynes and his friends to be freed from their parents' belief that God could be relied on to maintain the social order. After the war, that was no longer the case. Thus Skidelsky (1983, p. 402) concluded his first volume, by arguing that 'In the last resort Keynes's post-war fear of the future of capitalism was profoundly influenced by the Victorian fear of a godless society'. The prospect of civilisation briefly opened up by Moore's *Principia Ethica* (1903) had receded over the horizon. The rest of Keynes's life was spent in trying to bring it back into sight. *Economic Consequences of the Peace,* Skidelsky (1983, p. 384) claimed, was Keynes's 'best book', in which, more than in any other, he brought *'all'* his gifts to bear on the subject in hand. Harrod could never have raised doubts about the merits of the *General Theory* in this way.

Subsequent work has continued the process, begun with Skidelsky's volume 1, of correcting many of the errors in Harrod's biography. These were significant because Harrod had used his sources selectively: he was 'a master of selective quotation', aiming to cleanse Keynes's statements for public consumption. For example, in the

quotation from a 1905 letter, 'I want to manage a railway or organise a Trust . . .', the omitted words denoted by the dots were 'or at least swindle the investing public', a sentiment that Harrod would not have wished his readers to encounter (Skidelsky 1983, p. xviii). Harrod had carefully not discussed Keynes's views on conscientious objection (where he supported his Bloomsbury friends), even though surviving documents clearly attest to his position (Johnson 1960). Neither had he discussed the 'search for love' that Keynes himself described as his main preoccupation before 1908, now carefully documented ('boy by boy', according to Keynes's own records) by Moggridge. Both Skidelsky and Moggridge explain that Keynes's search for love eventually was calmed for several years through his intimate relationship with the painter Duncan Grant that lasted from 1908 to 1912 and that would become a lifelong friendship. Moving beyond this sexual biography, however, both Skidelsky's subsequent volumes and other work such as Moggridge's biography have served to narrow the gap between the pictures of 'Keynes the economist' and 'Keynes the member of Bloomsbury'. Thus, although as late as 1921 Keynes was expressing doubts about his vocation (the values of Bloomsbury were still important to him and he lamented the lack of a true artistic talent), his turn to economics had deep roots: though his first formal training was after graduation, when preparing for his Civil Service examination, he came to this having studied a formidable list of books on economics. His philosophical views, discussed separately below, also serve to bridge the two interpretations.

The early 1920s were a crucial period for Keynes in several respects. *The Economic Consequences of the Peace* had made him a celebrity, and given him the financial basis for his earliest speculative activities (which came to grief in 1920 when the currencies on which he had speculated moved in the wrong direction). His Treatise on Probability (1921; *JMK*, VIII) was published, although he left behind any ideas of further work in philosophy. Though he had left the Treasury (something he had planned to do even had he not resigned in protest) he chose not to resume his heavy pre-war teaching duties in Cambridge, and spent much time offering policy advice from the position of an outsider to the Whitehall system. In giving up his income as a university lecturer at Cambridge and his income as a fellow of King's College following the First World War, Keynes now needed new streams of income to support his lifestyle. Journalism and attempts to influence public opinion became major activities. He also embarked on a long-term career as an investor, losing his investments (and that of his friends) through commodity speculation when the postwar boom collapsed, but then began to rebuild them again. There was also the change in his private life. To the horror of his Bloomsbury friends, he fell in love with a ballerina from Diaghilev's company, Lydia Lopokhova, whom he eventually married in 1925. In the opinion of his family and many of his friends, this gave him a new lease of life and may, at least in part, account for the enthusiasm with which he was willing to entertain and explore new ideas. Their relationship (Hill and Keynes 1989) clearly refutes the allegation that Keynes's emphasis on the short run stemmed from a belief that he would not have children.

With his marriage to Lydia, he became more distant from Bloomsbury, though contacts remained strong, even though Lydia and Vanessa Bell were never on good terms. Keynes (as Moggridge has shown) certainly found relaxation from his hectic schedule as a professional economist amongst his Bloomsbury friends, both in London and in the houses they acquired in the Sussex countryside. He also built professional and social contacts outside Bloomsbury. His experience as an investor grew, and his position as a director of the Provincial Insurance Company as well as Chairman of the National Mutual Insurance Company gave him regular contact with the City. He made money during the 1920s, but lost it a second time in 1929, and had a further setback in 1937. His speculative activities were *not* a success, though he regularly extricated himself from disaster. At one point he had to take delivery of a contract for wheat because the price had fallen too low for him to wish to sell it. Though he went so far, on one occasion, as to estimate the capacity of King's College Chapel to serve as a place to

store wheat, he never had to try to use it for that purpose because he ingeniously realized that he could forestall the delivery of the wheat by demanding that it be cleaned before delivery. When he eventually established his fortune, it was through a very different strategy: of holding, long term, a small number of stocks, in companies that he understood and in which he had confidence.

Keynes had suffered from recurrent bouts of appendicitis and influenza while in the Treasury during the First World War, both problems to which he was made vulnerable because of overwork and exhaustion. In 1937 he had a major heart attack and, though he was gradually brought back to health, the last decade of his life, as demanding as any in his career, were plagued by heart problems. However, recent work, notably by Craufurd Goodwin (1998, 2006) has argued that, despite this broadening out beyond Bloomsbury, strong intellectual links can be found between Keynes, Roger Fry, and the artists and novelists of Bloomsbury.

These intellectual links bear on Keynes's economics in both broad and narrow ways. One of the links that Goodwin uncovers is a consistent concern throughout the works of the Bloomsbury novelists (such as Virginia Woolf, E.M. Forster, David Garnett), art critics (such as Roger Fry, Clive Bell), and political theorists (such as Leonard Woolf) with the problem of inconsistent and disappointed expectations, a theme that would run through the *General Theory.* Another shared theme with his fellow Bloomsburies was a fascination with the emerging study of psychology and the varieties of human motivation. Again, it is difficult to read the *General Theory* without realizing the extent to which Keynes was decades ahead of the discipline in using psychological explanations of economic behaviours such as investment and consumption. And this points to another area of shared interest amongst the Bloomsburies crucial to understanding Keynes's mature theoretical work: like their mentor G.E. Moore, they completely eschewed utilitarian explanations of human behaviour and did not take utilitarian ethics as a reasonable guide for behaviour or policy.

Keynes and Philosophy

Beginning in his years at Eton, Keynes demonstrated a keen interest in political and philosophical questions. As an elected member of College Pop, a debating club, Keynes frequently spoke in support of Liberal positions. In his final year, he wrote a long essay on the poet and monk Bernard of Cluny, which he would revise and read again several times later in his life. The central fascination of Bernard for Keynes was the tension between the following a path of contemplation and the path of active engagement with the world.

The skills that Keynes had begun to develop at Eton came into full bloom when he matriculated to Cambridge in the autumn of 1902. At the centre of his many engagements at Cambridge was his membership in the secret society known as the Apostles, one of Cambridge's most distinguished societies at the time, which the years immediately preceding Keynes's matriculation had begun to develop a concern with philosophical questions. Both Bertrand Russell and G.E. Moore had been active in the society in the years before Keynes's election and on occasion both would still attend the group's Saturday evening meetings. Moore's classic, *Principia Ethica,* was published at the end of Keynes's first year and it became the most important single text for Keynes in his undergraduate years. '[I]ts effect on *us,* and the talk which preceded and followed it, dominated, and perhaps still dominate, everything else' (*JMK*, X, p. 435).

For several reasons, this early devotion to Moore and philosophy was still not generally understood as a part of Keynes's life and work when Patinkin wrote his entry on Keynes. On the one hand, as mentioned above, Harrod chose to minimize this influence on Keynes's work because he feared that it would point toward his sexuality and so risked diminishing the status of his economic work. On the other hand, when the decisions were made to publish Keynes's *Collected Writings*, the editors concluded that, apart from including his *Treatise on Probability* so as to have all his published books in the edition, no effort would be made to include his philosophical correspondence or any of the early philosophical essays written for the Apostles. Following

Harrod, the Keynes of the *Collected Writings* was to be an economist only.

Thus, when Patinkin undertook his project he would have had little or no idea that this philosophical work even existed. As the early volumes of the *Collected Writings* began to appear, there was a flood of new material to absorb, and little or no indication of this additional trove of untapped material. By the late 1980s, however, as scholars began to explore the Keynes Papers deposited in the King's College Modern Archive, the importance of this philosophical material began to become clear. The times were perhaps propitious for such a discovery since macroeconomics in the 1980s had taken a sharp turn to questions of probability and uncertainty, and much of Keynes's early philosophical work involved the philosophy of probability. The discovery of this previously unexplored part of Keynes's work offered the possibility to see what Keynes himself had said about uncertainty and expectations, a topic that had become central to many critiques of his work (for example, rational expectations).

Two early Cambridge University dissertations on the topic by Anna Carabelli and Roderick O'Donnell opened this field, and became the basis, if somewhat altered, of Carabelli (1988) and O'Donnell (1989). These two early interpreters took diametrically opposed approaches to Keynes's work in probability, with Carabelli arguing that Keynes had authored a subjective theory of probability while O'Donnell argued that, quite to the contrary, Keynes had authored an objective theory of probability. Both agreed that Keynes's contribution hinged on his articulation of a logical theory of probability, in which Keynes argued that probability represented the logical degree of belief in a proposition rather than a frequency distribution of outcomes. This much, of course, was indisputable, but the question remained of how to interpret what Keynes had said. Was the logical relation an objectively known (and identical) value for all rational persons with the same knowledge, or was the logical relation subjectively known, unique for each individual?

The source of the possible confusion came from the well-known critique of Keynes's work in probability made in the 1930s by the great Cambridge philosopher Frank Ramsey (1931). Ramsey argued that there were no such things as Keynes's logical relations of probability, or that he at any rate could not identify them; rather, Ramsey argued, we form our own subjective probabilities, subject only to the consistency required of them by the Dutch book, gambling argument (that they should not be willing to accept combinations of bets that guarantee that they will lose money). Ramsey's work was published posthumously, after his tragic early death, and Keynes's review of it seems to make clear his acceptance of Ramsey's criticism. Thus, after recapping Ramsey's criticism, Keynes would report, 'So far I yield to Ramsey – I think he is right' (*JMK*, X, p. 339). Against this, Carabelli seemed to argue that Keynes had always had a subjective theory of probability, and that Ramsey's criticism amounted to an argument over whether the subjective probabilities represented a logical entity. O'Donnell, on the other hand, argued that Keynes had held an objective theory of probability in *Probability*, and that he had never capitulated to Ramsey.

In Bateman (1987, 1988, 1996) a very different argument is made that takes at face value both Keynes's statements about objectivity in *Probability*, as well as his capitulation to Ramsey's critique. This work approaches Keynes initial position through the same route that he took himself, his engagement with and critique of Moore's ethical theory. In *Principia Ethica,* Moore had made one argument that Keynes did not accept, namely, that in a person should follow the general rules of conduct (for example, do not murder, do not steal, do not commit sodomy) because of the uncertainty of the outcome of one's actions. Keynes began his critique of this position while he was a second-year undergraduate in one of the earliest papers he read to the Apostles; and he developed the insights in that paper into his fellowship dissertation (submitted in 1909) and eventually into *Probability* (*JMK*, VIII).

The crux of Keynes's critique of Moore's ethical position was that he had defined probability incorrectly. In his argument, Moore depended on a frequency theory of probability and assumed the impossibility of knowing long-run frequencies

with any certainty. In the face of this radical uncertainty about the possible outcomes of committing murder or committing adultery, for instance, Moore argued that the best course of action was represented by the general rules of conduct, which he argued gave the highest frequency of good outcomes. Moore felt that, since we would not know when an act of murder might turn out to have a good outcome, the best course of action was not to murder at all.

For Keynes, who was a practising homosexual and who generally enjoyed the youthful pleasure of making up his own mind about when rules were reasonable (and when not), this argument needed to be proven wrong. His method was to posit that probabilities are logical relations that are, indeed, capable of being known when we act. His argument had the added twist of drawing on Moore's Platonic treatment of the good. Like Moore, who argued that we know the good through intuition of an indefinable quality, Keynes argued that the logical relations of probability are Platonic entities, not reducible to anything else, and known through intuition. On this argument, any bright young man with the same knowledge could intuit the probabilities of the various possible outcomes of an action, as well as the amount of goodness that would attach to each one. On this argument there was no need to follow traditional rules of conduct. The argument seemed to be persuasive, as Moore dropped his argument for following rules in *Ethics* (1912) and included a logical theory of probability in the same book.

But it was exactly the idea that probability was a Platonic entity that Ramsey criticized. He had written about this as early as 1922 in a review of *Probability* in which he talked about fog-shrouded mountains which were not visible to the human eye. And his posthumously published essay, 'Truth and Probability' (Ramsey 1931) says simply that, if these logical relations exist, he is unable to recognize them and certainly does not act on them. Perhaps the most convincing explanation of Keynes's ultimate position comes from Donald Gillies and Grazia Ietto-Gillies (1991) who describe Keynes as embracing 'intersubjective' probabilities. Gillies and Ietto-Gillies accept Keynes's capitulation to Ramsey but go on to point out that the positive result of this in the *General Theory* was a world in which most people formed their subjective probabilities by guessing what others were thinking. Thus in Chapter 12 of the *General Theory,* in Keynes's well-known description of how stock markets function, investors seek stability in an uncertain world by depending on the mass psychology of the market. This same idea is borne out in his description elsewhere in his magnum opus in his description of liquidity preference and the ways that bond traders make their portfolio decisions. This entire line of thought is most strongly emphasized in Keynes's famous restatement of his book's argument in response to his critics in his 1937 article in the *Quarterly Journal of Economics.*

There are many dimensions to Keynes's early work in ethics, probability, and political philosophy, but perhaps the most crucial for understanding his work in relation to mainstream economics as it evolved in the 20th century is his refusal to embrace utilitarianism. Bateman (1988) and Goodwin (2006) have noted this, but the philosopher Tom Baldwin (2006) has put it in a form that makes it particularly striking for an economist. This comes in his observation that, despite his place at the centre of a long tradition of British liberal political philosophers, Keynes never seriously engaged John Stuart Mill's work during his long and prolific career. There is perhaps no Briton in the first half of the 20th century who so acutely explored the meaning of liberalism as John Maynard Keynes. Both in his economic work on the appropriate role of the state in the economy and his essays on political liberalism (reprinted in *JMK*, IX), Keynes explored the frontier questions of the autonomy of the individual, the possibilities for human freedom, and the role of the state. And yet, as Baldwin makes clear, Keynes's acceptance of Moore's argument that Mill had misidentified utility as good kept Keynes from ever seriously tackling Mill's work. For much of the 20th century, this meant a kind of deep misunderstanding and misapprehension of Keynes's work on the part of those economists who were unable to work outside a framework of individual utility maximization as both a positive

description of human behaviour and a normative goal of policy. Much of Keynes's writing and his modelling are opaque to mainstream neoclassical economists for this reason. Perhaps with the recent shift to behaviourial economics Keynes's work will seem less difficult to understand and appreciate on its own terms. But, whichever is true, much of the time since the publication of the *General Theory* has been marked by a deep chasm caused by the fact that Keynes did not assume that people seek to maximize utility in most situations, or that they should.

Keynes's Economics

Where Skidelsky painted a brilliant portrait of the economist as operating in a broader intellectual environment, encompassing not simply Cambridge economics but also the philosophical and political concerns of the Apostles and Bloomsbury, Moggridge sought to redress the balance with what his subtitle described as 'an economist's biography' (cf. Moggridge 2002). Keynes's complete dismissal of utilitarianism distanced him from much economic theory, but Keynes was an original thinker of the first rank, especially in areas such as international finance and monetary economics where utilitarian thinking has always had a limited influence. Thus, what emerges from Moggridge's account is an economist who, to an extent greater than implied by Patinkin, with his focus on theory, was primarily an applied economist whose career was *dominated* by issues of international finance (see Mundell 2008). Though politicians may not have always accepted his arguments, throughout his career he had the ear of governments and his ideas were avidly sought. Sometimes he was invited to serve on committees, but in other cases he sent a memorandum to the Treasury that caused him to be brought into the discussion. He may have been an outsider, but even in the 1920s he had considerable access to officials and government ministers. Thus he was never an economic theorist as the term is now understood, but was for ever analysing institutions, estimating rough magnitudes and formulating policy proposals on the basis of those estimates. When, during the Second World War he acted as mentor to James Meade and Richard Stone in constructing the British national accounts, this came after a lifetime of promoting the collection of economic statistics, a passion that he developed as a young man when he developed his ideas on probability to include an extended treatment of induction (Bateman 1990).

His first appointment in the Civil Service was in the India Office, but it was after he had left and returned to Cambridge that, in 1913, he was invited to sit on the Royal Commission on Indian Finance and Currency. Several of his fellow commissioners worked in the Treasury or had done so recently, and so his distinguished service on this appointment helped him to make the contacts that eventually would lead to his appointment to the Treasury during the First World War. Keynes's work on the Royal Commission was a harbinger for much of his later government service; he was appointed to the Commission largely on the basis of the proofs of his book *Indian Currency and Finance* that he was circulating in 1913.

The book appeared within a month of the start of the Commission's work and Keynes used the analytical framework of the book to drive his questioning and to bring the other Commission members around to his own views.

This pattern of writing, demonstrating expertise and being invited into the inner circles of policymaking, would repeat itself over and over again during his career. It was the general pattern of his next assignment advising the government, when he entered the Treasury in January 1915 as an adviser to Sir George Paish, a special assistant to the Chancellor of the Exchequer, David Lloyd George. In summer and autumn 1914 Keynes had been asked his opinion on the crisis that initially rocked the London financial markets at the outset of the war. Using the information he had gained while consulting at the Treasury, he wrote and published articles that autumn in the *Economic Journal* and the *Quarterly Journal of Economics* explaining what had happened when the joint stock banks had, in his opinion, unnecessarily called loans and so restricted credit. These two pieces caused some consternation in the banking community, but they won him more invitations to

write memoranda for the Treasury and eventually led to his appointment. Once inside the Treasury, Keynes moved through several committee assignments and served on inter-ally financial working groups to help keep the finances of France, Britain, and Russia coordinated and well functioning; after America's entry into the war in 1917, the group of allies expanded. Keynes rose to a position of considerable stature for such a young man, being made the head of A Division, the senior person in charge of Britain's external financial relations during the war.

As the war wound down, Keynes was asked to write a memorandum on German indemnity and the limits of what Germany could be expected to pay. This in turn led to more committee assignments and his eventual appointment to the Treasury team that was sent to Paris for the peace negotiations, where he served as the senior Treasury official in Paris. With this pattern of mastering his brief quickly and advancing in the Treasury well established, Keynes became the lead financial negotiator for Britain in many circumstances during the negotiations. The work was dispiriting to him because of the political machinations and the lack of any goodwill towards Germany. He seemed to see only avarice, revenge and political gain as the means and end of the negotiations, with little or no concern for the starving peoples of Europe. Keynes was also working to exhaustion in poor conditions in Paris, and eventually he felt compelled to submit his resignation. In June 1919, he left Paris unable to see any good in the outcome of the negotiations.

Resignation from the Treasury did not mean an end to his involvement as a policy adviser at the highest level. As early as February 1920, he was advising the Chancellor of the Exchequer on whether to raise interest rates, and was kept informed of discussions in official circles. In 1921, he began his career in journalism, the primary issue initially being reparations, on which international negotiations continued throughout the 1920s. This took him into questions of post-war reconstruction and exchange rates. Though his was not the dominant voice, his arguments were not without influence, as when, in 1924, his views and those of Reginald McKenna helped steer the Chamberlain Committee away from the idea that deflation would be the likely result of a return to gold. In coming to his decision to return to power, Churchill listened to Keynes and had his advisers respond to his arguments. His position in policy circles was recognized by his being appointed to the Macmillan Committee on Finance and Industry in November 1929, and the newly formed Economic Advisory Council in January 1930, both of which were established to address the unfolding problems of the slump.

It was against this background of extensive journalism and advising on policy that Keynes's economics evolved. His attempt to write a major work on monetary economics started in 1924, whilst he was involved in debates over the return to gold. In the next two years he worked closely with his fellow Cambridge monetary economist, Dennis Robertson, whose *Banking Policy and the Price Level* (1926) strongly reflected his discussions with Keynes; but Keynes's own book, *A Treatise on Money* (1930; *JMK*, V and VI) did not appear for several years, its final drafting coming while Keynes's life was dominated by the Macmillan Committee, in whose deliberations Keynes played a dominant role, and by the attempt by the economists on the Economic Advisory Council to produce a unanimous report on measures to combat the slump. From November 1929 to April 1931, Keynes attended over 100 meetings of the Macmillan Committee alone, this at the time when he was preparing his *Treatise on Money* for publication.

Though Keynes's writings early in the 1920s were concerned with exchange rates and inflation, and were conducted within an essentially Marshallian framework, the basis for his advice changed. In the *Tract on Monetary Reform* (1923) he had argued for the importance of monetary management, but by 1925 he was focusing on the overvaluation of sterling involved in returning to gold at $4.86 to the pound. In 1924 he began to write specifically on unemployment, asking whether unemployment needed a drastic remedy, and this became an increasingly important theme in his writings as the decade went on,

taking him into issues ostensibly far from international finance, such as the need for restructuring in the cotton industry. However, international monetary issues never went away. Of particular significance, given that it revealed his failure at this time to attach importance to the income effects central to the *General Theory,* was his 1929 exchange with Bertil Ohlin on the transfer mechanism, still in the context of reparations. Also, his policy recommendations concerning unemployment, though focused more on domestic issues, were never far from questions of international finance. In 1924, his argument for action against unemployment rested on arguments about diverting resources 'from relatively barren foreign investment into state-encouraged productive enterprises at home' (quoted in Moggridge 1992, p. 421). In his writings later in the 1920s, the possibility of raising employment became more prominent, especially in the confrontation with the Treasury view in 1929, but the background was the constraint imposed by the restored gold standard. It was the fact of the restored gold standard that led Keynes, in early 1931, to support a limited introduction of tariffs.

The story of Keynes's theoretical development, discussed in detail by Patinkin, took place against this background. The *Treatise,* with its Wicksellian approach, taking Keynes away from the Marshallian framework of his earlier work, was written at a time when his public commitments left him precious little time for more academic pursuits. For example, Hawtrey offered detailed criticisms of drafts of the *Treatise,* but Keynes did not have time to read them until after publication. This may account for the unsatisfactory nature of the resulting book and hence the rapidity with which he moved on. Furthermore, when sterling was allowed to float in 1931, the case for public works made in the *Treatise* was no longer relevant, and, now that the need to defend sterling was removed, Keynes began to argue for low interest rates. Though he remained active in both journalism and policy advice, he made sure that what was to become the *General Theory* was subject to much more systematic academic criticism from his colleagues in Cambridge.

The process whereby Keynes made the crucial step taking him from the 'classical' framework of the *Treatise on Money* to the *General Theory* has been examined in great detail. Evidence for this comes from his publications, public statements on policy, recollections of scholars who visited Cambridge, and students' notes of his lectures. Patinkin's conclusion was that Keynes reached a 'full understanding' of the ideas in the book some time in 1933: not until then did Keynes have in place the three crucial elements (the multiplier, equilibration through changes in output, and an unemployment equilibrium). Some scholars have supported this conclusion; others have argued for dates in 1932 and 1934 (for a concise survey see Skidelsky 1992, pp. 443–4, including note 48; see also Clarke 1998, ch. 4). What is of interest there is as much the reasoning underlying such arguments as the conclusions themselves. For Patinkin, an idea existed when it could be written down as a model. On the other hand, for Clarke, the intuition was more important, a conclusion endorsed by Skidelsky (1992, p. 444, quoting student lecture notes), who has pointed to Keynes's belief that one can think 'accurately and effectively' even before being able to formalize ideas. A further dimension is the weight to attach to practical theorizing in the context of policy arguments in relation to theorizing at a more abstract level. There is also the issue of whether an idea has to have been conceived in someone's mind, written down privately, or placed in the public domain. Thus it is because he believes that Keynes did not confine himself to what followed rigorously from the *Treatise* framework that Clarke (1998, pp. 92–5) is willing to date Keynes's understanding of aggregate demand to the summer of 1932: not only were his lectures that autumn significantly different from those the previous session (so that students well versed in the *Treatise* found them hard to follow), but by November 1932 he was writing about the contrast between Malthus and Ricardo in ways that clearly anticipated the break with Ricardian orthodoxy found in the *General Theory.*

The Second World War took him into the Treasury again, though as an unpaid adviser rather than a salaried official, where he had a possibly

unparalleled combination of access to officials and freedom to pursue whatever he thought important. Once again, it was his brilliant writing that helped him to be called into the Treasury: *How to Pay for the War* (1940; *JMK*, IX), perhaps his clearest success in the policy arena, providing the theoretical and statistical framework for controlling wartime inflation. Though this has been seen as an application of Keynesian theory to problems of inflation at full employment, it is worth noting that it relies more on the doctrine of forced saving, discussed by other economists in the years before the *General Theory*, a fact that acquires significance given that this is the theory of inflation first used by Milton Friedman (Laidler 2002, pp. 103–4). However, because the path from Keynesian ideas to their implementation in the 1941 budget was relatively smooth, this did not serve as a drain on Keynes's time and health in the same way as his international negotiations. Here he was up against the Americans who, for a variety of reasons, were much harder to convert. Isolationist tendencies were strong in American politics, and there was widespread hesitation about using American resources to support a country that was still the centre of a worldwide empire. There was even a belief in some circles that a contributory factor behind America's over-expansion of 1928–9 and hence the subsequent collapse had been pressure on the Federal Reserve to keep interest rates low, due to the pressure on sterling after the return to gold in 1925. Britain was bankrupt and the burden of negotiating American financial support under difficult conditions fell substantially on Keynes. Given this weak bargaining position, it is thus not surprising that, in negotiating the post-war economic order, he failed to persuade the Americans to give the new international monetary authority greater resources to assist countries with balance of payments problems, for they were the ones who would, at least in the early years, be paying. Nonetheless, his success in helping to establish the International Monetary Fund was significant, given that, after the previous war, the Americans had entered into negotiations only to walk away before agreement was reached.

Conclusions

The debate between Patinkin and Clarke over the exact dating of the birth of Keynes's new ideas in the *General Theory* is a classic in the history of ideas. As Moggridge (1992, p. 559) and Skidelsky (1992, pp. 443–4) have noted, however, there will never be a clear answer to the question of exact dates because of Keynes's lifelong style of work. Keynes always depended on working from fundamental intuitions that he would sketch out, sometimes years ahead, sometimes days ahead, of the final, formalized version of his newest work. Thus Clarke can be correct in the precise dating of Keynes's initial working out of the intuitions that might later become the concepts of aggregate demand and liquidity preference, and Patinkin may be correct in his dating of when Keynes published a theoretically satisfactory account of his theory; neither need be wrong in establishing two important points along the trajectory of one of Keynes's ideas. Although there is clear historical value in fixing the arc of these trajectories in Keynes's work, the real value of the recent work on Keynes to economists does not lie in the exact dating of his various contributions. Rather the value to economists of the work of historians like Clarke, biographers like Moggridge and Skidelsky, and commentators on his life in Bloomsbury such as Goodwin lies in seeing the full range and complexity of his ideas and understanding the nature of the influences that led him to his breakthroughs.

In his entry on Keynes, Patinkin argued that 'a basic contribution of the *General Theory* is that it is in effect the first practical application of the Walrasian theory of general equilibrium', and likewise that, 'The voice is that of Marshall, but the hands are those of Walras'. This reflected Patinkin's own effort in *Money, Interest and Prices* (1956) to capture Keynes's 'central message' in the Walrasian general equilibrium framework and the effort throughout all of his historical writing on Keynes to identify the origins of elements of that Walrasian version of Keynes in Keynes's own writings. Whilst this remains a legitimate interpretation, for that is how

Keynesian economics was conceived during the Keynesian era, understanding Keynes himself requires paying attention to other possibilities. Thus Leijonhufvud (2006) and others have reinterpreted the Marshallian dimension to his work, arguing that the gap between Keynesian and Walrasian theorizing was deeper than architects of the neoclassical synthesis believed. Rather than seeing Keynes as endorsing a Walrasian interpretation of his work when he responded favourably to the efforts of John Hicks and others to translate his work into simultaneous equation systems, it is better to see Keynes as concerned with his basic intuitions, content for them to be developed in different ways. The intuitions were more important to him than any specific model (Backhouse and Bateman 2008). This helps justify both his radical statements about uncertainty and his endorsement of analysis that subsequent generations of Post Keynesians have found excessively orthodox and have needed to explain (for references to the Post Keynesian literature on Keynes see King 2002; Chick 1983; Dostaler 2007; Lawlor 2006; and a significant proportion of the 40 chapters in Harcourt and Riach 1997). At least in part, this was because Keynes was not interested in the elaboration of his fundamental insights beyond the form in which he needed them for making successful policy arguments. In both the *Treatise* and the *General Theory*, he sought to formalize his insights enough to persuade fellow economists, but his main concern was to provide a workable basis for policy: he was, in the words of Hoover (2006), primarily a physician creating a 'diagnostic science'.

Keynes's focus on fundamental assumptions was the approach of the pre-war Apostles, and his intuitions about the economic system arose out of the Bloomsbury understanding that the modern world was built upon a set of inconsistent and easily disappointed expectations. This insight first appears in the *Economic Consequences of the Peace* and suffuses the *General Theory.* It was neither an argument for the impossibility of economic modelling, as some Post Keynesians have argued (Shackle 1972, 1974; Davidson 1972), nor was it, as Patinkin argued, of no central importance. Rather, it was a key insight that Keynes built into the *General Theory* and that he believed would have to be a part of any analysis relevant to formulating policies that would help to support the type of civilization that he believed was possible in a humane, well-managed capitalism.

However, though Keynes's involvement in Bloomsbury was fundamental, the intuition about the importance of uncertainty and expectations that he encountered amongst his artistic friends did not carry over into his economics in a simple and straightforward way. Though it animated the *Economic Consequences of the Peace* and the *General Theory*, it was not a feature of his work in the intervening years (Bateman 1996). In the *Treatise* Keynes denied that expectations were an important factor in explaining the business cycle. When, in response to Keynes's questioning before the Macmillan Committee, Pigou put forward the standard Cambridge trade- cycle theory in which expectations were important, Keynes dismissed the idea, insisting that it was interest rates alone that explained the behaviour of the cycle. To understand the story of how he came, once again, to see the relevance of the old Bloomsbury concern with inconsistent expectations to economic modelling, one has to work carefully through his management of the Provincial bond portfolio (Westall 1992), his work as bursar of King's College, his policy advice to the government at the time of Britain's abandonment of the gold standard in 1931, and his own investments in the stock market during the Great Depression (Moggridge 1992).

There is also no straight line from Keynes's early work in the philosophy of probability to the *General Theory.* By the time he came back round to the view that expectations were central to the workings of a capitalist economy, he had abandoned his earlier conception of probability and was left with an adaptation of Ramsey's work in the form of intersubjective probabilities that are shaped by the mass psychology of investors (Gillies and Ietto-Gillies 1991; Davis 1994; Gillies 2006). It is necessary to look at the whole of Keynes's life – as Apostle and Bloomsbury, as

student of Marshall, as journalist, government adviser and City investor – to see all the pieces that came together in *General Theory.*

The part of Keynes's philosophical background that perhaps most consistently influenced his economic theorizing throughout his career was not his work in probabilities but his rejection of utilitarian thinking. Keynes never used utility maximizing in a thoroughgoing or consistent way during his long career as an economist. It was, in his view, neither an adequate description of human behaviour nor the desideratum of policy analysis. This, no doubt, is a significant reason why his work has been such a puzzle to economists, leading to misunderstanding of his motivations, modelling, and policy advice. Perhaps in the emerging era of behaviourial economics, this part of his work should seem less puzzling and disturbing. It is not the case, of course, that Keynes foreshadowed work in behaviourial economics, but rather that, like the behavioural economists, he looked for alternative explanations of suboptimal outcomes and behaviours that were clearly not driven by utility maximization.

See Also

► Keynes, John Maynard (1883–1946)

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Keynes, John Neville (1852–1949)

Phyllis Deane

Keywords

Keynes, J. N.; Marshall, A.; *Palgrave's dictionary of political economy*

JEL Classifications

B31

John Neville Keynes was born in Salisbury and died in Cambridge, outliving his famous son, John Maynard Keynes, by over 3 years. He was a promising early pupil of Alfred Marshall, who on leaving Balliol in 1885 persuaded Oxford University to hire Neville, then a Cambridge lecturer and Fellow of Pembroke College, to fill the gap in its economics lectures, and then backed him strongly for the Oxford professorship when it became vacant in 1888. Keynes, however, was unwilling to leave Cambridge; he lectured for only two terms in Oxford, was not sorry when the Drummond professorship went to Thorold Rogers, and refused all offers of posts elsewhere (including the offer of a Chicago chair in 1894), devoting himself increasingly to his beloved family and to university administration – in which he held the top bureaucratic post, University Registrar, from 1910 to 1925.

Keynes published only two books, both textbooks, arising out of his university lectures: one in 1884 on formal logic, and the other, on which his reputation as an economist depends, *The Scope and Method of Political Economy* (1891), which grew out of the lectures he gave in Oxford in 1885. He also wrote a number of (mainly methodological) articles for Inglis Palgrave's *Dictionary of Political Economy.*

The importance of Keynes's *Scope and Method* lay in its becoming the standard text on economic method for the new Cambridge school

led by Alfred Marshall. Its later drafts were composed at the same time as the later drafts of Marshall's *Principles of Economics* (1890), on which Keynes was commenting for Marshall while the latter was performing a similar critical service for *Scope and Method.* For the proponents of the new orthodoxy, the main contribution of Keynes's monograph was that it signalled the end of the methodological debates of the 1870s and 1880s, which had seemed to many, inside and outside the discipline, to call into question the scientific credentials of classical political economy.

It did so in three main ways: (1) by its lucid, judicious, low-key mode of exposition, deliberately occupying the middle ground in the methodological disputes and shifting the most controversial arguments to appendices; (2) by redefining the hard scientific core of economic theory so as to insulate it from the charges of ideological bias, or immorality, or relativity, as well as from failures in practical economic policies; Keynes's threefold classification of economic enquiry claimed positive scientific status only for pure theory; the normative aspects and the policy aspects (the ethics and the art of political economy) constituted a protective belt which could absorb the attacks of historicists, socialists or nationalists, and so shift the doctrinal battleground away from fundamental principles; (3) by systematically minimizing the differences between the old economics and the new, by suggesting that the latter was a synthesis of the most fruitful of the conflicting views which characterized the period of methodological crisis and by stressing the continuity of economic ideas – so depicting a cumulative advance in economic knowledge analogous to the progressive improvements in knowledge claimed by researchers in the natural sciences.

In each of these ways, Neville Keynes successfully reflected the spirit of a new economic age, emergent not only in England but also in Europe and the USA, whose activists were bored with methodological argument and confident that they were in at the start of an exciting new research programme. At this point one might have expected the ambitious young academic to develop new research interests of his own in that programme.

The evidence of Keynes's diaries and letters leaves no doubt that he would have preferred to commit himself to political economy rather than logic, but the university's needs dictated otherwise. His appointment to a university lectureship coincided with Alfred Marshall's return to Cambridge as professor of political economy (and Mary Marshall's return as director of studies in economics at Newnham College), so that henceforth Keynes's opportunities to teach economics to Cambridge undergraduates were confined to an elementary course for Indian Civil Service candidates. One can thus date Keynes's loss of active interest in political economy from the completion of his *Scope and Method.* He was evidently bored by its long gestation, often depressed by Marshall's criticisms of successive draft chapters, but delighted with the flattering reviews or letters which its publication evoked from Marshall, Edgeworth, Palgrave, Taussig and Cossa, among other leading economists. Yet he made no attempt to embark on another book and was deaf to Edgeworth's pressing invitations to write for the new *Economic Journal* on topics outside the methodological field (though ready enough to rehash chunks of *Scope and Method* for Palgrave's *Dictionary*). Nor by then did he show any interest in being elected to an economics chair outside Cambridge, though in 1896 he seriously considered standing for the vacant registrarship in the University of London. The fact is that by the 1890s Keynes was fully committed elsewhere. His diaries show that he spent his working days trying to inject common sense into university politics (from the infighting on the Moral Sciences and Economics Boards to the perennial issue of women's degrees), while his leisure hours were absorbed in the ambitions and hobbies he shared with a lively, intelligent wife and three remarkable children – Maynard, Margaret and Geoffrey. These proved sufficiently demanding and fascinating concerns to distract him from the new economics which his colleagues (but not he) were then teaching in Cambridge.

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Keynes's General Theory

Murray Milgate

If one were to isolate from the many readings of Keynes's *General Theory* those which might be said to have dominated the discipline, including those of his theoretical adversaries as well as those of his advocates, one characteristic feature would be present in them all. This is the idea that the contribution of the *General Theory* consists in the examination of the 'disequilibrium' behaviour of a market system. Of course, to its proponents, the *General Theory* is seen to provide not only what the old classical economists or Marshall might have referred to as an analysis of the temporary effects of particular changes, but also a rationale for taking these to be of paramount importance in the circumstances in which we actually conduct our daily lives. The *General Theory*, it is sometimes said, draws our attention to the fact that the underlying forces working towards the establishment of equilibrium, while ever present, are often only weakly felt. The simple and appealing notion behind this view is that a market economy may become 'stuck', so to speak, in a situation where certain frictions and rigidities (sometimes of formidable dimensions) prevent more persistent forces from producing those permanent effects which they ultimately have a tendency to produce. At the risk of some oversimplification, I shall classify readings of the *General Theory* which view its concern as being with 'disequilibrium', as falling within the compass of 'received opinion'. One consequence of received opinion has been that debate over the significance of the book has frequently been played out in the arena of empirical argument and practical affairs.

Leaving to one side, for the moment at least, Keynes's *General Theory* itself, received opinion may be traced back to certain sympathetic views expressed as to its importance (mainly by younger economists of the day) which followed immediately upon its appearance in February of 1936. The assessments of James Meade and of Roy Harrod (1937) come to mind. Yet probably best known, since they were subsequently to be incorporated into textbooks as the 'Keynesian model', and in an important sense typical of the genre, are the interpretations advanced by Hicks in 'Mr Keynes and the classics' (1937) and by Modigliani in 'Liquidity preference and the theory of interest and money' (1944). It is not, of course, in the *details* of these arguments that one finds unanimity, but rather it is in the general tenor of the assessment that the common theme emerges. What matters is not whether the actual obstacle to the attainment of equilibrium arises from, say, money wage rigidity, or the presence of a liquidity trap, or the operation of the monetary system, or the behaviour of trade unions, or any other imperfection. The common theme is that the question is one of 'disequilibrium'.

Paul Samuelson, himself swept up by the Keynesian revolution in the 1930s, has commented subsequently on the reception of the *General Theory* in terms which loudly echo this theme. Speaking of Schumpeter's negative reaction to the book, for example, he has commented:

> [Schumpeter's] instinct – not incorrect but not usefully relevant to policy dilemmas in, say, 1938 – was to look for some price rigidity in the scenario and, having located it, to shrug off the phenomenon with the remark: 'Of course, if you introduce rigidities in your system, you can fabricate involuntary deviations from full employment for it' (Samuelson 1981, p. 16).

Samuelson's remark that the instinct was 'not incorrect' is evidence of the presence of received opinion. To be noted also, of course, is the idea that the reception of the *General Theory* depended

upon the view taken as to its practical relevance: Oskar Lange was later to incorporate what he saw as the high probability for the appearance of such disequilibria in market economies as part of his well-known argument favouring 'socialist' planning (Lange 1987).

Interestingly, the same theme that defines received opinion also dominated the thinking of Keynes's less sympathetic readers at the time. Thus, for example, Pigou (1936) had held the book to be about disequilibrium and, correctly if abruptly, dismissed any claim that this realm of analysis might have to being 'general' – 'we have watched an artist firing arrows at the moon', he reflected, 'while we may all admire his virtuosity', we must question his marksmanship (Pigou 1936). A decade-and-a-half later, in his self-styled reconciliation with Keynes, Pigou simply attributed to Keynes a more reachable target. He now held that Keynes's *purpose* was to deal with 'fluctuations over short periods' as distinct from questions of 'ultimate equilibrium' (1950, pp. 3–4). A similar case is provided by Schumpeter, whose review of the *General Theory* concluded with the remark:

> the whole *theoretical* case . . . collapses, and we are *practically* left with friction, or 'stickiness', institutional inhibitions and the like . . . which prevent the whole of [the] equilibrating mechanism from functioning adequately (1936, p. 794).

In the *History of Economic Analysis*, Schumpeter restated essentially the same conclusion. It would have been better, he argued, if Keynes had not objected to the tendency towards equilibrium (at full employment), he claimed, 'just as we do not object to the law of gravitation on the ground that the earth does not fall into the sun', rather Keynes really meant that though the tendency stated is correct, its operation 'is impeded by certain facts' (1954, p. 624). To the list of critics whose arguments fit into this broad pattern might be added the names of Dennis Robertson, Ralph Hawtrey and Harry Johnson.

Received opinion, that Keynes's *General Theory* is a contribution to 'disequilibrium' analysis, was stamped indelibly upon the collective consciousness of the economics profession at an early date – by critics and converts alike.

The theme is also prevalent in more recent readings of the *General Theory*. Among the supporters of Keynes, one may single out, for example, the arguments of Leijonhufvud. Though presented as a criticism of certain details of earlier interpretations, the essential ingredient of the old position is present. 'Of course', Leijonhufvud writes, 'Keynes used the term unemployment equilibrium . . . [but] it is not an equilibrium in the strict sense at all. It is preferable to use some more neutral term which does not carry the connotation that no equilibrating forces at all are at work. The real question is why . . . the forces tending to bring the system back . . . are so weak' (1969, p. 22 n.1.). Similarly, in his analysis of Keynes's monetary thought, Patinkin has concluded that Keynes's general theory is not 'strictly speaking' one of 'unemployment equilibrium' (1976, p. 114 ff). Following the same line of argument, James Tobin has argued that Keynes showed that 'disequilibrium can be protracted and stubborn' (1980, p. 19).

These new readings in an old framework, are paralleled by the readings of a new generation of detractors who, like their forebears, though sceptical of the lasting value of Keynesian theory, remain agreed that the *General Theory* deals in disequilibrium. Milton Friedman exemplifies this group.

The above typology, of course, is fine enough only to filter out the essential ingredient of received opinion. At this level, the category 'disequilibrium' has proved to be sufficiently definite to suit its purpose. In fact, it reveals an important feature of received opinion that warrants repeating – its borders do not correspond to those which separate Keynes's critics from his champions. Just where one might have expected to unearth something essential about Keynes's *General Theory*, at the boundary between opposing sides in Keynesian debate, one actually finds agreement.

However, the idea of 'disequilibrium' can itself be subjected to an internal partition which, when taken into account, renders our typology capable of generating a somewhat finer description of received opinion than that which it has secured thus far.

The notion of 'disequilibrium' is dependent on the abstract concept of equilibrium to which it is attached and upon which it is defined and constructed. There is one species of received opinion in which the Keynesian disequilibrium is taken as a deviation from the *long-period* equilibrium of the system. There is another that considers it to be connected with the possible failure of the market to achieve full *intertemporal* equilibrium. These are two species into which received opinion can be further divided. The second and more modern view, based on the notion of intertemporal equilibrium and the related idea of 'temporary equilibrium', finds its earliest advocate in Hicks's *Value and Capital* (1939). It will be appreciated that the necessity of distinguishing this category of reading from others, arises not because Keynes is no longer to be read as a 'disequilibrium' theorist. To the extent that Keynesian cases are located in situations where full intertemporal equilibrium fails to emerge, they are no different in general character from the view which holds Keynesian cases to be located in situations where long-period equilibrium is not achieved. The distinction is introduced only in order to highlight the differing conceptions of equilibrium being employed in each.

(A warning is in order: in the newer mode of analysis the familiar terminology of 'equilibrium' and 'disequilibrium' is sometimes put aside in favour of the habit of denoting the *solution* to any model an 'equilibrium'. Temporary equilibrium, rationed equilibrium, conjectural equilibrium, non-Walrasian equilibrium, and the like, are all examples of this trend. It needs to be noted, however, that everything that has been said above could be recast in these terms, but only at the cost of much circumlocution and loss of clarity, at least as far as the subject of this entry is concerned.)

Given these characteristics of received opinion on Keynes's *General Theory*, much of the Keynesian debate has been conducted over the question of the empirical relevance of the kinds of disequilibrium situations considered. Exegetical debate has likewise focused on determining which particular case of disequilibrium most accurately reflects Keynes's actual argument. Here, of course, received opinion has open to it any number of ways of generating the result it is after – the number of frictions and rigidities that might be invoked is limited only by the imagination of the investigator. These details need not detain us here. Yet passing mention should be made of the perplexing propensity evidenced by some writers to present the dispute within received opinion over the significance of Keynes's *General Theory* as a battle over fundamental or ultimate theoretical principles. It goes without saying, that all such claims are entirely without foundation, and that in attempting to sustain them certain 'Keynesians' have been roundly defeated by their opponents. There is evidence of this singularly unproductive approach in some of the attacks on the quantity theory of money, monetarism, and rational expectations theory that arose in the 1970s and 1980s.

Before turning to the *General Theory* itself, to trace the basis of received opinion to its sources in that book, consideration needs to be given to the familiar idea that the essence of Keynes's work is its 'macroeconomic' character (as distinct from the predominantly 'microeconomic' character of the arguments of his predecessors). Initially, at least, the differences between these two departments of economic analysis were invoked to account for the conclusions arrived at by Keynes which seemingly differed so markedly from pre-existing arguments (i.e. the possibility of prolonged bouts of unemployment). Though the actual literature that proceeded along these lines appears to be quite different from that already discussed, this particular perspective on Keynes's general theory is nothing more than an example of received opinion in a slightly different guise. To the extent that the question involved contrasting the conclusions of equilibrium microeconomics with those reached by Keynes, it became apparent in the course of discussion – first over the aggregation problem, and subsequently in the debate over the relationship between macroeconomics and microeconomics – that the only way of explaining the Keynesian 'macroeconomic' conclusions was by grounding it on a disequilibrium 'microeconomics'.

To understand correctly the basis of received opinion in the *General Theory* itself, or of any

other opinion on the subject for that matter, it is necessary to recognize the composite character of Keynes's argument. First, there are what he regularly referred to as the 'constructive' versus the 'critical' parts of the book. Then, within both, there are the theoretical as opposed to the more polemical pages and passages. There are the inevitable asides targeted at debates of the day (familiar, perhaps, at the time, but often lost on the modern reader); excursions into historical reconstruction, conjoined with ever present observations and commentary on the social and political philosophies of other economic writers (and even that of the *General Theory* itself); there are the original arguments, and the remnants of earlier orthodoxy. Finally there is the sustained attack (which at few points in the book is very far from the surface) on the quantity theory of money. What matters here, is that not all of these are mutually compatible with one another.

The whole of Keynes's theoretical argument is, of course, built around the idea that the reconciliation of otherwise incompatible investment decisions and savings plans is ensured by variations in the level of income (output). This process determines the aggregate level of employment – Keynes dubbed it the principle of effective demand. So far as can be determined, despite the intensity of Keynesian controversy, there has been no disagreement over this.

This argument departed from what had hitherto been the traditional view – that the mutual compatibility of decisions to save and decisions to invest was secured by relative price adjustments (or, in the language of the Marshallian partial equilibrium framework of the day, by changes in the rate of interest). By re-locating the analysis of saving and investment, however, Keynes's argument immediately opened-up three questions which had been dealt with simultaneously, so to speak, in the earlier theory: the determination of the level of savings, the volume of investment and the rate of interest. (It should be said that he also re-opened the questions of wage and price determination, but these can be left to one side for the moment.) The marginal propensity to consume, the marginal efficiency of capital, and liquidity preference were used by Keynes to fill his newly created empty boxes. These matters are pretty much uniformly agreed upon.

Armed with this theoretical toolbox, Keynes made his celebrated claim for the principle of effective demand in relation to earlier theory:

> the postulates of classical theory are applicable to a special case only and not to the general case, the situation which it assumes being the limiting point of the possible positions of equilibrium. Moreover, the characteristics of the special case assumed by classical theory happen not to be those of the economic society in which we actually live, with the result that its teaching is misleading and disastrous if we attempt to apply it to the facts of experience (1936, p. 3).

With the usual warning as to Keynes's singular use of the term 'classical', this claim, together with the basic theoretical building blocks already laid out, readily permit an understanding of the basis of received opinion in the *General Theory.*

If one retains, as Keynes actually did, two of the basic postulates of earlier theory – the interest–elastic demand schedule for investment (expressed in the marginal efficiency of capital schedule), and the relationship between the marginal productivity of labour and the real wage (expressed in the usual demand schedule for labour) – the only fully consistent theoretical basis for the idea that the possibility of unemployment was non-negligible (and that if it should actually appear then it could well be of long duration) had to be set in terms of an argument whereby the effective demand mechanism would come into play in disequilibrium (arising, say, in the simplest kinds of cases, from interest-rate or wage-rate inflexibility). In these circumstances, aggregate income (output) would not be at its full-employment level, and everything that Keynes seemed to be saying, whether about the theory of employment and the price level or about the effectiveness of government deficit spending as a remedy for unemployment, held good.

But not quite everything. The claim that this would be a 'general' theory of employment, at least in the formal sense of being a theory about the full equilibrium of a market system, just could not stand. However, as is quite apparent in the

passage where Keynes made this claim, there is a feasible avenue of interpretation open to received opinion even given this fact. The second sentence of the passage previously cited, where Keynes remarked that 'classical' theory did not accurately describe the world in which we actually live, was enough to confirm in the eyes of received opinion that perhaps what he was driving at was simply that his theory was 'more generally applicable' to concrete cases than was that of his predecessors. Received opinion thus translated Keynes's claim (see the first sentence of that passage) into one which held that Keynes's general theory could be defended as being 'general' only on the grounds of its practical relevance. This had the added advantage of keeping intact pre-existing modes of analysis.

This last factor is in many respects the single most notable feature of received opinion. It facilitates, though rarely in precisely the same way, the re-assertion of the theory of Keynes's predecessors – not, of course, as a theory which necessarily applies to each and every actual situation, but as the only claimant to the status of a general theory in the formal sense of that term. 'Keynesian' cases are, as it were, embedded among the disequilibrium possibilities of traditional equilibrium analysis. It should be said, however, that to its advocates Keynes's analysis of unemployment highlights a class of cases more prevalent and problematic than any which had been considered before his time. After all, deviations from equilibrium were in themselves nothing new. But deviations in which the tendency towards full employment is so weak, as it is in most disequilibrium versions of the principle of effective demand, and ones where a more direct remedy is available to policy-makers than some kind of tampering with the price mechanism, had not previously been brought to the notice of the profession. Indeed, much of the practical appeal of Keynesianism seems to stem from the optimistic prospect it offers for a measure of collective action to eliminate unemployment.

Minority opinion over Keynes's *General Theory* is more heterogeneous in nature. It has in common, in fact, little more than what appears to be a shared starting point in that it attempts to build upon Keynes's claim to have completely replaced the traditional analysis of employment. To put it another way, the very claim to generality that received opinion transliterates into a claim about practical relevance, minority opinion actually takes seriously. There are two lines of argument which should be mentioned.

The first owes much to the later work of Joan Robinson. It calls into question the whole idea of 'equilibrium' argumentation in economics. Its usual appeal is to the fact of uncertainty and the consequent disappointment of expectations upon which, or so it is argued, Keynes's entire argument is based. The essence of the opinion seems to be that these features of the economic environment render otiose any vision which sees market economies as being in any significant sense stable in their operation. This is not, or so its adherents claim, to be mistaken for just another variety of the 'frictions and rigidities' story – even if in many instances it is difficult to see how this claim could be made to stand up.

The second takes a quite different track. It focuses its attention on the nature of the market mechanism and the theoretical explanation given of its operation. Instead of maintaining (as is customary under received opinion) that Keynes *shared* with his predecessors the same theoretical characterization of the mechanisms through which market economies operate and *differed* only in as much as he showed that these mechanisms were not uniformly as beneficent in the actual world as they were in theory, it holds that Keynes's general theory requires the replacement of that theory in its entirity. Rather than arguing that the market mechanism *tends* to produce full employment in the absence of frictions and rigidities, as even received opinion would admit, this statement of tendency is put aside.

This particular reading of the *General Theory*, though consistent with many of the claims Keynes himself made for the book, opens up a whole field of new and difficult problems. If the principle of effective demand is to be utilized as an explanation of what Marshall might have called the long-run normal levels of output

and employment, rather than just their disequilibrium or short-run levels, then the question immediately arises as to what explains the rate of interest, the real wage, the level of investment and, not least, the relative prices of commodities – all of which previous equilibrium theory had dealt with at a single blow by conceiving of capitalist society as a world regulated by the maximizing behaviour of agents given the preferences of individuals, the available techniques of production, and the initial endowments of the system. These new questions cannot, however, be answered by the theories Keynes himself selected – with the exception of the idea of the marginal propensity to consume, these must be largely left behind (at least as far as long-period theory is concerned).

The solution that has been proposed is that one might return to the vision of the market mechanism furnished by the old classical economists, from Smith through to Ricardo, and by Marx. This may, perhaps, seem paradoxical given Keynes's own undisguised hostility to both Ricardo and Marx (though probably no more so than the route taken by received opinion which returns to the theory of still others for whom Keynes had little deep regard). According to this line of argument, the market mechanism as a structural feature of capitalist society, is activated not by the wills of individuals, but independently of them, as Quesnay might have said. This suggests that markets exist to ensure the continued economic and social reproduction of the system. Therefore, the prices determined on these markets need to satisfy the distributional requirements of reproduction. Owners of means of production must in the long run receive the customary rate of profit on the best-practice technique in whatever line of production they are engaged, and the real wage must conform to the historical, institutional and customary norms of the society in question. However, only a tentative start seems to have been made in this direction.

There are, however, two claims that have been made for a recasting of economic theory along such lines which may be mentioned. One concerns theory proper, the other relates to the realm of practical affairs. According to the first, there would now be no longer any necessity to regard the market mechanism as being inherently efficient save for its potential to become 'stuck' in 'disequilibrium'. That is, if the long run tendency of the market mechanism is to produce in general results like unemployment, then the analytical basis of many pre-Keynesian doctrines vanish. Perhaps principal among these, is the old fashioned quantity theory of money. Moreover, the optimality of the mechanisms of competitive capitalism, so central to the general theory of Keynes's predecessors (and present also in received opinion), is fundamentally called into question. The argument places in the hands of its practitioners reasons to agree with, rather than to dismiss, some of the most provocative and telling claims made by Keynes on behalf of the theory of effective demand:

> there are . . . forces which one might fairly well call 'automatic' which operate under any normal monetary system in the direction of restoring a long-period equilibrium between saving and investment. The point on which I cast doubt – though the contrary is generally believed – is whether these 'automatic forces' will . . . tend to bring about not only an equilibrium between saving and investment but also an optimum level of production (Keynes 1973, vol. 13, p. 395).

At the level of practical affairs, it holds out the prospect that a measure of collective control over the investment and industrial processes of market economies will render possible the achievement of goals like full employment and improved standards of living which for a long time, and still in certain circles today, had been thought to be beyond the reach of human intervention and control.

Nevertheless, over a work which has captured the attention of some of the leading economists of the 20th century, it would be foolhardy to pretend to be able to draw steadfastly fixed conclusions. The preceding discussion lays claim only to having elucidated what seem to the present writer to be some of the broad contours which typify the landscape of Keynesian debate. Elsewhere in this dictionary are to be found many accounts of its specific features. The typology set out above may prove to be a fruitful one with which to examine existing arguments; how

relevant it might prove to be in the future is more difficult to determine.

See Also

- Aggregate Demand and Supply Analysis
- Aggregate Supply Function
- Bastard Keynesianism
- Disequilibrium Analysis
- Effective Demand
- Equilibrium (Development of the Concept)
- Imperfectionist Models
- Income–Expenditure Analysis
- IS–LM Analysis
- Keynes, John Maynard (1883–1946)
- Keynesian Revolution
- Long Run and Short Run
- Monetary Disequilibrium and Market Clearing
- Neoclassical Synthesis
- Post Keynesian Economics
- Price Level
- Rational Expectations
- Saving Equals Investment
- Temporary Equilibrium

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Keynesian Revolution

David Laidler

Abstract

The term 'Keynesian Revolution' suggests that Keynes's *General Theory* (1936) overthrew a defective and discredited classical orthodoxy and created a new understanding of how economies work. However, Keynes's critique of earlier work seriously misrepresented it, and his new system was, in fact, a synthesis of components drawn from it. Keynes's analysis nevertheless embodied an original and radical vision of how a monetary economy functions. The widespread adoption of the IS–LM interpretation of his system began a process of obscuring that vision, and economics has now largely lost sight of it.

Keywords

Beveridge, W.; Effective demand; Expectations; Fisher, I.; Great depression; Hansen, A.; IS–LM model; Kahn, R.; Keynes, J. M.; Keynesian Revolution; Keynesianism; Klein, L.; Leijonhufvud, A.; Liquidity preference; Macroeconomics, origins and history of; Malthus, T.; Marginal efficiency of capital; Marginal propensity to consume; Mill, J. S.; Monetarism; Multiplier; New Classical revolution; New Deal; Pigou, A.; Rate of return over cost; Ricardo, D.; Robinson, J.; Say's Law; Underemployment equilibria; Warming, J

JEL Classifications

B2

The words 'Keynesian Revolution' conjure up the story of how a new intellectual framework, created by John Maynard Keynes and set out in his *General Theory of Employment, Interest and Money* (1936), challenged and quickly replaced an old-established but discredited classical orthodoxy.

The term, first popularized by Klein (1947), now has a permanent place in the vocabulary of economics, but this article follows Laidler (1999) (where references to relevant literature more extensive than space here permits are given) in suggesting that this revolution was *fabricated*, in two senses. First, Keynes to an extent *invented* the classical orthodoxy that he claimed to be overthrowing; but, second, he nevertheless *constructed* a radically new vision of how the economy functions, using components drawn from his predecessors' work. It then suggests that the ideas underlying Keynes's revolution, always less influential than he intended, and currently barely recognized by economists, might nevertheless not be quite beyond revival.

Keynesian Influences on Economics

Economics saw enormous changes between the mid-1930s and the 1950s. To highlight only developments relevant to this essay, a new sub-discipline, *macroeconomics*, emerged; econometric modelling came into its own; and economic policy found a new anchor in the idea that ongoing government intervention in economic life can do more to promote economic and social well-being than the unregulated workings of the market. This whole apparatus is often labelled 'Keynesian', but to do so attributes too much to one man's influence.

Keynes was a sharp though perceptive critic, rather than a pioneer, of econometric modelling (Patinkin 1976). His main contribution to the area was indirect and posthumous, lying in the adoption of the IS–LM model, extracted by some of his followers from the *General Theory*, as the template around which were built the forecasting models which became ubiquitous among central banks and departments of finance throughout the non-socialist world from the 1950s onwards.

As to economic policy, governments had begun to abandon laissez-faire long before the First World War, and the experiences of the interwar years hugely accelerated this process, quite independently the influence of economics in general or of the *General Theory* in particular. The American New Deal was already well advanced before that book appeared; the famous Swedish model of a social-democratic mixed economy was mainly home-grown; and the government's major presence in the post-war British economy owed at least as much to the Fabian Society and William Beveridge as to Keynes. Even the use of fiscal and monetary policy for controlling the overall levels of economic activity and employment had many advocates before 1936, though the *General Theory* did significantly clarify the theoretical case for such macro-activism.

Keynes's Intended Revolution

Even so, this clarification was incidental to the book's purpose, which was, as its full title makes clear, to expound a *theory, general* in character, that would explain the determination of the level of *employment*, by referring to the roles played in economic life by the phenomena of *interest and money*. And, as Keynes told George Bernard Shaw in an oft-quoted letter dated 1 January 1935, he expected his book to 'largely revolutionise ... the way the world thinks about economic problems'.

The central tenet of Keynes's intended revolution was that 'A monetary economy ... is essentially one in which changing ideas about the future are capable of influencing the quantity of employment and not merely its direction' (1936, p. vii). By this Keynes meant that private investment decisions were heavily dependent upon expectations about the future profitability of the projects involved, and that, in a money economy, when those expectations varied, the result would be fluctuations in the level of employment. The outcome of similar shocks to a barter economy would be different: labour would simply be reallocated between the investment goods and consumption goods sectors.

Say's Law of Markets (that no one offers to sell goods except with the intention of buying goods with the proceeds, so that their general oversupply is impossible) guaranteed a barter economy against unemployment, apart from that generated by frictions as workers moved among sectors; and variations in the rate of interest would induce changes in saving to match those in investment no matter how large and irregular the latter might be.

But, Keynes argued, Say's Law did not hold in a monetary economy, because the monetary system itself could, and often would, prevent the rate of interest from playing its equilibrating role. Since the days of David Ricardo, his predecessors, with a few honourable heterodox exceptions, had been blind to this, and his contemporaries remained so. They routinely, albeit often unself-consciously, applied Say's Law to monetary economies characterized by large-scale unemployment, thereby blundering into fundamental analytic inconsistency.

Not only did Keynes claim to have identified a ubiquitous error in the dominant economic theory of the preceding century and a quarter, but in the *General Theory* he also showed how an alternative system that avoided it could explain the mass unemployment plaguing market economies, and inform the design of a new policy framework. The latter's salient feature would be a government that took responsibility for guiding long-term investment decisions – whether only their overall volume or also their make-up was left unclear – this being an activity that both Keynes's theorizing and recent economic experience suggested were beyond the capacity of the private sector. Keynes provided only a sketch of this new policy framework, but emphasized its compatibility with a liberal-democratic political order.

Offered at a time when some important protagonists of economic and political liberalism, notably the Austrian school (Hayek 1931; Robbins 1934), were arguing that activist policy would only make the Great Depression worse, and when the apparent successes of the Soviet Union, Nazi Germany and Fascist Italy in conquering mass unemployment were tempting many in Britain, the United States, and elsewhere to embrace political totalitarianism as a necessary prerequisite for the conduct of effective economic policies, the political importance of Keynes's message is hard to overestimate. One cannot read Tarshis's (1987) first-hand account of his exposure to Keynes's radical and wide-ranging assault on received economic theory without sympathizing with the enormous excitement that it generated.

But such sympathy must be tempered by the knowledge that Keynes himself, perhaps inadvertently, presented a very particular and sometimes very inaccurate view of his *General Theory's* place in the history of economics. He claimed to have overturned more than a century of economics and to be rebuilding the subject on new foundations, but it is more accurate to say that the *General Theory* first seriously misrepresented earlier work, and then selected from it components to be synthesized into what was, nevertheless, a strikingly original framework.

Keynes on Classical Economics

In the depressed period following the Napoleonic Wars, Ricardo had attacked Malthus's argument that too rapid a rate of capital accumulation had created a state of affairs in which the economy was no longer able to consume all that it was capable of producing. Deploying Say's Law, Ricardo had argued that a *general glut* of commodities, such as Malthus postulated, did not, indeed could not, exist. There was merely a temporary, though serious, mismatch between the compositions of output and demand as the economy continued to switch from wartime to peacetime patterns of production and consumption.

Ricardo's logic initially carried the day, but it was soon subjected to an important qualification. Specifically, John Stuart Mill (1844) pointed out that Say's Law, when applied to a money economy, ruled out only a general glut of everything *including money*, but left open the possibility that an oversupply of everything *except money* would appear at times when agents were trying to build up their stocks of the latter. Mill associated such behaviour with financial crises, and thought it would be short-lived, but as the 19th century

progressed his insight became incorporated into accounts of the upper turning point of the business cycle.

There, in tandem with the hypothesis of nominal wage stickiness, it helped to provide a monetary explanation for the onset of cyclical unemployment which still found an influential expression among Keynes's contemporaries in the work of Ralph Hawtrey (for example, 1919). In Hawtrey's view, cyclical interactions of the supply and demand for money led to fluctuations in what he (like Malthus, and later Keynes) called *effective demand* – the rate of flow of money spending on goods and services in the aggregate – which would impinge upon income and employment to the extent that money wage and price stickiness prevented those fluctuations from being absorbed by movements in the general price level.

Keynes was thus wrong to assert (1936, p. 33) that Ricardo's version of Say's Law had for more than a century dominated an orthodox economics that had lost sight of the very concept of effective demand, and, as a corollary, he was also wrong to claim novelty for his own account of how cuts in money wages, and hence prices, might affect employment for the better through an indirect channel involving the interaction of the supply and demand for money (1936, p. 266).

These errors are arguably mere slips when viewed in the context of the *General Theory's* central claim that large-scale unemployment was not, after all, due to money-wage stickiness, but to fundamental problems posed by the nature of a monetary economy for the capacity of the rate of interest to coordinate saving and investment; but Keynes was by no means the first to explore the latter issues either. From Wicksell (1898) onwards, increasing attention was paid to the influence of the rate of interest set by the central bank on saving and investment decisions, and to its capacity to disrupt their coordination by the capital market. Swedish, Austrian and British economists (for example, Myrdal 1931; Hayek 1931; Robertson 1926) all investigated ways in which monetary mechanisms might create fluctuations in output and employment, albeit none of them with complete success.

Keynes's contribution, then, was not to emphasize that monetary factors could disrupt the smooth allocation of resources over time, but to show precisely how they might do so, what the consequences would be, and how economic institutions could be adapted to cope with such problems. Before the *General Theory* there was no coherent and widely accepted analytic framework in terms of which these issues could be discussed, but after it there was.

Keynes's New Framework

That framework had three major components: a theory emphasizing the role of expectations in driving investment decisions, a theory of the demand for money that explained why the rate of interest could not be relied on to coordinate these with saving decisions, and a theory of saving–consumption behaviour that implied a self-limiting multiplier process. Each already existed before 1936, but they had not been brought together. When they were, output and employment variations were revealed to be what equilibrated saving and investment when, as would happen in a monetary economy, the interest rate failed to do so.

Keynes called the central concept of his theory of investment the *marginal efficiency of capital*, the rate of discount that would equate the present value of the profits expected from a unit of investment to the cost of producing the capital equipment involved. Forward-looking maximizing firms would push the flow of investment to the point at which this rate of return was just equal to the rate of interest at which the expenditure was to be financed.

There was nothing revolutionary in this concept, which Keynes acknowledged to be essentially identical to Irving Fisher's (1907) *rate of return over cost*, but his views on the relationship between profit expectations and the real productivity of investment that, in Fisher's analysis, underlay them, were less conventional. For Keynes, this connection was essentially nonexistent: the passage of time was a fundamental fact of economic life, and the future was simply

too uncertain for calculations of productivity to be made in a rational fashion. Profit expectations therefore were inevitably driven by the essentially irrational *animal spirits* of investors. When these were high or low, so would be the marginal efficiency of capital.

Though arguably radical, this idea was not particularly new. It restated, using a new vocabulary, the view of other Cambridge economists – not least the 'classical' *bête noire* of the *General Theory*, A. C. Pigou (for example, 1927) – that investment decisions were largely driven by contagious and cumulative waves of errors of optimism or pessimism on the part of businessmen. Keynes's account of how the development of stock markets had deepened the wedge between long-run economic fundamentals and the short-term and ill-informed expectations on which investment decisions were actually based was also foreshadowed in earlier Cambridge work.

So too was his treatment of money-holding behaviour. Cambridge monetary analysis had been conducted since the 1870s in stock supply and demand terms, with demand being driven by money's role as the economy's means of exchange. In 1921 Keynes's former student Frederick Lavington had extended this analysis to an economy characterized by sophisticated financial markets. Here, he noted, money had the particular virtue of being always readily tradable at a market value that was subject to less uncertainty than that of other assets. Lavington concluded that, while remaining its means of exchange, money would also serve as a store of value in such an economy, providing a hedge against the uncertainty inherent in its financial markets.

Keynes himself considerably elaborated this idea in his *Treatise on Money* (1930), and under the label *liquidity preference*, it in due course appeared in the *General Theory*, where it provided a rationale for the incapacity of the rate of interest to maintain equilibrium between saving and investment. Holding money to obtain security against financial market uncertainty involved forgoing the interest yielded by alternative assets. In a monetary economy, then, interest was the price of liquidity, and its performance of this, its major role, would sometimes fatally interfere with its capacity to coordinate the allocation of resources over time.

When animal spirits were up and expectations optimistic, to be sure, financial market uncertainty would be a minor matter, liquidity preference would be both weak and relatively insensitive to the rate of interest, and these considerations would not be crucial to the economy's functioning. But when animal spirits and expectations were depressed they would be. Under these circumstances, which Keynes believed to be chronic in the market economies of the 1930s, the marginal efficiency of capital would be low and a low rate of interest would be needed to match it; but liquidity preference would simultaneously be strong with only very small movements in the interest rate being needed to induce large changes in money holding.

The very nature of a modern monetary economy thus inhibited the interest rate's accommodating itself to a depressed marginal efficiency of capital, and such an economy could, and very likely would, settle into an equilibrium characterized by large-scale unemployment. This final implication was established by the logic of the *multiplier* relationship, which Keynes took over, not from earlier theoretical work, but from a much more practical literature dealing with the use of public works expenditures to fight unemployment.

Long before the First World War it had been recognized that prosperity and depression in one sector of the economy could spill over into others, and this idea helped establish the desirability of using public expenditure to put the unemployed to work. Sometimes, however, the implications here seemed too good to be true: if spending geared to employing previously unemployed workers would generate further expenditures on their part that would then put others to work, and so on, what was there to stop one small injection of public expenditure eliminating any level of unemployment?

A satisfactory answer to this awkward question was finally provided in 1931 by Keynes's student Richard Kahn: there would be some leakage of expenditure at each round in the process, and each successive increment to employment would be

smaller than its predecessor. The effects of public expenditure on employment would be multiplied beyond their immediate impact, to be sure, but not infinitely so. They would converge to a limit that would be smaller the greater the size of the aforementioned leakages.

The Danish economist Jens Warming (1932) then offered a crucial modification to this analysis. Instead of applying it to employment, he applied it to output, and hence real income; and instead of invoking a number of possible leakages from the circular flow of expenditure as Kahn had done, he emphasized one, namely, saving. Postulating in his illustrative numerical example that consumers would spend 75 per cent of each increment to their income and save the balance, Warming showed that a given injection of public expenditure would generate a fourfold increase in national income.

Warming's version of the multiplier was incorporated in the *General Theory*, though only Kahn was cited there. In Keynes's hands, however, the stable fraction spent out of any increment to income – still 75 per cent in his own numerical example – became the *marginal propensity to consume*, the embodiment of a 'fundamental psychological law' of consumer behaviour, and the multiplier itself elucidated not merely the practical consequences of public works expenditures, but the fundamental theoretical links between investment and the economy's overall level of effective demand – consumption plus investment – and hence output and employment. When the rate of interest was unable to offset fluctuations in the marginal efficiency of capital because of its role as the price of liquidity, the multiplier would ensure that output and employment moved so that savings matched investment. Hence it lay at the very heart of Keynes's revolutionary message that, 'a monetary economy ... is essentially one in which changing views about the future are capable of influencing the quantity of employment...' (1936, p. vii).

IS–LM and After

By the 1950s, what was still called Keynesian economics had largely lost track of this message. In part, this was because the Second World War and its aftermath had seen the restoration of high employment as the economy's apparently normal state of affairs, but more importantly it was the consequence of the way in which Keynes himself had developed his results.

Before 1936, many economists had paid attention to expectations and their evolution over time, but available analytic techniques were not up tackling such problems, and their efforts, though sometime yielding valuable insights along the way, routinely ground to a halt in confusing, not to say confused, complexity. The critical step enabling Keynes to tell an analytically tractable story where others had failed was to treat expectations as exogenous to the mechanisms he analysed, and this simplification also made it possible for others to extract a formal comparativestatic model from the *General Theory* that could be expressed either in simple algebra or in equally simple geometry.

This, the IS–LM (investment equals saving – liquidity preference equals the supply of money) model, was, in its simplest form, a set of simultaneous equations that linked consumption to income, investment to the rate of interest, and the demand for money to income and the rate of interest, and characterized the money stock as exogenous.

These components were all to be found in the pages of the, *General Theory,* and the IS–LM system could also be manipulated to demonstrate some of that book's central conclusions – for example, about how a fall in the rate of investment spending at any level of the rate of interest would put downward pressure on the equilibrium values of output as well as the rate of interest, and about how a high degree of interest sensitivity on the part of the demand for money would force more of this adjustment onto income. It was, furthermore, easily extended to accommodate analyses of monetary and fiscal policy.

All of this gave IS–LM a strong claim to be a legitimate representation of Keynesian economics, as Alvin Hansen (1953), its most influential exponent, would in due course claim. By and large, this is how it came to be treated, despite the protests of some who had been close to

Keynes when he had tried set his revolution in motion, not least his younger Cambridge colleague Joan Robinson, who memorably characterised IS–LM as 'bastard Keynesianism'.

It is not necessary to take sides in this debate here. It will suffice to note that IS–LM proved remarkably flexible. In the 1960s it accommodated versions of not just Keynesian but also monetarist doctrine, and provided a framework in which some of the issues separating them could be debated. Hence it dominated both research and teaching within macroeconomics for close to two decades; but its dominance came at a cost (Backhouse and Laidler 2004). In particular, under this model's influence macroeconomics lost sight of the importance of time in economic life. Ideas, including those that had lain at the heart of Keynes's intended revolution, about the crucial role played by expectations and uncertainty in inter-temporal coordination mechanisms, and the essential differences between the ways in which money and barter economies coped with such matters, were pushed into the background.

They have never quite disappeared, however. For example, Axel Leijonhufvud's (1968) restatement of Keynes's economics attracted much attention. So did his suggestion that Keynes had been forced by his analytic framework to treat as equilibria the disequilibria that coordination failures in fact created, though his suggestion that a new and explicitly disequilibrium dynamic economics be built on Keynesian foundations was not taken up. Instead, in the 1970s economists in large numbers embraced analytically more tractable New Classical analysis, built on the principle that markets are continuously in equilibrium.

This technically convenient clearing-markets assumption in fact had huge substantive significance, implying the total irrelevance of Mill's (1844) critique of the application of Say's Law to a monetary economy, and all that had followed from it. When Lucas and Sargent (1978) announced the demise of Keynesian economics, therefore, more than activist policies supported by macroeconometrics was under attack. The discipline's very comprehension that a monetary economy might suffer coordination failures, let alone of Keynes's specific analysis of these issues, already weakened by IS–LM, was threatened. It is just as well, then, that the New Classical revolution, like its Keynesian forerunner, has been less than totally successful, perhaps leaving room for these old problems to be debated once more.

See Also

- ▶ Fisher, Irving (1867–1947)
- ▶ Great Depression
- ▶ Kahn, Richard Ferdinand (1905–1989)
- ▶ Keynes, John Maynard (1883–1946)
- ▶ Keynesianism
- ▶ Macroeconomics, Origins and History of
- ▶ Pigou, Arthur Cecil (1877–1959)
- ▶ Robertson, Dennis (1890–1963)
- ▶ Underemployment Equilibria
- ▶ Warming, Jens (1873–1939)

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Keynesianism

Roger E. Backhouse and Bradley W. Bateman

Abstract

In the post-war years, Keynesianism became the label for the mixed economy, for an approach to fiscal policy that entailed fine-tuning the economy, and for the revolution in economic theory that brought macroeconomic analysis to the fore. This article debunks many of the myths that grew up around Keynes's legacy by examining his attitude to fiscal and monetary policy over the course of his career. By differentiating what Keynes said from what his followers and his critics said after his death, it is possible to understand the broad switch to demand management during the 20th century in a clearer light.

Keywords

Aggregate demand; Beveridge, W.; Buchanan, J.; Budget deficits; Cheap money; Command economy; Counter-cyclical policy; Deficit spending; Fine tuning; Fiscal policy; Full employment; Functional finance; General equilibrium; Great depression; Hansen, A.; Harrod, R.; Hayek, F.; Hicks, J.; Inflation; IS–LM model; Keynes, J. M.; Keynesianism; Keynesian revolution; Lerner, A.; Market frictions; Meade, J.; Microfoundations; Mixed economy; Monetary policy; Monetary targets; National debt; New deal; Public works; Robinson, J.; Salant, W.; Samuelson, P.; Sinking fund; Social security; Stagflation; Sticky wages; Unemployment; Welfare state

JEL Classifications

B1; B2; E12

Keynesianism has many meanings. It is the label for the political philosophy that dominated most Western countries in the 30 years after the Second World War, embracing a mixed economy and the welfare state, steering a course between what were believed to be the dead hand of socialism and the social injustices of free- market capitalism. Keynesianism is also used to refer to something narrower: to the use of macroeconomic policy to stabilize the economy and to maintain low levels of unemployment. In this usage, Keynesianism is associated with fine-tuning the level of government spending and taxation so as to use variations in the budget deficit to counteract shocks that would otherwise cause high unemployment. Beneath all of these meanings, of course, lies Keynesian economic theory, which provides the theoretical foundation for these policies. (For further discussions of Keynes, Keynesianism, and the Keynesian Revolution, see Backhouse and Bateman 2006.)

According to popular mythology there are clear historical links between these various meanings of Keynesianism. This mythology comprises the claim that Keynes's *General Theory* (1936) provided the basis for a new economics, marking a revolutionary break with previous orthodoxy, justifying the use of debt-financed government budget deficits to stimulate the economy and cure unemployment. Governments turned to Keynes to provide a way out of the Great

Depression and to justify maintaining high levels of demand after the Second World War. In doing this they ensured that mass unemployment would not recur, thereby making possible the development of the welfare state. However, this policy had two unintended effects. It undermined an unwritten fiscal constitution, according to which governments would normally balance their budgets, except in wartime. Also, by removing the fear of unemployment, it undermined the willingness of workers to restrain their wage demands. The combination of budget deficits and high wage demands eventually caused the stagflation of the 1970s, thereby bringing about the demise of Keynesianism.

Fortunately for Keynes's reputation, modern scholarship has shown that most of the claims on which this account is based are mythical. Things simply did not happen this way. As the Keynesian Revolution in economic theory is discussed elsewhere in this dictionary, the focus here is on Keynesianism as economic policy and political philosophy. We start by showing how 'Keynesian' ideas actually entered policy, in many cases before 1936, the year that Keynes's *General Theory* was published. From there we outline Keynes's own views on fiscal policy, differentiating them from what came to be known as Keynesianism. In conclusion, we suggest that Keynesianism in economic policy is more alive than is often assumed.

The Spread of Keynesianism

In a path-breaking comparative study, *The Political Power of Economic Ideas: Keynesianism Across Nations* (1989, p. 367), Peter Hall was surprised to discover 'the degree to which Keynes's ideas about demand management were resisted or ignored in many nations'. Demand management was adopted in many countries, but often without reference to Keynes's ideas. The United States provides an excellent example. President Franklin Delano Roosevelt, in his 1932 and 1936 election campaigns, ran on the promise of balancing the budget. In his first administration he managed to limit deficits to what was spent on relief projects. It was only in his second term, as the economy slid into recession again in 1937, that Roosevelt submitted a budget that was purposely in deficit to stimulate the economy. He did this, not because he was influenced by Keynes, but because other options to raise prices and stimulate recovery had failed. Attempts to buy up gold had raised the price of gold but not prices of basic commodities. The National Industrial Recovery Act had been declared unconstitutional. The idea of running a deficit came from a group of economists (Laughlin Currie, Leon Henderson and Isador Lubin), recruited by Harry Hopkins, a New Deal administrator about to become Secretary of Commerce. They noted that the fortunes of the economy in 1936–7 had exactly mirrored the change in the government's fiscal position, caused by the ending of the First World War Veterans' bonus and the imposition of taxes to support the new Social Security system. It was this evidence, not Keynesian theory, that was used to make the case for fiscal stimulus. Though young Keynesian economists did eventually enter the government, the initial arguments for using fiscal policy to stimulate the economy were without reference to or influence from Keynes. Herbert Stein (1969, p. 131) thus went so far as to say, 'it is possible to describe the evolution of fiscal policy in America up to 1940 without reference to him [Keynes]'.

In Germany and France, too, deficits came independently of Keynesian ideas. In Germany, the formation of a democratic government in the economic chaos that followed the First World War meant satisfying various interest groups, which implied deficits: businesses demanded tax cuts and workers and farmers demanded higher spending. Deficit spending was the 'social cement' (James 1989, p. 234). In France, the *General Theory* was not translated until 1942, and few people at this time read it in English.

Britain and Canada, where Keynes and young Keynesians were involved in government, were exceptional cases. However, even in Britain the precise nature of Keynes's influence is far from clear (Peden 1988, 2006). His influence was clearest in the 1941 budget, which he believed marked a revolution in public finance; but his

ideas about balancing aggregate supply and demand were used to control inflation, not to ensure full employment. In general there was considerable resistance to Keynes's ideas, often on grounds of administrative practicality. Even after the Second World War, it has been argued that Keynesian ideas were not applied till 1947, and then, as in 1941, to control inflation. Furthermore, though demand management was certainly in vogue after that, high employment was not achieved by running government deficits. If deficits are calculated on a traditional Gladstonian basis, excluding separately funded capital expenditure from the budget, the British government ran a surplus in every year from 1948 to 1972 (with the possible exception of 1965; see Clarke 1998, pp. 210–11). Even if the result was sometimes an overall deficit, this hardly justifies the charges of profligacy and undermining an implicit fiscal constitution levelled by critics such as Buchanan and Wagner. And this was the country in which Keynes's influence was strongest.

The early arguments for counter-cyclical fiscal policy were independent of Keynes. They were what Hall (1989) described as 'proto-Keynesianism' – Keynesianism without the theoretical foundations provided by Keynes's *General Theory.* However, during the 1940s Keynes's name eventually came to be attached to such policies. One reason for this was simply that Keynes's model of aggregate demand was the most advanced economic theory at the time and it could easily be used to provide an *ex post* imprimatur to a change that was already under way. Keynesian economic theory, combined with national accounts constructed along Keynesian lines, provided a common language in which economists, in government and outside, could talk about macroeconomic problems. The combination of mathematical economic theory and statistical data analysis opened up an apparent gulf with pre-Keynesian work on money and the cycle. The credibility of this new economics, comprising Keynesian theory and counter-cyclical policy, was given an enormous boost from the apparent success of wartime demand management: Walter Salant (1989, pp. 45–6) has claimed that 'The elimination of unemployment during World War II was one of the greatest influences on post-war views about the role of government in attaining and maintaining high employment'. It has, however, been argued that this was based on a misperception, in that the war economy in the United States was an example of a successful command and control economy, not successful demand management (Higgs 1992).

The association of Keynes with counter-cyclical policy was actively fostered by Keynes's disciples, Alvin Hansen and young Keynesians in Britain and the United States, James Meade, Joan Robinson, Abba Lerner, Paul Samuelson and Walter Salant. Lerner's *The Economics of Control* (1944), ironically a Ph.D. thesis supervised by Friedrich Hayek, then still at the London School of Economics, used Keynesian theory to advocate a high degree of fiscal fine tuning. In *A Guide to Keynes* (1953), Hansen wove together an exposition of Keynesian economic theory with his own policy recommendations on deficit spending, creating an indelible link between the two.

Keynes and Keynesianism

Though Keynes's views on economic policy were famously fluid, there was little change in his views on deficit spending. From the late 1920s till his death, he supported using public works projects to stimulate aggregate demand at appropriate points in the cycle. However, this did not imply support for government deficits.

New housing or investment in the transport infrastructure were capital projects that would generate revenue streams capable of paying back any money that had been borrowed to finance their construction. Such spending would therefore appear on the capital budget, meaning that it would not affect the government's regular budget or the government's deficit. Keynes's opposition to funding such projects through the government budget, partly on the grounds that it might frighten businessmen, was strong enough for him to argue, from 1924, for the creation of a separate capital budget into which such funding could be placed. He also argued that payments to the sinking fund (the fund destined to repay the national debt)

could be diverted into the capital budget, obviating the need to raise any new funds to undertake public works projects. A major part of Keynes's battles with the Treasury, therefore, was to argue for new accounting procedures so that such projects could be undertaken without unbalancing the budget.

Keynes continued his opposition to budget deficits to the end of his life. In working on the White Paper on full employment (Great Britain: Ministry of Reconstruction 1944 – a set of proposals published by the government as the basis for legislation) and the National Debt Inquiry (Keynes 1945), he insisted repeatedly that he was not arguing for deficits in the ordinary budget. Historians have even taken the failure to separate the capital and ordinary budgets in the White Paper as evidence on Keynes's limited impact on Treasury thinking at this time, so closely was he associated with the idea. He also argued against the young Keynesians, who were advocating the adjustment of social security taxes to regulate demand.

In these decades, Keynes's emphasis was on increasing investment, not consumption. Public investment might be increased directly, and private investment could be increased through a policy of cheap money. In the *General Theory* he argued that interest rates should be kept low, and maintained that view for the next ten years of his life. Nowhere did he support the view, commonly associated with Keynesianism, that monetary policy was ineffective.

Neither was Keynes especially enthusiastic about the welfare state. William Beveridge was the person who championed the development of Britain's post-war welfare state, and Keynes was never a close collaborator with Beveridge in this work. Keynes did look at several drafts of Beveridge's draft reports as a Treasury official, and he once wrote to Beveridge praising the plans. The fact remains, however, that his work within the wartime government on the implementation of the Beveridge plan consisted largely of efforts to trim the size of Beveridge's plan, limit child payments so that they did not cover the first-born in any family, and to delay implementation of the plan. For Keynes, the most important issue was policy to ensure full employment, and he never linked that objective directly to the welfare state in his own writing.

How, then, did Keynesian economics come to be associated with policies that Keynes clearly rejected throughout his life, such as the fiscal fine tuning of Lerner's 'functional finance'? The answer is that his ideas came to be seen through the work of the young Keynesians, who claimed Keynes's imprimatur for their ideas. Lerner (1936, p. 435), in his review of the *General Theory,* wrote 'this article has been read in manuscript by Mr. Keynes himself, who has expressed his approval of it'. Though this article was about model building, not policy, Lerner subsequently wrote as if Keynes's approval extended to all his work. Hansen, too, wove his interpretation of Keynesian economics together with his own policy recommendations on deficit spending. As a staple of undergraduate and graduate education in the 1950s and 1960s, this helped create the view that Keynes supported deficit spending (despite a caveat that Keynes had not endorsed such policies hidden away towards the end of Hansen's book). In Britain, young Keynesians such as James Meade had the advantage that they had actually worked with Keynes: even though they had disagreed on some policy recommendations, this personal link meant that their ideas came quickly to be associated with Keynes. Keynesianism became the policies of the Keynesians, not of Keynes himself.

Blame for the mislabelling of what came to be known as 'Keynesian' policies also rests with Keynes's critics. In the same way that supporters of using countercyclical policy to maintain a high level of aggregate demand wanted to claim Keynes's authority for their ideas, critics wanted to make the same identification, to give more significance to their own attacks on such ideas: had it been known that Keynes himself was critical of these policies, questions would have been raised concerning whether there were alternative policies to those being proposed. While Keynes was alive, Hayek was well aware of the differences between Keynes's own views and those of the young Keynesians; he recalled having a conversation in which Keynes agreed with him when

he complained about the dangerous things that the young Keynesians were saying on Keynes's behalf (Hayek 1995, p. 232). Yet, after Keynes's death, and in particular in the 1970s when he returned to writing about money and inflation after a decades doing other things, he too spoke of Keynesianism as though it reflected the ideas of Keynes. Buchanan and Wagner were even more explicit, in their *Democracy in Deficit: The Political Legacy of Lord Keynes* (1977), in claiming that it was Keynes who had called forth a world of ever- increasing budget deficits, never pointing out that Keynes was avowedly hostile to this idea (for an assessment of this view, see Bateman 2005).

At the level of economic theory, Keynesian economics came to be associated with a theory that led to conclusions that were different from those advocated by Keynes himself. Within a year of the *General Theory's* appearance, economists began reformulating its ideas as a simple two or three simultaneous equation system that eventually became known as the IS–LM model. This model was then given more formal microfoundations and seen as a miniature general equilibrium model. As with Lerner's review of his book, Keynes was willing to encourage such models, writing positively to Roy Harrod and John Hicks about their early papers that provided the initial foundation for the IS–LM model. However, while these models captured something of what Keynes was doing, there was much in the *General Theory* that they left out, and as a result the theory became simplified. The theory became shorn of many of the elements that related most closely to time, resulting in a static model in which the only mechanism that would ensure the economy did not return to full employment was inflexibility of the money wage rate (see Backhouse and Laidler 2004). For example, Keynes's dynamic arguments about how wage cuts might have perverse effects through causing expectations of future wages to change were ignored. Keynesian economics thus came to be seen as 'the economics of sticky wages', even though Keynes had written the *General Theory* to combat the view that this was the cause of the depression.

This theoretical reinterpretation probably happened because of another change that took place after the Second World War: economists began conducting their arguments in terms of mathematical models (either algebraic or geometric). Ideas, even if they were important to Keynes, that could not be forced into a model were forgotten. This reinterpretation of Keynesian theory tied in with the emerging Keynesianism in economic policy in that in these models, which analysed the determinants of a homogeneous aggregate output, the distinction between current and capital expenditure played a minor role. Government spending, in most models, was equated with current expenditure, and investment was seen as a private sector activity. These assumptions were largely unquestioned, at least in the mainstream of the discipline, until Axel Leijohnufvud's *On Keynesian Economics and the Economics of Keynes* (1968). This argued explicitly that Keynesian economics was very different from the economics of Keynes: Keynes's followers had come to the conclusion that Keynesian economics was a special case of the more general classical theory only because they had misrepresented his ideas.

Are We All Keynesians Now?

In the 1970s governments moved away from Keynesianism, as the term had by then come to be understood. This parallels developments in economic theory, and had much to do with the apparent breakdown of the Phillips curve, and the failure of Keynesianism, as it was then understood, to provide guidance appropriate to a time of stagflation. However, governments were mainly moving away from doctrines that were associated with Keynes's followers, not with Keynes himself. Fiscal fine tuning to maintain full employment was abandoned in favour of focusing on money and inflation. Paradoxically, in Britain at least, it was only in the 1970s that the government began to run budget deficits (defined in the Gladstonian manner), perhaps because of its policy of drastically cutting public investment. Keynesianism appeared dead. And yet, as governments learned about the problems with using monetary targets, there was a move, by the end of the century, towards policies that were much

more in line with what Keynes himself had advocated. Interest rates were kept as low as was consistent with reasonably stable prices (a slightly positive interest rate). Monetary policy, not fiscal policy, came to be seen as central to stabilizing the economy. There is much here that is not in Keynes – hardly surprising given the changes that took place during the preceding 60 years – but he would probably have had much sympathy with the broad framework of policy: targeting domestic prices, creating the conditions for high levels of investment, and perhaps even limiting the role of the welfare state. There were parallels in economic theory, where Keynesianism came to be used to refer to those who believed various market frictions opened up a role for activist policy. Perhaps the abandoning of 'Keynesian' political philosophy was what paved the way for implementing some of the ideas that were important to Keynes.

See Also

- ▶ Functional Finance
- ▶ Keynes, John Maynard (New Perspectives)
- ▶ Keynes, John Maynard (1883–1946)
- ▶ Keynesian Revolution
- ▶ Monetary and Fiscal Policy Overview
- ▶ Monetary Policy, History Of

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K

Keyserling, Leon Hirsch (Born 1908)

Lynn Turgeon

An important practitioner of New Deal economics, Keyserling is best remembered for his role as Chairman of the Council of Economic Advisers from 1950 to 1953. Born in Charleston, South Carolina, he received a degree in law from Harvard. Subsequently Keyserling left the PhD programme in economics at Columbia University to go to Washington at the urging of his mentor, Rexford Tugwell, who became famous as a member of Roosevelt's 'brain trust'. There he worked as a lawyer for the Agricultural Adjustment Administration and later as secretary and

legislative assistant to Senator Robert Wagner of New York. During World War II, Keyserling was general counsel to the United States Housing Administration. He was influential in the passage of the Employment Act of 1946, which gave rise to the Council of Economic Advisers. Keyserling served under Edwin Nourse, the first Chair, although there were great differences in their views as to the function of the Council. Nourse thought of the Council as being politically neutral, while Keyserling felt that it should be more activist and support the President. Nourse was inclined to see inflation as the chief threat to the postwar economy, while Keyserling viewed unemployment as the greater threat.

President Truman was more sympathetic to Keyserling's approach, eventually easing Nourse out and appointing Keyserling as the first and last Chair never to have received a PhD in economics. Keyserling was a vociferous opponent of the Treasury Accord of 1951, which restored the independent power that the Federal Reserve Board had lost in 1942. Subsequently Keyserling has been a consistent critic of the Federal Reserve policies designed to 'cool off an overheated economy' by frequently raising and seldom lowering interest rates.

With the election of Eisenhower, it became clear that the Council of Economic Advisers was to become a political advisory board. Keyserling was replaced by Arthur Burns, an economist much more in tune with Republican economic philosophy. From 1953, Keyserling published a steady stream of monographs attacking mainstream economics, whether Republican or Democratic. While there are some similarities between the New Economics of the Kennedy administration and Keyserling's ideas, there are also some differences, particularly Keyserling's disbelief in the effectiveness of tighter monetary policy to control inflation resulting from a bold fiscal policy.

More recently, in 1978, Keyserling played some role in drafting the Humphrey-Hawkins bill, which required subsequent Councils of Economic Advisers to pay lip service to the goal of reaching four per cent unemployment – the bill's definition of full employment.

Keyserling has always been an advocate of substantial defence budgets, beginning with his role in drafting NSC–68 of April 1950. This top-secret National Security Council report outlined the potential usefulness of military Keynesianism in the Cold War. Keyserling has denied being a Keynesian and would prefer to be called a pragmatist, possibly as a reflection of his early exposure to institutional economics at Columbia.

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Kindleberger, Charles P. (1910–2003)

Peter Temin

Abstract

International economist and economic historian of the late 20th century, Charles Kindleberger was an astute observer of the

world around him and a master prose stylist. His most influential works made the case for irrationality in capital markets and the need for a lender of last resort to minimize the damage from bubbles and mania. His work was narrative rather than abstract, but no less convincing for that. His most famous book is *Manias, Panics and Crashes.*

Keywords

Bagehot, W.; Bubbles; Gold standard; Great depression; Kindleberger, C.; Labour supply

JEL Classifications

B31

Charles P. Kindleberger was born in New York City. He received his B.A. at the University of Pennsylvania in 1932 and his Ph.D. at Columbia University in 1937. He had a distinguished career in public service (including the Federal Reserve and the Office of Strategic Services during the Second World War) before going to teach international trade at MIT. His wartime experiences directed his interests towards the interaction of countries and gave him a keen sense of how academic ideas play out among real people and governments. His scholarship was characterized by its realism and willingness to consider actual – as opposed to idealized – behaviour.

Kindleberger made his mark on the field of international trade through his textbook and through papers and books about the recovery of Europe after the Second World War. He was active in the analysis of the dollar scarcity and then the dollar glut that characterized the short life of the Bretton Woods System. He also wrote a prescient book, *Europe's Postwar Growth: The Role of Labor Supply* (1967), on the role of immigrants and guest workers from eastern and southern Europe in alleviating the labour scarcity of western Europe. Kindleberger's emphasis on the evolution of labour supply has been echoed in many subsequent studies. The legacy of these post-war policies has been evident in political and economic conflict between the children and even grandchildren of these immigrants and other residents. As Kindleberger said (1967, p. 213), the short-run benefits of labour migration are clear, but there are dangers in the long run: 'To rely heavily on foreign labor in one's economy constitutes a positive risk.'

Kindleberger made his entry into economic history with *Economic Growth in France and Britain, 1851–1950* (1964). He surveyed the extensive literature on these two countries and concluded that there was no single convincing explanation for the differences between them. He ended the book with the following famous words: 'Economic history, like all history, is absorbing, beguiling, great fun. But, for scientific problems, can it be taken seriously?' This ironic comment set the tone for Kindleberger's future work in economic history. His books and papers are distinguished by his command of the previous literature. His reasoning is informed by an intelligent, if sceptical, use of economic theory. His prose is sprightly. And his conclusions are clear, forcefully presented, and always worth debating.

Kindleberger's impact on economics and economic history comes primarily from two books first published in the 1970s. The first, *The World in Depression, 1929–1939* (1973), provided a comprehensive narrative of the Great Depression from an international perspective. Instead of seeing the Depression as a succession of national stories, Kindleberger argued persuasively that it was the result of a failure of the international economic system. The economic structure built around the gold standard had allowed the pre-war industrial economies to weather various economic shocks in the late 19th and early 20th centuries, but it proved unable to contain or offset the shocks arising in the period after the First World War.

Why so? Kindleberger argued that the interwar economy lacked a hegemon, a dominant leader. The hegemonic power in the pre-war period was the United Kingdom, more specifically the Bank of England, which acted to contain crises wherever they started. But England was exhausted by the effort to defeat Germany in the First World War, and the Bank of England was in no shape to continue this role. Although the United States was the obvious candidate to pick up the baton, Americans were isolationist after

their wartime efforts and declined to act. In the shortest summary: no longer London, not yet New York. Without a hegemon, the shocks to the world economy in the late 1920s were allowed to drag the world into the Great Depression.

The costs of encouraging immigration of foreign workers after the Second World War emerged only slowly; the costs of poor macroeconomic policies in the early 1930s became evident more quickly. Kindleberger recounted the abortive efforts of central bankers and government officials to organize some kind of cooperative solution to the economic shocks. Failing in this endeavour, the world was subjected to competing devaluations and deflations. Among the costs was extensive damage to financial institutions and to the operation of those economies that held on to the gold standard.

Kindleberger generalized his argument in *Manias, Panics, and Crashes: A History of Financial Crises* (1978). He surveyed financial crises in the past two centuries that were important enough to have macroeconomic effects. He described the various irrationalities that preceded crises, as suggested in his title, and synthesized a vast literature in a small and engaging book. He argued that irrationally optimistic expectations frequently emerge among investors in the late stages of major economic booms, differing sharply from most modern models of finance and relying on a more impressionistic theory of financial crises. When these optimistic expectations appear, investors grossly overestimate the future profitability of some promising firms. These overestimates lead unscrupulous managers to over-promote their firms vigorously and to issue bogus debt and equity with abandon. They may lead even well-meaning, sober managers to issue unsupportable amounts of debt. The more a firm's managers sincerely overestimate their firm's growth opportunities or successfully promote a Ponzi-style fraud, the more securities they try to issue. When the unrealistically high profits fail to develop as predicted, debt and stock values collapse. Markets for over-promoted financial assets may even dry up. The more severe the price decline, the more the collapsing value of previously highflying assets spreads insolvency to creditors of both the over-expanded firms and their stockholders.

Kindleberger observed that speculation in a bubble often develops in two stages. In the first, sober stage of investment, seasoned professional investors and analysts are gradually persuaded that bubble assets offer a good chance of high returns. In the second stage, 'professional company promoters – many of them rogues interested only in quick profits – tempted a different class of investors, including ladies and clergymen'. It is of course hard for any market participant or observer to know when the bubble has progressed from the first stage to the second.

Kindleberger concluded that stability is promoted when a lender of last resort exists and follows the recommendations of Walter Bagehot over a century ago in his *Lombard Street* (1873) to lend freely at punitive rates during a crisis. This is what a hegemonic power –the United States government internationally and the Federal Reserve domestically –should have done in the 1930s, in Kindleberger's view; it is what the International Monetary Fund should do today. His book has proved exceedingly popular with a varied audience: economists, investors and the general public alike. It was revised and expanded several times; the fourth edition was published shortly before Kindleberger's death, when he was 90 years old.

See Also

- ▶ Bubbles
- ▶ Great Depression
- ▶ Great Depression (Mechanisms)

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King, Gregory (1648–1712)

Phyllis Deane

Keywords
Davenant, C.; Demand analysis; Gregory King's Law; King, G.; National income accounting; Population estimation

JEL Classifications
B31

King was born in Lichfield in 1648, the son of a jobbing technician who had acquired a sufficient practical competence in mathematics to earn a modest livelihood practising as a surveyor, a sundial maker, a landscape gardener and even a teacher of bookkeeping. King himself, according to his autobiography, was educated partly at the local Free School and partly at home (for example, in bookkeeping and surveying) until he became clerk to Sir William Dugdale, then Norray King of Arms, whom he served for five years. This appointment set the course of his professional career as a herald, though he was to work for several years in London as a cartographer and engraver before being appointed Rouge Dragon in 1677, Registrar to the College of Arms in 1684 and eventually Lancaster Herald in 1688. After the accession of Queen Anne, when King's Tory bias ceased to be an obstacle to advancement in the public service, he held several appointments of an accounting nature, for example the secretaryship of the Commission of Public Accounts and secretary to the Controller of Army Accounts.

It was in the mid-1690s that King began to take an active interest in political arithmetic, or what contemporaries called 'the art of reasoning upon things relating to government', mainly as a result of his friendship with Charles Davenant, who was then playing a major role in the current debate on how to pay for the war.

Davenant's *Essay upon Ways and Means of Supplying the War* appeared in print in 1695 and in the following year King wrote his *Natural and Political Observations and Conclusions upon the State and Condition of England*, the work that established him as the leading political arithmetician of his day. Henceforth, he and Davenant, a prolific pamphleteer, systematically exchanged ideas and statistical estimates on the main policy issues facing government, and King owed his considerable early 18th-century reputation largely to the polemical use Davenant made of his estimates.

Indeed, King's most famous pamphlet was not published in full until 1802, when George Chalmers printed it as an appendix to his bestseller, *An Estimate of the Comparative Strength of Great Britain During the Present and Four Preceding Reigns*, which had already gone through several editions. It then directly inspired Patrick Colquhoun to produce a comparable estimate of social income, first for England and Wales in *Treatise on Indigence* (1803) and later for the United Kingdom as a whole in *Treatise on the Wealth Power and Resources of the British Empire* (1812). Much later still, in 1936, King's *Observations* was published again, this time together with his only other tract, *Of the Naval Trade of England 1688 and the National Profit Arising Thereby* (MS dated 1697), and with an introduction by the Professor of Statistics at The Johns Hopkins University. His estimates then acquired fresh importance as part of the evidence used by the growing army of mid-20th-century economic statisticians researching long-term trends in population and national income.

Gregory King's claim to fame as a demographer and a national income statistician rests on the imaginative skill, methodical consistency and intellectual integrity with which he compiled and applied the severely limited statistical raw material available to him. His deep respect for the truth and his readiness to respond fully and frankly to those of his contemporaries who doubted the validity of his estimates is exemplary and illuminating. Modern statisticians may argue with his results, but they cannot fail to take them seriously as informed estimates of the dimensions of population, national income and national capital of England at the end of the 17th century and of immediate past trends in those dimensions. Similarly, modern social historians may query the details of social structure implicit in King's oft-reprinted 'Scheme of the Income and Expence of the several Families of England Calculated for the year 1688', but the overall picture it presents and the notion of distinguishing between those groups which he conceived of as 'increasing the wealth of the kingdom' and those decreasing it, remains a pioneering and instructive analytical device.

The other field to which King is generally believed to have made an original pioneer contribution as an economic statistician is that of demand analysis. The law which is generally referred to as 'Gregory King's Law' postulates a systematic relationship between downward deviations from the normal corn harvest and upward deviations in the price of corn. It was attributed to King by Lauderdale in 1804 (though not by Davenant, who first spelt it out with the aid of a numerical example in 1699) and, among others, by Tooke in his *History of Prices*. Jevons estimated the equation implicit in the Davenant exposition in his *Theory of Political Economy* (1871) and so did G. Udny Yule in 1915. Whether it really did originate with King has not yet been established, but the attribution to him rather than to Davenant is highly plausible.

See Also

► Political Arithmetic

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Kinked Demand Curve

V. Bhaskar

Abstract

The kinked demand curve, one of the staples of oligopoly theory, was originally formulated as a theory of price rigidity. We review dynamic game-theoretic reformulations, which give rise to a theory of collusive price determination.

Keywords

Bertrand competition; Collusion; Cournot competition; Duopoly; Folk theorem; Kinked demand curve; Markov perfect equilibria; Oligopoly; Price rigidity; Quick response equilibria; Repeated games

JEL Classifications

D21; D43; L11; L13

The kinked demand curve (Sweezy 1939; Hall and Hitch 1939) has been one of the staples of oligopoly theory. It was originally formulated as a theory of price rigidity. A firm conjectures that its rivals will match its price if it reduces the price, but will not match its price if it initiates a price increase. This gives rise to a kink in the firm's perceived demand curve, at the prevailing price. The consequent discontinuity in its marginal revenue curve implies that the firm will not adjust its price in response to small changes in costs, giving rise to price rigidity.

In contrast with the standard Cournot or Bertrand models, the theory represents one of the first attempts at a dynamic model of oligopoly. However, this modelling has been criticized. Implicit in the analysis is the assumption that the firm is motivated by its profits after all price adjustments have taken place. That is, profits in the time interval, where a firm has cut its price and before its rivals have responded, are insignificant. However, if this is so, why does a firm in a symmetric oligopoly not initiate a price increase? If its rivals fail to respond in kind, it can rescind the original increase. Knowing this, its rivals would have an incentive to match its price increase, as long as the original price was below the monopoly price.

To address these questions, one needs to formulate oligopolistic interaction as an explicit dynamic game. The first option is the standard repeated game model, where one obtains an embarrassment of riches – the 'folk theorem' states that every individually rational feasible payoff is an equilibrium payoff, as long as firms are sufficiently patient (Anderson 1988, provides a foundation for the kinked demand curve in terms of 'quick response equilibria' of a repeated game, where the period length shrinks to zero). Second, one can model price setting as a dynamic 'pre-game' with profits depending only on the profile of final prices that results. This is the modelling choice adopted by Bhaskar (1988) and Kalai and Satterthwaite (1986). Third, Maskin and Tirole (1988) analyse the Markov perfect equilibria of a repeated game where firms take turns in choosing price. These theories of the kinked demand curve are not theories of price rigidity. In all these models, a firm is deterred from undercutting price by the knowledge that its rivals can respond. In consequence, they may be thought of as models of oligopolistic collusion.

We set out a variant of the model of Kalai and Satterthwaite, possibly the simplest of these models. Consider a homogeneous good oligopoly with n firms, where firm i has constant marginal costs ci. Let $D(p)$ denote market demand when p is the lowest price in the market, and assume that the revenue function, $p.D(p)$, is strictly concave. The game played by the firms has two stages, as follows. In stage 1, firms simultaneously choose prices. Given the vector of prices chosen, $(p_1, p_2, \ldots, p_n)$, let $\overline{p}$ denote the smallest of the prices chosen. In stage 2, firms may choose any price greater than or equal to $\overline{p}$. Our focus is on subgame perfect equilibria where firms do not use weakly dominated strategies in stage 1, given subgame perfect continuation play in stage 2. Let p_i^* denote firm i's optimal common price, that is the unique maximizer of firm i's profits when all firms choose the same price, $p_i^* = \text{argmax}_p \frac{1}{n}(p - c_i)D(p)$. Without loss of generality we may assume that firm 1 has the *minimum optimal common price*. If the cost asymmetries between firms are not too large, then this game has a unique equilibrium. In the first stage, each firm chooses p_i^*, and in stage 2 all firms reduce their prices to p_1^*. That is, the equilibrium outcome is at the minimum optimal common price. The intuition for this result is as follows. In stage 2, one has Bertrand competition with a price floor at $\overline{p}$, the smallest price chosen at stage 1, and all firms will choose $\overline{p}$ as long as it is not too low. Given this, a firm knows that it influences the common equilibrium price only in the event that its price is lower than everyone else's. This ensures that it is weakly dominant at stage 1 for the firm to choose p_i^*.

The model set out here incorporates a restriction on stage two behaviour, namely, that no firm can price below the lowest price chosen at stage 1. To avoid this restriction on undercutting one must formulate a dynamic game without a last stage, since otherwise the Bertrand outcome is irresistible. Bhaskar (1988) sets out a duopoly formulation where firms may repeatedly revise prices downward, and the pre-game ends when no firm

seeks to reduce its price. This game produces a similar equilibrium outcome to the one set out above. The theory does not imply price rigidity – if costs increase for firm 1, then this will increase the equilibrium price. The theory also has a flavour of price leadership, since the lowest-cost firm effectively selects the equilibrium price, with the follower firms having to follow suit. Indeed, the follower firms perceive a kinked demand curve at the equilibrium price. If a follower firm were to choose a higher price, firm 1 would not follow suit, thus ensuring that no other firm does so, while if it reduces price, all firms would match this.

Maskin and Tirole (1988) analyse a repeated duopoly where a firm's price is kept fixed for two periods, and where firms alternate in choosing price. They find multiple Markov perfect equilibria, with the unique symmetric renegotiation proof equilibrium giving rise to a kinked demand curve at the monopoly price.

The traditional kinked demand theory has been criticized on empirical grounds (Stigler 1947; Primeaux and Bomball 1974) since oligopoly prices do not appear to be excessively rigid, nor do they show the predicted asymmetry. However, this is not a prediction of the reformulated theories. These theories do predict that in any market, $n - 1$ firms (that is all firms except the leader) should *expect* their rivals to respond asymmetrically to their price changes, at the equilibrium price. Bhaskar et al. (1991) analyse survey evidence, where firms were asked how they expected their rivals to respond if they changed price. The survey data finds evidence of asymmetry in expected responses that is consistent with the prediction.

See Also

► Oligopoly

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Kitchin, Joseph (1861–1932)

S. N. Solomou

Keywords

Kitchin, J.; Trade cycles

JEL Classifications

B31

In 1888 Kitchin joined the staff of the *Financial News* as a compiler of statistics, with particular reference to the South African goldfields. In May 1897 he took up a business career in the South African mining industry. As a businessman Kitchin established a wide reputation for his statistical compilations and came to be regarded as a leading authority on the statistics of precious metals. He produced numerous articles on the theme and provided evidence before the Indian Currency Commission (1926), the Committee on Finance and Industry (1930) and the Gold Delegation of the Financial Committee of the League of Nations (1930).

Kitchin's work on money and gold gave him an interest in the study of trade cycles. His first study, which was a description of trade cycles since 1783, was published in *The Times Financial Review* in early 1921. In 1923 he published a study of British and American cycles during 1890–1922. Kitchin distinguished minor cycles of 40 months, major cycles of between 7 and 11 years, and trends dependent on the movement of world money supply. Although the existence of major cycles and secular trends was well established, the existence of a 40-month cycle was original to Kitchin. This cycle was seen to result from the psychological reactions to capitalistic production.

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Klein, Lawrence R. (Born 1920)

Roberto S. Mariano

Abstract

Lawrence Robert Klein, pioneer in economic model building and in econometric forecasting and policy analysis in industry and government, was awarded the Nobel Memorial Prize in economic sciences in 1980. He has established the directions and accelerated the development of the theory, methodology and practice of econometric modelling since the 1940s. He has provided a training ground in applied econometrics for academicians and practitioners worldwide. Lawrence Klein continues to develop and apply econometric methodology for high-frequency forecasting, using weekly and daily information, and for analysing current world economic issues.

Keywords

Aggregation; Capacity utilization; Clark, C. G.; Cost-of-living indexes; Cowles Commission; Econometric forecasting; Econometrics; Estimation; Expenditure side model; Flow of funds; Forecasting; Growth models; High-frequency forecasts; Income side model; Input–output analysis; Keynes, J. M.; Klein, L. R.; Klein–Goldberger model; Linear expenditure system; Macroeconometric models; Mathematics and economics; Morishima, M.; National Bureau of Economic Research; Phillips curve; Phillips, A. W.; Principal components model; Rational expectations; Representative agent; Sample survey method; Samuelson, P. A.; Simultaneous equations model; Statistics and economics; Theil, H.; Tinbergen, J.; Two-stage least squares estimator

JEL Classifications

B31

Lawrence Robert Klein 1980 Nobel laureate in economics, has been a pioneer in economic model building and in developing a worldwide industry in econometric forecasting and policy analysis. As Klein's Nobel citation states, 'Few, if any, researchers in the empirical field of economic science have had so many successors and such a large impact as Lawrence Klein.' When one thinks of macroeconometric models, his name is the first that comes to mind. Spanning six decades, his research achievements have been broad, covering economic and econometric theory, methodology, and applications. In emphasizing the integration of economic theory with statistical methods and practical economic decision-making, he played a key role in establishing the directions and in accelerating the development of the theory, methodology and practice of econometric modelling.

His pioneering efforts in the 1940s built on the earlier works of Tinbergen (in the League of Nations Secretariat in 1936–8) and Haavelmo (1943), the seminal treatise of Keynes (1936), and the then emerging toolkit in mathematics

and statistics for economic analysis. He was one of the first to establish an operational paradigm for macroeconometric models, and he developed statistical techniques for the estimation and application of these models. Always willing to give generously of himself as he interacted with students and colleagues, he has provided a training ground in applied econometrics for an impressive and long list of academicians, government officials and corporate executives from all over the world. Lawrence Klein continues to contribute in developing and applying econometric methodology for high-frequency forecasting, using weekly and daily information, and for analysing current world economic issues.

Lawrence Klein was born in Omaha, Nebraska on 14 September 1920. He obtained his undergraduate degree from the University of California at Berkeley in 1942 and completed his Ph.D. in Economics at Massachusetts Institute of Technology (MIT) in 1944. He has been professor of economics at the University of Pennsylvania since 1958. He founded Wharton Econometric Forecasting Associates (WEFA) and, as a principal investigator at the University of Pennsylvania, helped with Bert Hickman and Aaron Gordon to establish Project LINK. Together with Michio Morishima, he founded the *International Economic Review* as a joint publishing endeavour of Osaka University and the University of Pennsylvania. He has been President of the American Economic Association (1977), President of the Econometric Society (1960), editor-in-chief of *International Economic Review* (1959–65), and John Bates Clark Medalist (1959).

In 1980, he was awarded the Nobel Prize in Economics 'for the creation of econometric models and their application to the analysis of economic fluctuations and economic policies' (prize citation in the Alfred Nobel Memorial Prize in Economic Sciences 1980; also in Lindbeck 1992, p. 411).

Klein's experience as a youth in the Great Depression and his intense desire to understand what was going on led him to the study of economics. After spending two years in Los Angeles City College, Klein completed his last two undergraduate years at the University of California in Berkeley. With a keen interest in seeing how mathematics and statistics can be used in analysing economic problems, he worked with students of pioneers like Griffith Evans (professor of mathematics and a founding member of the Econometric Society) and Jerzy Neyman (professor of statistics and key developer of statistical theory). He also worked as a summer research assistant of George Kuznets in the Giannini Foundation. This summer work exposed him to perhaps his first foray into applied econometrics – estimating demand functions for Californian lemons! It was also during this time that Klein was introduced to the early scholarly works of Paul Samuelson, a serendipitous preparation for a long-time relationship that was to blossom as Klein moved to MIT for his doctoral studies.

On graduate scholarship at MIT, Klein was Paul Samuelson's research assistant from the outset. As Klein himself remarked:

> Working with Samuelson, who was at the forefront of interpreting Keynesian theory for teaching and policy applications, I was put immediately in the midst of two challenging contests – one to gain acceptance for a way of thinking about macroeconomics and another to gain acceptance for a methodology in economics, namely, the mathematical method. Later, both challenges were to be overcome, but for ten or twenty years, opposition was fierce. (Breit and Hirsch 2004, p. 18)

He would elaborate further on this:

> working as an assistant for Samuelson was something that is very hard to duplicate anywhere in the world. He generates ideas so fast. At that time, there was a whole succession of ideas concerning Keynesian macroeconomics and econometrics and the development of mathematical methods in economics. It was a very exciting time, and I felt very fortunate to be in that background. (Mariano 1987, p. 411; and Klein 2006)

At that time, when Haavelmo's celebrated *Econometrica* paper (Haavelmo 1943) was circulating as a working paper, the treatment of identification in econometric models led Samuelson to ask Klein to investigate the mathematical equivalence between the problems of identification in supply–demand models and in saving–investment analysis.

It was during his graduate student days that he started working on two papers that were later published in *Econometrica* and the *Journal of Political Economy.* The first, published in 1943, studied the specification of the investment function, while the second (1947) dealt with alternative theories of effective demand. Considered a seminal paper in the debate between the Keynesians and the classical economists, this latter paper formulated the Keynesian system in mathematical terms and argued that the specification of the liquidity preference function and determination of money wages are keys to the Keynesian system.

Klein completed his degree in two years, as Samuelson's first Ph.D. student. His thesis, dealing with Keynesian economics, led in 1947 to the publication of *The Keynesian Revolution,* which was to become one of Klein's best-known works. The book provided the mathematical specification of Keynes's ideas that served as the foundation for the economic models that Klein formulated subsequently.

After finishing at MIT, Klein accepted Jacob Marschak's invitation in 1944 to become a research associate in the Cowles Commission at the University of Chicago. This turned out to be a defining period for Klein's professional career. His interactions with an unusually talented group that included J. Marschak, T.W. Anderson, H. Rubin, M. Girschick, T. Haavelmo, T. Koopmans, D. Patinkin, L. Hurwicz, K. Arrow, H. Simon, R. Leipnik, H. Chernoff, and visitors such as J. Tinbergen, R. Frisch and M. Kalecki proved to be a catalyst for his development into an applied econometrician par excellence. His MIT work on Keynesian economics began to evolve at this time into applied econometric modelling. While teams were formed to work on various aspects of an emerging econometrics field, Klein focused his energies on what was to become his lifelong endeavour. He described his task in the Cowles Commission as follows:

> The central problem posed for research at Cowles by Jacob Marschak and Tjalling Koopmans was a fresh attempt at U.S. model building by using Haavelmo's new ideas about econometric theory. ... Jacob Marschak insisted that I base my econometric modelling on received economic theory and that I justify macroeconomic specifications on the basis of reasoning about individualistic decision making, with proper attention to the problem of aggregation. ... It turned out to be an exciting time for me and enabled me to build on the Keynesian lessons that were taught to me at MIT by Paul Samuelson. ... That was the beginning of my long association with the problems of macroeconometrics that were then being tackled afresh at the Cowles Commission. (Marwah 1997, pp. xx–xxii)

At Cowles, Klein completed his first series of macroeconometric models. The celebrated Klein Model 1 was part of this series. It was initially developed as a compact prototype model of the US economy to study computational methods. It has now become a standard reference in most introductory econometrics textbooks. Klein also put his models to work to answer pressing questions about the post-war US economy posed by professional colleagues like Albert Hart from the Committee for Economic Development, Theodore Yntema (former director of the Cowles Commission), and Alfred Cowles himself, who was a member of the Budget Committee of the Community Fund in Chicago. Klein's models proved useful in forecasting what was in store after the war – predicting that the US economy would not return to the Great Depression.

Klein's interactions with his peers at Cowles deepened his interest in statistical methodology, especially in estimation and prediction in simultaneous equations models. He developed a keen attention to detail in estimation in empirical work and a firm belief in the value of 'high technology' estimation procedures. At this juncture, he also started his joint work with Herman Rubin on the linear expenditure system for studying cost-of-living indexes in the context of a neoclassical demand model (see Klein and Rubin 1947) as well as on aggregation issues and demand systems. During this period, Klein completed most of the material for another major work, *Economic Fluctuations in the United States, 1921–1941,* which was published in 1950.

In the summer of 1947, Klein left the Cowles Commission, briefly to help in the initial econometric model building effort in Canada, then to spend the greater part of the year to visit Ragnar

Frisch's Institute in Oslo and Jan Tinbergen's office in the Central Planning Bureau in the Netherlands.

Klein then joined the National Bureau of Economic Research (NBER), at the invitation of Arthur Burns, to undertake econometric studies of production functions. Interested in investigating the influence of liquid assets on saving behaviour, Klein moved to the University of Michigan in 1949, initially as researcher in the Survey Research Center for one year, then lecturer in economics from 1950 to 1954. Having become involved with the sample survey studies in the Center, Klein produced a number of publications on savings and consumption behaviour using survey data, culminating in a book on the contributions of survey methods in economics (Katona et al. 1954).

While at Michigan, Klein noticed a considerable interest in the forecasts about the state of the economy and the use of econometric models and also resumed the econometric modelling work that he started at the Cowles Commission. With Arthur Goldberger, his doctoral student at Michigan, he developed what has come to be called the Klein–Goldberger model of the US economy. As the first substantial effort at an empirical representation of a large economy with a theoretical Keynesian structure (see Klein and Goldberger 1955), this model has become an important reference to students and researchers in econometrics. This model has become a standard example in econometric textbooks, making very realistic simulation projections about the small recession following the Korean War. Klein and Goldberger initially published this result in the *Manchester Guardian* to challenge a very pessimistic econometric forecast by Colin Clark. Another major piece of work during this time was his textbook on econometrics, the first to provide a blend of theoretical, methodological and applied developments in econometrics (Klein 1953).

The University of Michigan was to promote Klein to full professorship but then reneged when Klein testified in a Detroit hearing that he had been a member of the Communist Party for about six months in 1946. (Subsequently, in 1978, the university awarded Klein an honorary doctoral degree in which the citation stated that he would probably be a Nobel laureate.) Oxford University's Institute of Statistics quickly invited him to join its staff, which he accepted, becoming first Senior Research Officer from 1954 to 1955 and Reader in Econometrics from 1956 to 1958. As Klein himself explained in Breit and Hirsch (2004): 'In the McCarthy era, I left Michigan for the peace and academic freedom in Oxford.' At that time, the Oxford Institute of Statistics was undertaking the Oxford Savings Surveys in partnership with the UK government, an enterprise in which Klein played a substantial role. He also developed an econometric model of the UK economy, which was published in Klein et al. (1961).

In Oxford, Klein was 'given the green light to do what he thought could be done within the confines of the Oxford system in teaching, attracting attention in seminars, and doing research activities in econometrics' (Mariano 1987, p. 422). It was in this period that he produced his more intuitive instrumental variable interpretation of Theil's two-stage least squares estimator (Klein 1955). Carrying over research initiatives from Cowles Commission work, Klein also looked into the statistical efficiency gains from imposing a priori restrictions on an economic system. Klein had numerous productive discussions with colleagues, including Peter Vandome and Michio Morishima, and with A. W. Phillips about the Phillips curve and how it relates to his own ideas about closing the Keynesian system for the determination of absolute prices and wages. His discussions with Jim Ball and Peter Newman about growth theory and growth models led to his idea of constructing a total growth model of the economy in terms of stable ratios as limiting conditions in economics. Some of these ideas that circulated in Oxford were eventually refined in Klein's early years at the University of Pennsylvania (for example, Klein and Kosobud 1961).

Klein returned to the United States in 1958 – partly under family pressure, to help ageing parents – and joined the economics faculty of the University of Pennsylvania. University President Gaylord Harnwell and Provost Jonathan Rhoads told Klein that they did not have any

interest in his political beliefs and simply wanted him at the University of Pennsylvania to teach econometrics: the University of Pennsylvania remains his main base of operations. He produced a host of academic publications and contributions to both economics and econometrics and he created innovative ways of financing major economic research with fresh linkages with industry and government. He also played a key role in shaping the Economics Department into its position today as one of the top economics departments in the United States.

Klein's academic research at the University of Pennsylvania returned to favourite themes such as estimation and prediction in simultaneous equations models of economic systems (Johnston et al. 1974; Klein 1969; Klein et al. 1970; Klein and Howrey 1972; Klein and Nakamura 1962; and Klein and Young 1980). Some work opened up new issues such as the theoretical and empirical difficulties involved in measuring and tracking capacity utilization (Klein 1960a; Klein and Summers 1967; Klein and Preston 1967; Klein and Su 1979). Klein's subsequent research themes delved into economic techniques, analysis, and policy, dealing with diverse topics in economic theory, econometric methodology and forecast uncertainty, microfoundations and linkages of the macro Keynesian paradigm, the role of expectations in empirical economic models, anticipations and forecasting, the Phillips curve, international economics and finance, economic growth, and policy formulation. At the same time, in a synergistic fashion, he continued and sustained his work on macroeconometric modelling, developing numerous econometric models for a vast array of applications. Prominent examples of these are the SSRC–Brookings model of the US economy, the Wharton School models of the US economy (medium-term and long-term), and the Project LINK world model.

Klein's methodological approach in econometrics blends economic analysis, statistical method and mathematics. Many times in his writings he would strongly recommend that the best approach to applied economic modelling is to first develop an underlying theory, then move on to observation and the preparation of a database with the statistical methodology to construct, test and apply the empirical model.

He is wary of oversimplification in economic modelling, because, he says, the problems are complicated and can be understood only in the context of large complex systems. His starting premise is that 'the real world is very complicated and cannot be effectively understood or guided by simple rules, such as those that underlie monetarism or those that can be treated by single equation time series methods or even those that can be treated by vector autoregression (VAR) methods' (Marwah 1997, p. xxiv). It is his long-standing conviction that detailed structural modelling is the best kind of system for understanding the macroeconomy through its causal dynamic relationships, specified by received economic analysis. However, with more time-series information becoming available on weekly, daily, hourly, and real-time basis, he also feels that there are related approaches, based on indicator analysis, that are complementary, especially for use in high-frequency analysis.

Klein disagrees with the notion that macroeconomics is simply an adding up of the propositions of microeconomics (for example, see Klein 1993). He argues that macroeconomics stands on its own as a separate subject and cannot be entirely derived from microeconomics. In his view, there are important concepts and analyses that are inherently macroeconomic. And, of course, there are also important macroeconomic propositions that can be derived from microeconomics, but only after paying painstaking attention to the formulas and processes of aggregation. And on the issue of aggregation, which he had studied since his undergraduate days in Berkeley, he maintains in subsequent analyses that 'macromodeling in terms of unweighted aggregates or, even worse, in terms of the "representative agent", fails to deal with the relevant distribution issues' (Marwah 1997, p. xxi). There are two dimensions to aggregation, over commodities and services and over economic units (firms and households). Specific and narrow market analyses, involving intricate aggregation over economic units, are important in price determination; yet they are not purely microeconomic since they involve aggregation in various dimensions.

Klein believes that the market system cannot provide adequate self-regulatory responses in an economy. The economy definitely needs guidance and Klein looks to professional economists to provide policymakers with the right information for appropriate decision-making and leadership. On methods for doing this, according to Klein, there is no alternative to the quantitative approach of econometrics, but with the realization that not all policy issues are quantitative and measurable, and that subjective decisions must also be made (see Klein 1992). Furthermore, econometric information must be detailed if it is to be useful in policy formation. In general, there is a need to move in the direction of preparation of large-scale complex systems in order to help policymakers. Significant advances in computer technology and the provision of detailed information through associated telecom processes make it possible to push econometrics in the direction of truly serving policymakers (see Klein 1986).

Klein also sought to extend the narrow Keynesian model serially to the supply side, the open economy and the developing economy by integrating his conception of Keynesian theory with other branches of economics such as international trade and economic development. And he enhanced his model structure further not only with the flow-of-funds accounts but also with the introduction of input–output analysis. He felt strongly that the economic model structure must interface with the social accounts especially when supply side, industry, and longer-term analysis are of major concerns in the study. Thus, Klein's modelling team at the University of Pennsylvania produced standardized procedures for combining input–output analysis with macroeconometric modelling in a feedback mode (see Klein 1989; Klein et al. 1991).

Klein draws upon explicit surveys of consumer and manufacturer expectations to develop a powerful and meaningful way of dealing with expectations in macroeconometrics. He believes that the 'rational expectations' approach – where expectations are treated to be fully consistent with the model being estimated – is 'unrealistic and singularly unhelpful in guiding economic policy or in forecasting' (Marwah 1997, p. xxiii). The most important analyses of expectations will come through the in-depth use of the sample survey method. Along these lines, Klein's research sought to endogenize measured expectations and to include anticipatory variables in his macroeconometric models (orders, investment intentions, housing starts, building permits, survey responses about future spending, incomes, or price movements: see Klein 1972; Adams and Klein 1972; and Klein and Ozmucur 2007).

In the early stages of his career, Klein considered the real sector as the key focus of the analysis and that a good understanding of the economy is possible without careful reference to the monetary sector. But in studying the macroeconomy, he has increasingly come to appreciate the role of money and of the whole monetary sector. For example: 'Monetarism is fundamentally flawed, and dangerous when used as a doctrinaire policy approach, but I do believe that money matters; it is not everything but it does matter' (Klein 1992, p. 188; also in Marwah 1997, p. xliv). But he remarks further that science, technology, development, and innovation play important roles in the dynamics of the economy and that this interpretation of the supply side is different from and far more important than the simplistic and populist approaches through tax cuts.

In using his empirical models to forecast, Klein has always been concerned with how to adjust the model so that it would start on a forecast extrapolation at prevailing initial values. A particular concern was the frequent data revisions and new information flows about exogenous and endogenous variables at the very moment of forecast calculation. One approach – subjective adjustments to initialize the extrapolation process – is not replicable and is not satisfactory. Since the 1980s, Klein has been using time series methods to extrapolate higher frequency indicators for purposes of initializing the empirical macromodel (Klein and Young 1980; Klein and Sojo 1989; Klein and Park 1993; Klein and Ozmucur 2007).

Klein has always been conscious of the statistical uncertainties involved in the results of econometric model building and application. Consequently, coping with forecast errors from macroeconometric models is a constantly

recurring theme in his research agenda. And he has developed methods for assessing the degree of uncertainty in econometric inference, in particular model simulation techniques to evaluate forecast errors of large-scale models and to perform sensitivity analyses of these models (Klein and Howrey 1972; Johnston et al. 1974; Klein and Marquez 1989; and Klein 1994).

Construction of the Wharton models started with a Rockefeller Foundation grant in the early 1960s. This was followed by the establishment of the Wharton Econometric Forecasting Unit as a research group at the Wharton School for general quantitative studies in economics, financed by the Ford Foundation and the National Science Foundation. Subsequent funding came from several major corporations that sought Klein's help in econometric model building to assist their economic research departments. Since this activity thrived, the unit was formally incorporated in 1969 as a non-profit entity, fully owned by the University of Pennsylvania, and with the name Wharton Econometric Forecasting Associates (WEFA).

Through WEFA, Klein was able to tap major sources of funding and channel these towards the establishment of the University of Pennsylvania as a premier centre of academic research in applied econometric analysis. Through the 1960s, 1970s, and 1980s, WEFA earnings from research consultancies for private companies, and public agencies were ploughed back to support economics faculty, graduate students, and visiting scholars in the University of Pennsylvania. The commercial work within WEFA itself also pioneered the logical development and computer handling of large- scale systems.

While at the University of Pennsylvania, Klein also pursued his interests in international model building. In the 1960s, he started his work on modelling the economies of Japan, the Organisation for Economic Co-operation and Development (OECD), and Latin American countries, starting with Mexico, Brazil and Argentina. These model-building efforts then spread out into many developing countries in Asia, including China, and some in the Middle East. Klein headed the first delegation of academic economists from the US to China in 1979. The following year, in collaboration with Lawrence Lau, Klein convinced the Chinese Academy of Social Sciences to host an econometric workshop at the Summer Palace in Beijing. The workshop staff, consisting of Klein, T.W. Anderson, Albert Ando, Lawrence Lau, Gregory Chow, Cheng Hsiao and Vincent Su, introduced econometrics and related aspects of empirical economic model building to the then nascent community of Chinese economists. Klein also directed related efforts to socialist nations. All these efforts naturally led to Project LINK.

Project LINK was one of the biggest and most ambitious projects that Klein mounted, with initial funding support in 1968 from the Ford Foundation, National Science Foundation, the International Monetary Fund and the Federal Reserve Board. The project sought to integrate the macroeconometric models of different countries, which eventually included Third World and socialist nations, into a total simultaneous system through international trade and financial flows (for example, see Klein 1983; and Klein and Hickman 1984). The main objective was to improve understanding of international economic linkages and to make improved forecasts of world trade. Over the years, this worldwide project has provided an important research forum that brings together model builders from many countries to share each other's developments and to discuss in a systematic way world economic prospects and pressing economic policy challenges. Project LINK also has provided a critical impetus for the development of economic and econometric analysis in socialist and Third World countries. Today, Project LINK is headquartered at the University of Toronto and the United Nations office in New York. It involves approximately 100 countries worldwide.

One of Klein's research works now deals with forecasting with high-frequency data through the University of Pennsylvania Current Quarter Model (CQM) (see Klein and Sojo 1989; Klein and Park 1993; and Klein and Ozmucur 2007). This model embodies a constant effort to improve forecasts by combining results from different methods, namely the expenditure side model, income side model, and the principal components

model of an economy. It combines data at different frequencies to enable use of all available information. High-frequency forecasts are useful not only for studying the short-term developments of the economy but also for adjusting lower-frequency macroeconometric models so that they are solved from up-to-date initial conditions. The University of Pennsylvania Current Quarter Model has generated a great deal of interest in high-frequency macroeconometric models. Klein has authored or advised the building of similar models for Russia and China (see Klein and Mak 2005) and he is in the process of contributing to building a model for India. There are also efforts, mostly by Klein's students, to build high-frequency models for other countries such as Japan, Mexico, Hong Kong, France and the European Union.

Klein's efforts to improve forecasting accuracy also have moved in the related direction of building models that include survey results (households, investors, and managers: see Klein and Ozmucur 2007). And his constant attempt to answer pressing substantive issues has led to recent applied and technical papers on using input–output tables with econometric models (Klein 2003; on information technology and productivity, see Klein et al. 1999, 2003, 2004; on estimating China's economic growth rate, Klein and Ozmucur 2002/2003; and on financial crises' challenges and cures, see Klein et al. 2007; and Klein and Shabbir 2007).

In addition to the academic activities that this article has focused on, Klein has been active throughout his career in non-academic pursuits as well. He chaired the economic task force of Jimmy Carter in the US presidential election campaign in 1976. He served on the Finance Committee of the National Academy of Sciences and on the Board of Directors of W.P. Carey Co. He found time to contribute journalistic pieces about economic affairs to the *Los Angeles Times*, *Manchester Guardian,* and *Banker's Magazine;* and to be a founding officer and active moving force of the Economists Allied for Arms Reduction (ECAAR), now Economists for Peace and Security (EPS). All these activities have produced an illustrious line-up of students and colleagues who have benefited from their collegial training and/or collaboration with Klein. Many of them are in the highest levels in major academic institutions, leading companies in the private sector, multinational organizations and government agencies all over the world.

Klein has developed and moulded macroeconometric models for over six decades in his own inimitable way, addressing the soundness of the theoretical basis for the model specification, using empirical evidence and data and appropriate methodology to estimate and validate and apply the model for the purposes that drove its creation. Over the years, these models have evolved in terms of complexity, breadth, and new econometric methodologies. And these models have been constructed and applied to address a wide variety of issues such as post-war economic policy formation in the 1940s (his mission at the Cowles Commission), the oil price shocks and the ensuing stagflation in the United States in the 1970s, impact and policy implications of the financial crisis in the 1990s, impact of tariff and non-tariff barriers on regional trade flows, policy analysis of regional trade groupings and various international agreements (for example, Uruguay Round, NAFTA, APEC, WTO), capital flows, economic development all over the world, and explaining endogenous exchange rates after the demise of Bretton Woods parities.

Though Klein had the benefit of Tinbergen's early work as well as the post-war effort at the Central Planning Bureau in the Netherlands, Klein's modelling work was akin to the original model T Ford out of which many other models developed in different parts of the world. Klein's own work has shaped developments in the field quite uniquely and has influenced model builders on a worldwide scale.

'His principal achievement has been in pioneering an activity in the field of economic model building which has required foresight, persistence and great technical skill and which has been translated into a paradigm of research activity that has spread wherever statistical economics is taught and wherever models are

built' (Ball 1981, p. 92). Undoubtedly, he continues to inspire, teach, lead, explore and push the intellectual and academic frontiers of the pursuits that continue to define his lifetime of pioneering work.

See Also

- ▶ Econometrics
- ▶ IS–LM in Modern Macro
- ▶ Keynesian Revolution
- ▶ Lucas Critique
- ▶ Macroeconomic Forecasting
- ▶ Phillips Curve (New Views)
- ▶ Simultaneous Equations Models
- ▶ Structural Vector Autoregressions
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- ▶ United States, Economics in (1945 to present)

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Knapp, Georg Friedrich (1842–1926)

B. Schefold

Keywords
Capitalism; Feudalism; Gold standard; Hereditary bondage; Knapp, G. F.; Monetary theory; Money; Mortality; Paper money; Peasants; State theory of money

JEL Classifications
B31

Knapp was born in Giessen, the son of a professor of technological chemistry who was also temporarily director of the Königliche Porzellanmanufaktur. Justus von Liebig, the famous chemist, was his uncle. Knapp studied in Munich, Berlin and Göttingen, and in 1867 became head of the statistical office of the municipality of Leipzig, in 1869 extraordinary professor of economics in Leipzig and in 1874 professor in Strassburg. He was one of the leading German 'Kathedersozialisten' (socialists of the chair), and cofounder of the Verein für Socialpolitik.

At the beginning of his career he carried out some important work in statistics: he was the first to develop a systematic theory of mortality measurement (1868), and he applied mathematical methods to demographical problems (1874). After his appointment to Strassburg in 1874, his research shifted to German agricultural history. He compared the economic organization of agriculture in the different parts of Germany (1925–7, vol. 1, ch. 3), his special interest being focused on the agrarian conditions in the German East. In a work now regarded as classic (1925–7, vols 2 and 3), Knapp described the peasant liberation and the rise of a class of rural workers in the long-settled provinces of Prussia. Around the turn of the 19th century, property relations in the rural parts of Eastern Prussia were dominated by the estate

economy (Gutsherrschaft), which had arisen out of medieval landlordship (Grundherrschaft). It was characteristic of the estate economy that the peasants, who could own land, were obliged to do compulsory service on the land of the Junker, and remained in hereditary bondage (Erbunterthänigkeit). In Knapp's view, the latter had to be distinguished from slavery/serfdom and was not medieval at all, but inherently modern. Knapp perceived the estate economies as the first large capitalist enterprises and regarded hereditary bondage as the earliest capitalist labour constitution, a very controversial view. Thus Knapp emphasized that the origins of capitalism should be sought in agriculture (1925–7, vol. 1, ch. 2, pp. 91 –106).

This system was to be changed by the reforms under Stein and Hardenberg (1925–7, vol. 1, ch. 2, pp. 107–23), which aimed at the abolition of hereditary bondage. However, under the pressure of the Junker, who were interested in maintaining an abundant labour supply for their estates, only wealthy peasants were allowed to own landed property; the others were transformed into wage labourers working on the Junker estates. Compensation payments for the Junker allowed them to absorb many peasant holdings. This implied a loss of the former feudal protection of the labourers. Thus the Prussian agrarian reforms resulted in a restructuring of the organization of agriculture, which worsened the social situation of large parts of the peasantry and strengthened the position of the Junker as the dominant class of Prussia and later of Imperial Germany. In order to avoid such failures for the future, in order to curb profit interests and prevent the harmful effects of class struggle, Knapp advocated strong state intervention and a typical German solution to the problem: a state ruled by civil servants (Beamtenstaat) (1925–7, vol. 1, p. 122).

At a later stage in his career Knapp became interested in monetary theory. His *Staatliche Theorie des Geldes* (State Theory of Money) (1905, ch. 4) was the counter-revolution against the traditional classical and neoclassical theories of money. These theories regarded it as a logical necessity for money to consist of (or to be 'covered' by) a commodity, generally gold, silver, or both, whose exchange value or purchasing power would then determine the exchange value or purchasing power of money. Knapp defined money independently of its material value as the creation of the legal order of the state. Consequently, he was able to explain theoretically the existence of 'paper money'. Contrary to many of his followers, this did not lead Knapp to oppose the gold standard. He generally refrained from discussing monetary policy and tried to concentrate on the conceptual problems of monetary theory. In fact, the state theory of money did not really constitute a monetary theory, but was rather an analysis of the legal and historical aspects of money. In this sense it was supposed to be a precondition of monetary theory.

Knapp's approach aroused stormy controversies. It was extremely popular among those German economists who associated the gold standard with the international supremacy of the London money market. More importantly, both Knapp's institutional approach and his rejection of the quantity theory of money, his theoretical assessment of price increases being independent of the quantity of money and determined by 'real' phenomena such as wages and incomes (1905, pp. 436–48), constituted a first step towards the later theories of Keynes and his school.

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Knies, Karl Gustav Adolf (1821–1898)

B. Schefold

Keywords

Causality in economics; Culture and economics; Knies, K. G. A.; Labour theory of value; Marx, K. H.; Ricardo, D.; Roscher, W. G. F.; Walras, L.; Weber, M.

JEL Classifications

B31

Karl Knies was born in Marburg, the son of a police employee. He studied history and political science in Marburg, and in 1846 was appointed university lecturer. In 1855, after a break in his career due to political problems, he was appointed professor in Freiburg. He transferred to Heidelberg in 1865, where he taught until 1896.

Knies was a progressive liberal with an outstanding sense of political integrity. His refusal to sign a declaration of loyalty to a reactionary state minister prevented his appointment to a professorship after the failure of the revolution of 1848, and compelled him to emigrate to Switzerland. From 1861 to 1865 he was a member of the Diet of Baden, where he actively opposed the control of the school system by the Catholic Church.

Knies, who had a profound influence on Max Weber, was one of the most important economists of the German 'older' historical school. He favoured the inductive method (1853, pp. 321–55), regarding facts derived from experience as more important than logical postulates. Strongly opposed to any 'absolutism of theory', to any theoretical assessments that claimed to be valid for all times and all people, Knies rejected the existence of general economic laws (1853, pp. 235–49), and strongly objected both to the abstract deductive reasoning of Ricardo and to the mathematical approach of Walras. Political economy has to do with the permanently changing habits and behaviour of human beings. Therefore economic analysis has to be oriented towards practical life, taking account of the peculiarities of different people and nations and different historical circumstances – Knies puts the emphasis on the historical relativism. By comparing economic relations of different countries and different historical times we may find laws of analogy, but certainly no laws of the same causal nexus. In his opposition to such laws Knies went further than other exponents of the older historical school such as Roscher.

Knies's main work on political economy (1853) was totally different from traditional textbooks. The reader will look in vain for separate chapters on prices, wages and rents. Rather, he will find a treatise which is strongly history-oriented and focuses on the impact of history and geography on the characteristics of different people and economies, and on problems of method. Knies attacked the classical notion of self-interest as the central regulating mechanism of economic behavior and emphasized the equal importance of the sense of membership in a community, justice and fairness (1853, pp. 147–68). He was interested in the interdependence of economics with general cultural and political life and therefore objected to an isolated study of political economy. He focused closely on the national character, and on the peculiarities and uniquenesses of different peoples, nations and races (pp. 57–70).

He also provided an analysis of money, capital, credit and interest (1873; 1879). He outlined a concept for a world currency as an international means of payment (1874). However, his analysis followed conventional methodological patterns; he did not succeed in applying the

historical method to the analysis of concrete economic problems.

Knies was one of the rare bourgeois economists of 19th-century Germany who discussed Marx. He took special interest in the Marxian labour theory of value, which he opposed because of its neglect of the centrality of use value (1873, pp. 117–43).

Knies had a flexible approach towards state interventionism, which he regarded as necessary in certain cases. On the tariff question he took a stance similar to List: for an industrializing country tariffs are necessary to protect its young industry against the competition of more advanced foreign industries. Knies was also concerned with the economic and cultural implications of railroad transportation and with new systems of communication.

In an outstanding contribution to statistics Knies (1850) attempted to develop statistics as an independent discipline based on exact mathematical methods.

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Knight, Frank Hyneman (1885–1962)

George J. Stigler

Abstract

A founder of the Chicago School, Frank Knight in his 1921 classic *text Risk, Uncertainty and Profit* defined perfect competition and distinguished risk from uncertainty in that under uncertainty the probability of events was unknowable. He criticized Pigou's proposal that increasing-cost industries should be taxed. His work on capital theory refuted Böhm-Bawerk's use of the period of production concept. Yet he conceived of economics as applying to only a small part of human activity; he criticized competitive enterprise as intrinsically unethical and unfair and debasing in practice, and feared freedom would be undermined by increasing monopoly and income inequality.

Keywords

Böhm-Bawerk, E. von; Capital theory; Comparative costs; Curves of diminishing returns; Dimensionality; Diminishing returns; Ethics of competition; External economies; Friedman, M.; Graham, F.; Hayek, F. von; Hutchison, T. W.; Inequality of income; Kaldor, N.; Knight, F. H.; Lange, O.; Machlup, F.; Marshall, A.; Monopoly; Moral hazard; Perfect competition; Period of production; Pigou, A.C.; Positivism; Price theory; Probability; Rent; Risk; Robbins, R.; Sombart, W.; Spencer, H.; Stigler, G. J.; Time periods in production; Uncertainty; Weber, M.; Young, A

JEL Classifications

B31

Knight was born in McLean County, Illinois, on 7 November 1885, the first of eleven children of Winton Cyrus Knight and Julia Ann Hyneman Knight, farmers of Irish descent residing in

southern Illinois. Two of Frank Knight's brothers, Melvin Moses and Bruce Winton, also became economists. Bruce once recounted an episode characteristic of his oldest brother. Under the suasion of their deeply religious parents, the children signed pledges at church to attend church the rest of their lives. Returning home, Frank (then 14 or 15) gathered the children behind the barn, built a fire, and said, 'Burn these things because pledges and promises made under duress are not binding.'

Knight pursued his education through a series of schools and small colleges in the Midwest (see Dewey 1986). His academic work was unfailingly marked by hard work, high intelligence and excellent grades, and one suspects that he was unfair to both himself and the poverty of his family when he once remarked that it would have been difficult to have chosen these institutions more unwisely. This preparatory period ended with two years at the University of Tennessee, and in 1913 Knight went to Cornell University, first to study philosophy and a year later (with the eager assistance of the philosophy department) he transferred to economics. His main teachers were Alvin S. Johnson and Allyn A. Young. He wrote a dissertation, 'A Theory of Business Profit' (1916), which displayed an astonishing depth and breadth of knowledge of the theory of value and distribution to have been acquired so quickly. With significant revision, the thesis appeared in 1921 as the *classic Risk, Uncertainty and Profit.*

Knight's subsequent academic career is easily summarized. After a year of teaching at Cornell and two (1917–19) at the University of Chicago, he went to the University of Iowa where he was an associate and then a full professor for eight years. In 1927 he returned to the University of Chicago, where he taught until 1958 and remained for the rest of his life. (Cornell in 1928 and Harvard in 1929 unsuccessfully attempted to lure him away.) The main courses he taught were in value and distribution and the history of economic thought, although occasionally he offered different topics (the present writer was one of a small number of students in a seminar on Max Weber in the mid-thirties). He was clearly the dominant intellectual influence upon economics students at Chicago in the 1930s (on his teaching, see Patinkin 1973 and Stigler, in *Journal of Political Economy* 1973).

He received the major honours that his profession could give him: the presidency of the American Economic Association in 1950, after he refused to be nominated in 1936 and 1937; and the Association's highest award, the Walker Medal, in 1957.

In 1911 he married a classmate at Milligan College, Minerva O. Shelburne, and they had three daughters and a son. They were divorced in 1928. In 1930 Knight married Ethel Verry, a social worker who was for many years the director of the Chicago Child Care Society, and they had two sons, Frank Bardsley, a mathematician, and Charles Alfred, a geologist. Knight died in Chicago on 15 April 1972.

The Economist

Knight's dissertation, 'A Theory of Business Profit' was presented to Cornell University in June 1916. This was a short two years after he transferred to economics from philosophy, although evidently his interest in economics had begun earlier. (In 1913 he was already purchasing Marxist, Fabian and syndicalist pamphlets on a visit to London.) One can find much of Knight's mature thought in the thesis, which was completed when he was almost 31 years old.

The revisions of the thesis which appeared as *Risk*, *Uncertainty and Profit in* 1921 were substantial but not radical. Allyn Young reviewed the manuscript for the book and repeatedly asked him to 'avoid the *appearance* of bumptiousness' (Knight Papers, Box 54, folder 14), but the suggestions went unheeded. The three chapters in the thesis on the nature of perfect competition under stationary conditions became the four chapters of Part II of *Risk, Uncertainty and Profit* (hereafter RUP) with significant additions: the famous Knightian curves of diminishing returns (RUP, pp. 96ff.) made their first appearance, and the essence of the theory of the dominant firm was now mentioned (p. 193n). This section continued to present a clear, succinct statement of neoclassical price theory, and one can readily understand

why Lionel Robbins made it a basic text at the London School of Economics.

Knight said in this thesis that 'The definition of perfect competition ... is our principal task in this essay' (p. 8), and it was certainly an enormously influential part of the book. Knight's conditions must have seemed extraordinarily severe to his readers: he required infinite numbers of independent traders, free and instantaneous mobility of resources and communication of knowledge, perfect knowledge and fore-knowledge, and infinite divisibility of traded goods (*RUP*, pp. 76*ff.*). Even today we do not normally find it useful to postulate such extreme simplicity in the economy, so that even time and space are eliminated. Some of the subtle conditions, such as that the individual 'must be free to social wants, prejudices, preferences, or repulsions' (p. 78), are not developed sufficiently to reveal their relevance or implications.

The treatment of risk and uncertainty quickly became Knight's 'contribution'. Risk was characterized by the reliability of the estimate of its probability and therefore the possibility of treating it as an insurable cost. The reliability of the estimate came from either knowledge of the theoretical law it obeyed or from stable empirical regularities:

The crux of the whole question of probability, whether pure or empirical, for purposes of economic theory, is that in so far as the probability can be numerically evaluated by either method, it can be eliminated and disregarded (Thesis, p. 186).

In economic life of course the empirical probabilities are the important ones.

True uncertainty is to be 'radically distinguished' from calculable risks: here 'there is no *valid basis of any kind* for classifying instances' (*RUP*, p. 225, his italics; also p. 231). Knight believed that uncertainty cannot be explicitly and exactly defined, but one could read Bayesian elements into his discussion of probability (compare Thesis, ch. 6, with *RUP*, ch. VII).

The latter part of both the thesis and the book lack substantive structure. There is fertile, unsystematic attention to the use of combination (of which one form is specialization) to reduce uncertainty as well as risk, despite the assertion just quoted that this cannot be done for uncertainty. Considerable emphasis is placed upon intuitive knowledge in dealing with uncertainty: 'knowledge of men's capacities to know [how to deal with uncertainty] turns out to be more accurate than direct knowledge of things' (*RUP*, p. 298). Pure profit and pure 'rent' (his term for an accurately imputed income) are never found in real life: every income contains elements of both. Moral hazard makes an explicit and potentially major appearance (*RUP*, pp. 249–54) but then surprisingly vanishes from the subsequent discussion.

Several characteristics of Knight's writing were already well established in the first book:

(1) He looked upon received theory with a strongly sceptical eye. For example, the traditional distinctions between capital and labour are vigorously – and properly – criticized (*RUP*, pp. 126ff.). He was equally critical of both Clark's concept of the stationary economy (*RUP*, pp. 32ff.) and of Marshall's treatment of time periods in production (*RUP*, pp. 142ff.). He had already re-thought a large part of standard value theory by 1916.
(2) He was extremely dogmatic in his empirical generalizations – all without a trace of proof. Here are a few examples: 'The normal rate of interest is one-half to two-thirds of the normal rate of return in fairly successful businesses' (Thesis, p. 333). 'There is little question that in fact speculators in land make on the whole less than the competitive rate of return on their investment'; but he has the rare qualm to add, 'though this is difficult to prove conclusively' (*RUP*, p. 337). '... Laborers show themselves ready to engage in hazardous enterprises at their own risk for an increase in wages which is a fraction of an adequate compensation for the chances they take' (*RUP*, p. 301).
(3) He recurred time and time again to the same central thoughts. Once he defended the practice by quoting Herbert Spencer: 'Only by varied iteration can alien conceptions be forced on reluctant minds.' A lasting, and important, example of the tenacity of his

beliefs is the view that a competitive enterprise system inherently leads to a cumulative increase in the inequality of the distribution of income. In later years at countless lunches this was challenged on both analytical and empirical grounds by Milton Friedman, each time leading Knight to make temporary concessions, only to return to his standard position by the next lunch. Knight must have felt that luncheons are doubly unfree.

A rather modest part of Knight's later writings fall within contemporary economic theory: chiefly two important articles in price theory and the series of articles on capital theory.

The first article, 'Cost of Production and Price over Long and Short Periods' (1921; reprinted in *The Ethics of Competition* [*EOC*]), offers an emendation of Marshall's analysis of time periods. Knight distinguishes a 'momentary' price which represents the supply and demand for a commodity in a speculative market: it is essentially an analysis of the prices of stocks of goods. His second, closely related period is that within which the supply of a commodity is (initially) fixed, perhaps the pricing of a given periodic crop during the crop year. Knight's third period, long run normal price, is a merging of Marshall's short and long run normal prices, a distinction which is criticized as an unnecessarily rigid classification of what is truly a continuum of time periods. The neglect of external economies will be explained shortly. There cannot be many articles in price theory that read so well after sixty-five years.

The second great article in price theory was 'Fallacies in the Interpretation of Social Cost' (1924; reprinted in *EOC*). The article contains an attack upon Pigou's celebrated error in wishing to tax increasing cost industries and upon Frank Graham's criticisms of the doctrine of comparative costs. (For a discussion of Knight's criticisms of the latter's work, see Viner 1937, pp. 475–82.) Knight gave a lucid analysis of the role of intramarginal transfers (rents) in achieving an efficient use of resources. It was in this article that Knight explicitly dismissed external economies: 'External economies in one business unit are internal economies in some other, within the industry' (*EOC*, p. 229). The last three words of this dismissal are inappropriate: the activities subject to increasing returns may fall in separate industries. Even if these activities subject to increasing returns are monopolized, that need not prevent the buyers of their products or services from experiencing external economies.

The major later work in theory was the series of articles on capital theory, directed against both the time preference theorists ('Professor Fisher's Interest Theory: A Case in Point', 1931) and, in a round dozen additional articles, the Austrian theory of capital. The chief of these are 'Capital, Time, and the Interest Rate' (1934), 'The Quantity of Capital and the Rate of Interest' (1936), and 'Diminishing Returns from Investment' (1944).

The first major theme of these articles is that the Böhm-Bawerkian theory of capital and interest is fatally flawed. In that theory labour joins with natural resources to produce capital goods (in the Wicksell extension of Böhm-Bawerk, sustenance for labourers and landlords). The process of producing further goods is time-consuming, and as a fundamental empirical law, the longer the production period, the larger the product. Knight denies the existence of any 'primary' factors of production which contain no capital, and equally he denies the possibility of measuring the period of production of a society or an industry, although he would concede the possibility of measuring the period of construction or investment of a specific capital good. It is fair to claim victory for Knight over his adversaries (including Hayek, Machlup, Lange and Kaldor) on this score: the period of production concept, which had never been fertile in real applications of capital theory, has virtually vanished from the literature.

On the constructive side, Knight placed much emphasis on the correct treatment of dimensionality, with particular attention to the differences in magnitude of the stock of capital and its growth (savings) in a period such as a year. Knight believed that the long run substitution possibilities of capital for labour or for any specific form of capital such as land were immense, so

diminishing marginal returns to capital either did not exist or acted extremely weakly. Accordingly, no truly long run equilibrium (such as received so much attention in classical economics) might exist:

> The peculiarity of the capital market, viewing capital service as a commodity, and the interest rate as its price, is twofold: (a) the stock of the commodity is enormously large in comparison with reasonably possible additions or subtractions in any moderate interval of time and (b) under anything like normal conditions in the real world the price is definitely above any theoretical equilibrium level (as proved by the fact that the supply does increase), and the very possibility of such a level is so problematic that it really has no interpretative value whatever (JPE 1935, p. 813).

This work encountered much more criticism (see, for example, F. Lutz, *The Theory of Interest*, 1966, ch. 8, *and Paul Samuelson* 1943).

Throughout his career at Chicago, Knight taught a highly idosyncratic course on the history of economics, and it is suitably represented by the famous article 'The Ricardian Theory of Production and Distribution' (1935). Knight's interest in intellectual history is not in the process by which it evolves but rather in the lessons it has for modern scholars; for example,

> The classical theory of wages and profits contrasts with that of rent in that it continued to be controversial, while the rent doctrine was, from the beginning, accepted as definitive. This, at least, is a good sign, for the theory sheds no light whatever on the economic principles of distribution and is an amazing tissue of inconsistency and irrelevance. These reasonings are interesting and important, not merely because they illustrate the workings of the best minds in one of the most important fields of thought and have, needless to say, some relation to facts and to real problems, but especially because they serve to warn against types of fallacy which seem to be perennially natural to minds not trained to be on guard against them (*History and Method of Economics* [*HME*] 1956, p. 75).

If Knight was quite unhistorical in treating with *Dogmengeschichte,* he was unusually widely read and perceptive in his rare appearances as an economic historian. 'Historical and Theoretical Issues in the Problem of Modern Capitalism' (1928) is a fascinating commentary on Werner Sombart and the related literature on capitalism, and Knight was also the translator of Max Weber's *General Economic History* (1927).

This is perhaps as appropriate a place as any to point out the unceasing intellectual curiosity Knight displayed throughout his life. He was an inveterate and usually disappointed attendant at a vast number of lectures at the university. His wide-ranging reading never ceased. On our voyage to the first meeting of the Mt Pelerin Society in 1947, a voyage made in astonishingly powerful and persistent storms, he spent the whole time in his berth re-reading Jacob Burkhardt. It was a fundamental element of his character that his intellectual explorations were directed to the question of how 'right' the subject of these explorations was.

The Philosopher

For most present-day economists, the primary purpose of their study is to increase our knowledge of the workings of the enterprise and other economic systems. For Knight, the primary role of economic theory is rather different: it is to contribute to the understanding of how by consensus based upon rational discussion we can fashion liberal society in which individual freedom is preserved and a satisfactory economic performance achieved. This vast social undertaking allows only a small role for the economist, and that role requires only a correct understanding of the central core of value theory. That is why the larger part of Knight's writings are outside of technical economics; indeed, that is why Knight did not return to the subjects constituting the main contributions of *Risk, Uncertainty and Profit.*

Economic theory prescribes the efficient ways of achieving given ends: this to Knight was a pathetically small part of human activity. The effects of acts often diverge grotesquely from the desires which led to them. Wants themselves are highly unstable, and it is their essential nature to change and grow. 'The chief thing which the common-sense individual actually wants is not satisfactions for the wants he had, but more, and *better* wants' (*EOC*, p. 22). So man is an explorer

and experimenter, a seeker for unknown and perhaps unknowable truths, a creature better understood thought the study of literature than by scientific method.

It is easy, then, for Knight to castigate the competitive enterprise economy as essentially amoral, as he does in the famous essay 'The Ethics of Competition' (1923). Knight does not specify the nature of the ethical principles on which he bases his severe criticisms of a competitive economic system, beyond saying they are 'the common-sense ideals of absolute ethics in modern Christendom' (*EOC*, p. 44). That is a surprising criterion for him to employ, partly because he believed that 'the Christian conception of goodness is the antithesis of competitive' (*EOC*, p. 72) but also because he believed that Christian ethics had undergone great changes over time.

In the event, he bases his criticisms of those who praise the competitive system on three general grounds. The first ground is that the defence assumes perfect competition, which is certainly not even closely approximated in real life, and indeed the competitive economy instils in people crass and vulgar tastes (including placing a 'premium on deceit and corruption'; *EOC*, p. 50). The second ground is that, viewed as a game, which is what business actually is in good part, the competitive system lacks most elements of fairness (*EOC*, p. 60). Finally, a competitive system is triply damned because competition itself is not ethically admirable (*EOC*, p. 64).

Knight's argument is subject to severe limitations. Because he avoids almost all questions of *quantity*, he often bases his argument on polar cases. Most of men's wants, for example, are stable, and at most only a small part of men's activities are devoted to the search for new wants or the exercise of curiosity. Again, he judges actual competitive enterprise by the criterion of perfect competition, yet this would be an incongruous criterion to judge other types of economic systems. (I offer some additional comments in The *Economist as Preacher*, pp. 18–19.)

Yet he was even-handed in his criticisms, and when the historians criticize the competitive organization of economic life he laments their ignorance:

> Few critics of capitalism see clearly enough that the entrepreneur in his 'control' of production is relatively helpless as to what he shall produce, and where and when and by what instrumentalities and methods – and in particular as to what he shall pay for labour . . .. If one considers the range within which the manager can actually choose arbitrarily and remain in business, and averages out over a reasonable area and time period, it is evident that impersonal competition is after all overwhelmingly dominant (*HME*, p. 92).

The exploratory nature of man's goals, the infinite variety and changeability of tastes, and the mutuality of the relationship between scientist and subject in the social sciences, all led Knight to believe that positivism and behaviourism were grossly inappropriate to the study of man. (See, for example, 'What Is "Truth" in Economics?', 1940, reprinted in *Freedom and Reform* [*FR*], and the temperate reply of T. Hutchison, *Journal of Political Economy,* 1941, pp. 732–50.) The communication between individuals introduced a dimension wholly absent from the physical sciences, so the root fallacy 'is to believe that social science should or can be a science in the same sense as in natural science' (*FR*, p. 226).

On the basis of Knight's assignment of a narrow role to science in the study, let alone the control, of human behaviour, and of Knight's ethical axiom that one person should influence another only by rational discourse, he launched a series of powerful attacks on important exponents of social planning. Knight was a pungent writer and a skillful phrase maker. Instructive examples of these attacks are 'The Newer Economics and the Control of Economic Activity' (1932, *Journal of Political Economy*, pp. 433–76), 'Bertrand Russell on Power' (1939)*, Ethics*, 253–85), and 'Salvation by Science: The Gospel According to Professor Lundberg' (1947, *HME*).

Although the main principles of economics are obvious, 'even insultingly obvious' (*FR*, 325), Knight despaired that they would ever be (or even could be) recognized in political life. A parable he contrived in an unpublished lecture presents this fatalistic outlook in a typical manner:

> As for telling the truth in political matters – well there is a popular story of a small boy who told the truth. Not George and the cherry tree story, but the

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> equally famous boy who made the simple observation that an emperor had no clothes on. Scientifically, there is one fault in that story; it is unfinished. I think the author was a kindly, sensitive soul, and hadn't the heart. In the story, as a story, it is of course a merit. But in a scientific lecture if should be finished, and will only take a few sentences: That evening the people awoke to the realization that they had no emperor and the wise men were anxiously discussing what to do. You can't imagine a man as emperor after he had solemnly paraded the streets as his bare self, can you? The wise men couldn't agree, of course, and the next day there was a war. And in a year a prosperous, happy nation had been destroyed and a civilization reduced to barbarism. All because a child made an innocent remark about a plain matter of fact. And back of that, because the emperor was fool enough to let people see the human being inside an emperor's togs – which certainly everyone knew was there. Truth in society is like strychnine in the individual body, medicinal in special conditions and minute doses; otherwise and in general, a deadly poison. . . .

And yet, Knight did not believe that the age of liberalism was doomed by man's incapacity to engage in and abide by rational discourse in the formation of social policy. Time and again he returned to the two forces which made liberalism intolerable: the cumulative growth of monopoly and increasing inequality of income (e.g., *EOC*, pp. 291, 310; *FR*, p. 31n). Perhaps there is no paradox here: perhaps a master of theory must become a servant of casual empiricism.

See Also

► Chicago School

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Knights Templar

E. Castelot

The leading facts of the history of this military order are well known: at the time of the first crusade they were founded to defend pilgrims to the Holy Land against the infidel; they enjoyed exemptions, granted by special papal bulls, from ordinary ecclesiastical jurisdictions; they acquired immense wealth, became unpopular both in England and in France, and, in the latter country, were suppressed by an unscrupulous stroke of authority of King Philip the Fair, who condemned the grand master Molay and other dignitaries to death, and confiscated, in 1307, a large part of the wealth of the order. Though in England such extreme proceedings were not taken, Edward I., in 1295, carried away by force from the Temple a sum of £10,000, and Edward II, shortly after his accession, seized £50,000 in silver, besides gold and jewels, which had been deposited in their treasury (Cunningham, *Growth of English Industry*, p. 254).

During almost the whole of the 13th century the house of the Templars in Paris acted as bankers to the kings of France, the royal princes, noblemen, rich burghers, and merchants. Its dealings in this capacity were for the first time submitted to a searching and exhaustive analysis by M. Léopold Delisle in his *Mémoire sur les Opérations financières des Templiers* (*Mémoires de l'Académie des Inscriptions et Belles Lettres*, vol. 33, 1889), of which the following is a summary.

Owing to the sanctity ascribed to their precincts, monasteries were, during the middle ages, favourite places for deposits of the precious metals, jewels, chattels, etc., but the *Commanderies* of the Temple distinctly acted as bankers by (1) being chosen as deposits for disputed funds, (2) granting loans and acting as securities for the fulfilment of contracts, (3) transmitting monies and paying them at a distance, and (4) accepting and effecting payments for customers who had a running account with them. All these operations have been identified by M. Delisle and are authenticated by original documents printed in his appendix. Deposits in cash were sometimes locked up in special *hutches* marked with the names of the owners, in which case they could not be touched without the express consent of the depositors, but generally the Order was allowed to make use of the deposits at its discretion, but of course under its responsibility.

Fragments of one of the books kept in the Temple at Paris for the daily receipts of money, and printed in the appendix (pp. 162–223), afford an insight into their daily transactions, and show how the payments effected were either put to the credit of the owner of an account (*super talem*) or carried over to another account such as *in parvo libro novo, in magno libro*, etc. For each day the name of the brother in charge heads the entry; and at night the monies received are as a rule transferred to the central office (*Solvit in turre*). About 800 different names are entered in the relatively short space of fifteen months (12 March 1295 to 4 July 1296); the reference to about ten distinct other registers, such as *in magno libro ad debemus*, etc., show that the Templars understood the advantages of systematic book-keeping.

From 1202, the Temple became the central treasury of the kings of France, and under Louis IX the royal auditors even held their meetings in the Temple; it also paid the pensions granted by the king, the amounts of which were transferable. From the balance-sheets, which have been preserved (1286–95), it appears that the king was sometimes debtor and at other times creditor. Towards the very end of the 13th century Philip the Fair established a separate royal Treasury in the Louvre and kept the latter entirely under his own management. The accounts of the Temple with the king at the time of its suppression appear to have been destroyed, probably from sinister motives.

In the defective state of records it is impossible distinctly to state what remuneration the Templars secured for their financial services, beyond the extensive and 'perpetual' fiscal privileges granted by the kings, and some special and commercial

exemptions, which they temporarily enjoyed. In other words, did they actually charge interest on their loans? That they paid such (*pro custibus solutis*) on account of the king to merchants and bankers is demonstrable, but beyond this nothing can be ascertained. Still, there is evidence that they acted on the principle admitted by Aquinas that a man who lends money may without sin contract for a compensation in case of delay of repayment; thus in the collection of old French judicial sentences known under the name of *Olim*, a judgement occurs concerning a loan of £3000 made by the Templars with the stipulation that in case of non-payment at the prescribed term, they would be entitled to a fine of another £3000 (*Olim*, ed. Beugnot, vol. ii. p. 128). M. Delisle mentions this transaction, but perhaps does not lay sufficient stress on its bearing.

Kondratieff Cycles

S. N. Solomou

Abstract

Kondratieff cycles are defined as regular variations in economic growth and price movements with a periodicity of 50–60 years. Although the balance of the evidence suggests that such regular cycles probably do not exist, this conclusion does not amount to a dismissal of the idea of long-term cyclicality. In fact, it is quite clear that various forms of long-term cycles are an observed empirical phenomenon.

Keywords

Aftalion, A.; Austrian economics; Capital accumulation; Clarke, H.; De Wolff, S.; Garvy, G.; General purpose technologies; Helphand, A.; Innovation; Juglar trade cycle; Kondratieff cycles; Kuznets swings; Lenoir, M.; Long cycles; Long waves; Marx, K.; Product life cycle; Schumpeter, S.; Spectral analysis; Spiethoff, A.; Technical change; Tugan-Baranovsky, M.; Van Gelderen, J.; Wicksell, J.

JEL Classifications

N1

Kondratieff cycles are defined as regular variations in economic growth and price movements with a periodicity of 50–60 years. Over time the Kondratieff cycle has also been referred to as, *inter alia*, major cycle, long wave, long cycle, trend cycle, secular trend, secondary secular movement, secondary deviation, trend period and *mouvements de longue durée*. Kondratieff (1925) argued that the pre-1920 data he analysed imply that prices move pro-cyclically with output changes; periods of inflation were associated with rapid economic growth and periods of deflation with slow economic growth.

Although Kondratieff was one of the first economists to provide a thorough statistical analysis of the long cycle, he was not the first to recognize its existence. The Russian Marxist Alexandre Helphand, writing under the pseudonym of Parvus, pointed to the existence of a long cycle as early as 1901. He drew on Marx's notion of *sturm-und-drang periode* of capital accumulation within a long-wave perspective. In 1913 the Dutch Marxist Van Gelderen, writing under the pseudonym of J. Fedder, gave an outline of 'springtide' and 'ebbtide' long cycle phases in the socialist monthly, *De Nieuwe Tijd*. A long cycle in prices was also observed in the work of Wicksell (1898), Aftalion (1913), Lenoir (1913) and Tugan-Baranovsky (1894). In *Capital* Marx referred to 'fluctuations extending over very long periods' and implicitly related them to investment in buildings and other fixed capital with a low turnover period. In fact, as early as 1847 Hyde Clarke referred to a 54-year economic cycle associated with astronomical and meteorological variations.

In his first study of long cycles, Kondratieff (1922) referred exclusively to literature dealing with price movements. However, in his later work Kondratieff attempted to study long cycles as a more generalized phenomenon, observed in both nominal and real variables. Kondratieff's (1925) study is the most well known in the English-speaking world, having been first translated into English in 1935. The study is mainly an

empirical exercise to test for the *existence* of long cycles. Kondratieff fitted ordinary least squares trend lines to per capita data and then used a nine-year moving average of the deviations in an attempt to eliminate the Juglar trade cycle. These filtered deviations were used to describe the historical time profile of long cycles. The statistical methodology employed is an application of Kondratieff's (1924) paper on static and dynamic equilibrium, which distinguished between reversible (wavelike movements) and non-reversible (trend) processes: 'The wavelike fluctuations are processes of alternating disturbances of the equilibrium of the capitalistic system; they are increasing or decreasing deviations from the equilibrium levels' (Garvy 1943, p. 207).

Such a methodology implies that the equilibrium structure of capitalist economies remained unchanged over the period covered by his empirical work (*c*. 1780–1920). The periodization developed in Kondratieff (1925) is as follows:

1st long wave:	Upswing	1780s–1810/17
	Downswing	1810/17–1844/51
2nd long wave:	Upswing	1844/51–1870/75
	Downswing	1870/75–1890/96
3rd long wave:	Upswing	1890/96–1914/20
	Downswing	1914/20–?

Kondratieff's early work had little to say about the generating processes for long waves; the emphasis was on describing five stylized facts:

1. During the upswing phase years of prosperity are more numerous, whereas years of depression predominate during the downswing phases.
2. The problems of agriculture are particularly severe during long wave downswings.
3. Innovations (what he called inventions) cluster during the downswing phases, and their large-scale application during the next long upswing.
4. Gold production increases during the beginning of the long upswing, and the world market for goods is generally enlarged by the assimilation of new and especially of colonial countries.
5. Wars and revolutions occur during upswing phases.

All of these five aspects of long cycles are part of an endogenous process and not exogenous causal explanations. Even war is part of an endogenous long cycle; wars originate from the 'increased tension of economic life, in the heightened economic struggle for markets and raw materials' (Kondratieff 1925, p. 539). The waves are supposed to reflect the development path of the capitalist world economy:

> The long cycles of the very important elements of life established above are international in nature and for the European capitalist countries the periods of these cycles are almost coincident in time. Based on the information given above, we conjecture that the same applies in the USA. (Kondratieff 1926, translated in Makasheva et al. 1998, vol. 1, p. 38)

Kondratieff's theory of the generating process for long waves was developed in a paper read before the Economic Institute in Moscow in 1926. The theory was a long duration investment cycle, similar to Marx's ten-year investment cycle:

> . . . it may be asserted that the material basis for long cycles is the deterioration, replacement and extension of the main capital goods, with long production times and vast production costs. *The replacement and extension of the stock of these items is not a smooth process but a discontinuous one, which also finds* expression *in long cycles of conjuncture*. (Kondratieff 1926, translated in Makasheva et al. 1998, vol. 1, p. 56)

To explain the discontinuities in re-investment, Kondratieff introduced Tugan- Baranovsky's (1894) theory of free loanable funds. Lumpy investments require large amounts of loanable capital and, therefore, the following preconditions are needed for the upswing: (*a*) a high propensity to save; (*b*) a large supply of loan capital at low rates of interest; (*c*) the accumulation of loan capital at the disposal of powerful entrepreneurial and financial groups; and (*d*) a low price level to induce saving. The expansion has its limits in the increased interest rate and the resulting capital shortage. Thus, Kondratieff has a monetary over-investment theory of the upper turning point, similar to that of Spiethoff (1925). The lower turning point was not explained (Garvy 1943). Kondratieff's generating process for the long wave is similar to that of De Wolff (1924), who

perceived the long wave as an echo wave, caused by the replacement of capital goods of a long lifetime, averaging 38 years.

The replacement cycle was seen to be endogenous once set in motion by the Industrial Revolution of the 18th century.

Schumpeter (1939) diffused Kondratieff's ideas in the English-speaking world and significantly refined the explanatory framework. A major refinement was to view the Kondratieff cycle in a four-phase schema of prosperity, recession, depression and recovery around an equilibrium path. With respect to the price long cycle, the classification of the four phases can be interpreted using modern economic terminology. However, since Schumpeter worked within the Austrian theoretical economic framework, the pattern of real economic growth differs significantly from that postulated by Kondratieff (Solomou 1987, pp. 6–8). In Schumpeter the economy is modelled as consisting of two sectors (producer goods and consumer goods); during the prosperity phase of the cycle output growth remains unchanged – only the structure of production changes, with the producer goods sector expanding relative to the consumer goods sector. Aggregate output expands only during the recession phase as the gestation of the new investment generates increased productivity. Thus, over time, because of the impact of technical progress in a competitive environment, the price long wave is centred along a deflationary trend while output growth follows discrete upward steps.

The Schumpeterian long wave is an innovation-induced cycle. Schumpeter saw long cycles as resulting from the effects of lumpy, long gestation investments. Such investment was made possible by clusters of major innovations, such as railway and electricity networks. Many recent studies have developed Schumpeter's theory of long waves by linking the concept of product life cycles to the Schumpeterian idea of innovation clusters. For example, Mensch (1979) provides a modern restatement of Schumpeter's ideas. Mensch describes economic growth as being characterized by a series of intermittent innovative impulses that take the form of 'S'-shaped growth trajectories. He postulates a *metamorphosis model*, depicting long periods of stable economic growth and relatively shorter intervals of economic turbulence. He begins with the following working hypothesis of basic innovations:

> A technological event is a technological basic innovation when the newly discovered material or newly developed technique is being put into regular production for the first time, or when an organised market for the new product is first created. (Mensch 1979, p. 123)

Mensch argues that there is limited interest in implementing basic innovation during prosperous phases of growth; in such periods only minor improvements are introduced. In contrast, during major depression phases, when the old technologies have outlived their usefulness in sustaining profitability and economic growth, there is greater pressure for introducing basic innovations induced by low profit rates on the old technology and high potential profitability on new technology.

The empirical validity of Mensch's framework is dependent on proving the existence of *regularly recurring* clusters in basic innovations. Mensch rationalizes innovation clusters in terms of the pressures on profitability during periods of major depressions. However, without the assumption of the long wave pattern of major depressions as a macroeconomic conditioning factor, it is difficult to see why basic innovations should cluster in the interval of a regular 50-year cycle. The explanation for regular clusters has remained a major theoretical problem in the long wave literature (Garvy 1943; Kuznets 1940; Rosenberg and Frischtak 1983).

Do Kondratieff Cycles Exist?

Most economists find the empirical evidence for Kondratieff cycles to be weak. Garvy (1943) concluded that the waves identified by Kondratieff are, in part at least, statistical artefacts resulting from the techniques he employed to analyse long-run time-series data. Lewis (1978) concluded that long waves in production are not observed for the

four major industrial economies (Britain, France, Germany and the United States) or for the weighted sum of these economies. Using spectral analysis (which is a statistical technique for analysing the existence of cycles of different durations), Van Ewijk (1981) found no evidence for the existence of a Kondratieff cycle in aggregate production. Beenstock (1983) examined Kondratieff's original data with the technique of spectral analysis and found no evidence of long cycles in either nominal or real variables.

Kondratieff mainly analysed price and production data from Britain and France. The focus of recent research has been on the major industrial countries of the period. In the case of Britain, most quantitative studies fail to find a pattern of Kondratieff long waves since 1850. Matthews et al. (1982) recognized that British economic growth has shown long-run variations but did not observe Kondratieff cycles. Others (Van Duijn 1983; Kleinknecht 1987; Solomou 1987) found a similar result. Lewis (1978) analysed industrial production trends over the period 1850–1913 and failed to find evidence of a Kondratieff cycle growth pattern.

Most studies have also failed to find evidence of Kondratieff cycles in the production trends of the US economy. Lewis (1978) focused on the period 1860–1913 and failed to find a long wave in industrial production. Solomou (1987) analysed data for the period 1870–1973 and failed to find a Kondratieff cycle in GDP growth: the most significant long-run growth variations are associated with the growth stagnation of the 1930s and the resurgence of growth in the 1940s. More recent examinations of economic growth in the USA point to one 'big wave' over the century after c.1870 (Gordon 1999). Studies that have used the Kondratieff cycle to model the path of US economic growth have done so under restrictive assumptions: Bieshaar and Kleinknecht (1986) found a Kondratieff cycle in US GDP growth after 1890. A fast growth phase during 1890–1913 or 1890–1929 gives way to stagnation in the 1930s and is followed by a strong revival of economic growth after 1940. Metz (1992) also found a Kondratieff cycle over the period 1889–1979; however, this result is dependent on excluding the world war shocks and neglecting the available evidence for the 1870s and 1880s; with the war years included, the period of the long cycle is reduced significantly to the Kuznets swing periodicity. Given the importance of historical shocks to the growth process, it is difficult to justify a procedure that interpolates the war years. Similarly, neglecting the information on the 1870s and 1880s leads to a distorted picture of the US growth process during the period 1870–1913. Taking both sets of information into account results in the conventional picture that the US economy manifested a Kuznets swing growth process both during the classical gold standard period (Abramovitz 1968) and in the period since 1913 (Hickman 1974; Solomou 1987). Although there are interesting long-term cyclical features, they are much longer than the Kondratieff wave period.

Similar results have been reported for France and Germany. During the period 1850–1938 the dominant long fluctuation in both economies is a Kuznets swing pattern of 20–25 year cycles (Lévy-Leboyer 1978; Solomou 1987; Van Duijn 1983; Metz 1992). Only after the Second World War is there evidence of Kondratieff-type trend periods.

Van Duijn (1983) has argued a case for the existence of Kondratieff waves in the world economy. Van Duijn found that, although the evidence for long cycles is weak, when we examine the growth path of individual countries there is stronger evidence for long cycles in the growth path of the world economy:

> Great Britain, the USA, Germany and France each have their own histories, in which the S-shaped life cycle of economic development may be more conspicuous than long wave fluctuations. The industrialized world as a whole, or even the four core countries taken together, moves forward along a long wave path. (Van Duijn 1983, p. 154)

The production trends of the world economy provide some support to this view.

The long-run growth pattern in Maddison's (1982, 1995) world GDP series (a weighted average of GDP in the 16 major economies) suggests a pattern of long-run economic growth that is

consistent with Kondratieff cycles since 1870. World exports show a similar pattern to world production trends (Lewis 1981). It is important to emphasize, however, that this evidence cannot *prove* the existence of a propagation mechanism that generates long cycles as an endogenous economic process in the world economy. A number of shocks have played an important role in generating the phases of upswing and downswing in world economic performance.

Solomou (1986) accounted for the upswing in world economic growth during 1890–1913 as the outcome of two main influences. First, countries were growing at differential rates during 1870–1913. Thus, while GDP in Britain and France grew at two per cent or less annually, the German rate averaged three per cent and the US rate four per cent. As the weight of the fast-growing economies increased over time, the world economy saw a stepping up of long-run economic growth. Second, many smaller countries started growing at a higher rate after 1890. Thus, to understand the 'upswing' of 1890–1913 we need to understand why countries industrialize when they do rather than why economic growth follows a long cycle. Both these effects are outcomes of one-off historical processes rather than being part of a cyclical structure in world economic growth, generated by technological developments. A similar historical perspective can be argued as explanations for the episodes of growth of the inter-war period and the post-war golden age.

Based on the evidence considered, Kondratieff cycles of a regular period probably do not exist. In reaching this conclusion it is important to stress that this is not a dismissal of the idea of long-term cyclicality. *In fact, it is quite clear that various forms of long-term cycles are an observed empirical phenomenon*. The idea that technological change is an important determinant of modern economic growth is a general truth among economists. However, determining the details of this hypothesis raises important questions for the long-cycle literature. One hypothesis is the idea that the path of major technological change is depicted as a series of general purpose technologies (GPTs). This idea has its roots in Schumpeter's theory of Kondratieff cycles – because in Schumpeter major innovation is clustered in time, the effects of clustering are at the heart of growth swings. Although the idea that there are regular 50-year Kondratieff cycles, resulting from major innovation clusters, remains a questionable empirical hypothesis, the characterization of technological change as a series of GPTs that appear episodically and have a profound effect on the growth process has received much attention in the literature on economic growth since the 1990s. Much of this work has been theoretical in nature, informing us of possible outcomes but offering no insights on actual historical economic growth. A number of macroeconomic growth hypotheses that work with fairly simple prototype models of GPTs have been accepted in the literature. For example, much of the literature argues that the diffusion of a new GPT will be correlated with a productivity slowdown in the early diffusion stage and, with long lags, will be followed by a productivity acceleration or bonus. Studies that have seen modern economic history as displaying a sequence of GPTs have used this idea as a basis of a theory for long cycles of the type that Kondratieff discussed (Freeman and Louçã 2001). However, such models are, at present, simple thought experiments and have serious limitations when used to capture historical paths. For example, Lipsey et al. (2005, p. 384) argue that all models to date share the common problem that they deal with a complex historical economic system inappropriately, seeing economic growth as the outcome of a single GPT. In reality, at any point in historical time the growth process is the outcome of different GPTs at different stages of their life cycles, and as such the link between a new GPT and economic growth is not uniquely determined. Hence, although *episodic* long cycles are a feasible historical outcome, we cannot assume that they will give rise to 50-year cycles. However, the concept of episodic and 'stochastic' long cycles may end up being a useful tool in understanding long-run economic growth and economic cycles more broadly understood.

See Also

- ▶ Kuznets Swings
- ▶ Technology

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Kondratieff, Nikolai Dmitrievich (1892–1938)

S. N. Solomou

Keywords

Conjuncture Institute (Moscow); Econometric Society; Five Year Plans; Frisch, R.; Kondratieff cycles; Kondratieff, N.; Kuznets swings; Kuznets, S.; Long cycles; New Economic Policy (NEP); Peasant indices; Schumpeter, J.; Scissors crisis; Tinbergen, J.; Tugan-Baranovsky, M

JEL Classifications

B31

Kondratieff (also transliterated Kondrat'ev) was born in Russia on 4 March 1892. At the age of 13 he joined the Socialist Revolutionary Party. In 1915 he graduated from St Petersburg University with a First Class degree, having followed courses given by, among others, Tugan-Baranowsky. In the Soviet Union he established his reputation with his studies of the domestic economy, particularly agriculture. In October 1917, at the age of 25, he was appointed Deputy Minister for Food in the provisional (Kerensky) government, although this appointment lasted for only a few days. Kondratieff's professional career was associated with the Moscow Conjuncture Institute, which he founded and directed between 1920 and 1928.

Much of Kondratieff's work at the Conjuncture Institute consisted of obtaining accurate statistical information on the agricultural sector, including the sectoral terms of trade faced by farmers, the so-called 'peasant indices'. These indices provided disaggregated information about the prices faced and received by the farming sector, and were calculated for the Soviet Union as a whole and for regions with different types of farming. The indices allowed Kondratieff to address the 'scissors crisis' by showing that the prices of farm products, relative to the cost of goods purchased by farmers, had declined during the 1920s. During 1923–5 his detailed knowledge of the agricultural sector allowed Kondratieff to prepare the first Five Year Plan for agriculture, proposing policies that did not place undue burdens on farmers. As a proponent of the New Economic Policy (NEP), he advocated a development strategy that emphasized the primacy of agriculture and the consumer goods sectors over the development of heavy industry. The abandonment of the NEP and the power struggles in the Communist Party saw Kondratieff's influence decline and in 1928 he was removed from the directorship of the Conjuncture Institute, which was closed in 1929. He was arrested in July 1930, accused of heading the 'Working Peasants' Party' and given an eight-year prison sentence. Kondratieff's daughter, Elena Kondratieva, has confirmed that his arrest in 1930 came after he had organized a meeting of 'dissidents' in his home (Makasheva et al. 1998, p. xiiv). At the end of this sentence he was tried again and sentenced to be executed. In fact, as early as August 1930 Stalin wrote a letter to Molotov asking that Kondratieff be executed (Barnett 1995, p. 437).

In the West, Kondratieff is mainly known as an applied economist working on long cycles. The Kondratieff cycle became an aspect of Joseph Schumpeter's three-cycle schema, whereby the economic system was seen to display a short nine-year Juglar cycle, a medium-term Kuznets swing of 20 years and a long Kondratieff cycle of 55 years. Over the interwar period Kondratieff became a respected

economist in the West, and his ideas on long cycles generated discussion from leading economists, including Schumpeter, Kuznets, Frisch and Tinbergen. Respect for his work is shown by the fact that Kondratieff became one of the founding Fellows of the Econometric Society in 1933 (Freeman and Loucã 2001).

Kondratieff worked on long waves between 1919 and 1928. His interest in long waves may have been inspired by Tugan-Baranovsky, whom Kondratieff regarded as the 'greatest Russian economist of all time' (Jasny 1972, p. 159). Kondratieff first outlined his theory of long waves in 1922. The manuscript was 'lost' by its Soviet publisher in 1921 but was rewritten from notes. The evidence was drawn exclusively from price trends and the conclusions were tentative: 'We consider the long cycles in the capitalistic economy only as probable' (1922, p. 255). A fuller analysis of long waves was offered in 'The Major Economic Cycles', which first appeared in 1925.

In this paper Kondratieff analysed both price and production trends in Britain, France and Germany, and concluded that long waves are 'at least very probable'. This paper was purely descriptive and did not offer a theory to explain the cycle. The explanation for long cycles, in terms of reinvestment cycles of capital goods with a long lifetime, was given in a paper read before the Economic Institute in Moscow in 1926 and published in 1928.

Soon after Kondratieff was removed from the Conjuncture Institute, the official Soviet Encyclopaedia *(Bolshaya Sovetskaya Entsiklopediya)* referred to his theory on the major cycle in a single sentence: 'This theory is wrong and reactionary.' This claim to knowledge is clearly unscientific. Kondratieff was an applied economist who used historical evidence to pose questions that remain as relevant today as they were in the interwar period.

See Also

- ▶ Kondratieff Cycles
- ▶ Schumpeter, Joseph Alois (1883–1950)

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Konüs, Alexander Alexandrovich (Born 1895)

W. E. Diewert

Konüs was born in Moscow on 2 October 1895. During the war years 1914–17, he served in the

army and was wounded twice. In 1920, he graduated from the Cooperative Institute in Moscow as a statistician. During the years 1923–30, he worked in the price index section of the Business Cycle (Conjecture) Institute directed by N.D. Kondratiev and had E.E. Slutsky as a colleague. During the years 1931–45, he taught statistics and undertook analyses of the quality of metal production. In 1945–60, Konüs worked at various research institutes including the Research Institute of Communication. From 1960 to 1982, he was at the Institute of Economic Research in Moscow. He has written over 100 research papers in index number theory, consumer demand, the labour theory of value, statistics and probability theory.

Konüs has made a number of fundamental contributions. In his 1924 paper, he established a revealed preference theory result, he provided the definition of a consumer's true cost of living index as a ratio of cost functions evaluated at different prices but at the same utility level, and he showed that there exists a utility level between the base and current period utility levels such that the true cost of living index evaluated at this intermediate utility level lies between the Paasche and Laspeyres price indexes.

In his 1926 paper written jointly with Buscheguennce, the idea that preferences can be represented dually in terms of tangential coordinates (i.e. in terms of prices and income instead of quantities) was made, the indirect utility function was introduced and a homogenous quadratic utility function was shown to be exact for Irving Fisher's ideal index number formula. This is a truly remarkable paper which was well ahead of its time.

The best English language discussion of his later work on consumer demand and index number theory is Konüs (1968).

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Koopmans, Tjalling Charles (1910–1985)

Carl F. Christ and Leonid Hurwicz

Keywords

Activity analysis; Additivity; American Economic Association; Business cycles; Cowles Commission; Dantzig, G.; Econometric Society; Econometrics; Efficient allocation; Estimation; Exhaustible resources; Felicity function; Fisher, R. A.; Frisch, R. A. K.; Identification; Impatience; Infinite horizons; Koopmans, T. C.; Limited information maximum likelihood estimator; Linear programming; Linear regression; Maximum likelihood; Optimal economic growth; Renewable resources; Shadow pricing; Simplex method for solving linear programs; Simultaneous equations models; Two-stage least squares estimator; Utility representation of preferences

JEL Classifications

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T.C. Koopmans was born in 1910 at 's Graveland, The Netherlands, and died in 1985 at New Haven, USA. His MA was from Utrecht in 1933 in mathematics and theoretical physics, and his Ph.D. was from Leiden in 1936 in mathematical statistics with applications to economics. His career was

rather peripatetic for eight years: the Netherlands School of Economics, the League of Nations in Geneva, Princeton University, New York University, the Penn Mutual Life Insurance Company, and the Combined Shipping Adjustment Board in Washington (where he worked on the problem of optimizing the allocation of ships during the Second World War). Then in 1944 he joined the Cowles Commission for Research in Economics at the University of Chicago, where he remained until 1955 when the entire Cowles group moved to Yale. He retired from Yale in 1981. He was Research Director of the Cowles Commission at Chicago from 1948 to 1954, and of the Cowles Foundation at Yale from 1961 to 1967. He was a member of the economics faculty at Chicago from 1946 to 1955, and at Yale from 1955 to 1981.

His work earned him great honours. He was elected President of the Econometric Society in 1950, Distinguished Fellow of the American Economic Association in 1971, and its President in 1978. He received the Nobel Prize in economics jointly with Leonid Kantorovich in 1975.

He was a gentle and quiet man. His avocations were chess and music, both composing and playing the piano and the violin. He was dedicated to the search for knowledge, so much so that in the late 1960s, when the American Economic Association asked him to be its President, he declined on the ground that he had too much research he wanted to do. It was only after his friend and colleague Jacob Marschak died while president-elect that Koopmans accepted the association's second call to its presidency.

He was a theorist by nature, but a theorist interested in real problems. He made fundamental contributions not to just one but to three areas of economics: econometric methods, activity analysis (including linear programming), and the theory of optimization over time (including optimizing the use of energy and natural resources). His work was marked by precise statements of postulates and theorems, with rigorous proofs.

His doctoral dissertation (1937), now a classic, foreshadowed the style of his important later contributions to econometric methods. In it he brought the insight of Frisch and the rigour of R.A. Fisher to linear regression when all variables are subject to errors of measurement. He postulated that these errors are serially independent, and jointly normally distributed with a covariance matrix $\sigma^2\varepsilon$. He derived maximum likelihood estimators of σ^2 and of the equation's coefficients, but showed that they depend upon ε, which in general cannot be estimated. Hence, if an incorrect ε is used in place of ε an 'error of weighting' results which does not go to zero as the sample size increases. He then showed (inter alia) that under favourable conditions this error is confined to an easily calculated region: If ε is diagonal (that is, if the errors of measurement are independent not only across time but across variables), and if the elementary regressions (each obtained by minimizing parallel to a coordinate axis) agree as to the signs of the coefficients, then the weighted regression vector based on any diagonal e must lie in the closed space angle that is defined by the elementary regressions and that includes the orthogonal regression vector.

Koopmans later turned to the simultaneous-equations case, assuming that each equation contains a stochastic disturbance, but that variables are measured without error. He and his co-workers made a fundamental contribution to econometric methods by solving two closely related problems that arise in such models. The identification problem concerns conditions under which simultaneous equations can be estimated at all. The estimation problem concerns how to avoid the bias inherent in least squares estimators of simultaneous equations, and obtain good estimators.

Economists had struggled with these problems for decades, with varying degrees of success or generality. Then Mann and Wald (1943) and Haavelmo (1943, 1944) in seminal pieces laid the foundations for the solution, by formulating an explicit stochastic simultaneous-equations model and considering the joint distribution of the jointly dependent variables as a function of the stochastic disturbances and the predetermined variables.

Koopmans, Rubin and Leipnik (1950c) worked out the solution to both the identification and the estimation problems in a long and technically difficult paper, which was first presented at a conference at the Cowles Commission in 1945. Much more readable papers about it are Koopmans

(1945) and (1949c). Related pieces are Koopmans (1950b) and Koopmans and Hood (1953b).

An equation is said to be identified if, sampling variation aside, a unique vector of values for its parameters (up to multiplication by a nonzero constant) can be deduced from data for the variables in the model to which the equation belongs. Otherwise it is unidentified. A familiar example of unidentified equations occurs in a two-variable price-quantity model of supply and demand, where data for price and quantity allow one to estimate the intersection point of the supply and demand equations, but not the slope or intercept of either equation.

Koopmans and his colleagues considered a linear simultaneous-equations system of G equations in G jointly dependent variables, with T observations. In modern notation it can be written as

$$Y\Gamma + XB = E \text{ or } ZA = E \tag{1}$$

Here Y and X are matrices of data for jointly dependent and predetermined variables, of order $T \times G$ and $T \times K$, respectively. E is a $T \times G$ matrix of unobservable stochastic disturbances, serially independent, with mean zero and $G \times G$ unknown covariance matrix Σ. Γ and B are matrices of unknown parameters, $G \times G$ and $K \times G$ respectively. Z is $(Y\ X)$ and A is $(\Gamma' B')'$. Necessary and sufficient conditions were derived for the identifiability of the parameters Γ and B, that is, of A. Consider first the simple case where the only a priori information about A and Σ consists in the knowledge that certain elements of A are zero (meaning that certain variables do not appear in certain equations). Then a necessary and sufficient condition for the identification of the ith equation in the system (called the rank condition) is that the rank of a certain criterion matrix be equal to $G-1$. This criterion matrix is obtained from A by omitting just those rows of A in which the element in the ith column is not required to be zero. Thus the criterion matrix can never have rank greater than $G-1$, because its ith column is zero. Hence a necessary condition for the identification of the ith equation (called the order condition) is that its criterion matrix have at least $G-1$ rows, that is, that at least $G-1$ of the model's variables be excluded from it. In practice, if an equation satisfies the order condition, it is likely to satisfy the rank condition as well.

Koopmans and his colleagues also derived identifiability conditions for a type of a priori restriction that deals with two or more elements of A which may be in the same or different equations of the model.

In general, least squares estimators of simultaneous equations are biased if their expectations exist at all, and are inconsistent. Koopmans and his co-authors defined the reduced form of the model (1) as its algebraic solution for the jointly dependent variables,

$$Y = -XB\Gamma^{-1} + E\Gamma^{-1} \equiv X\Pi + V \tag{2}$$

where the reduced form's coefficients and disturbances Π and V are defined by the last equality in (2). Then the covariance matrix of V is $\Gamma^{-1'}, \sum\Gamma^{-1}$, denoted by Ω. They showed under their assumptions that the reduced form parameters Π and Ω are identified, and that when the disturbances are normally distributed, least squares estimators are maximum likelihood estimators and are consistent.

They also derived maximum likelihood estimators of the model's identified parameters Γ, B and Σ, and showed that they are consistent. This was done as follows. The likelihood function of the normally distributed reduced-form disturbances V is

$$(2\pi)^{-GT/2}\det^{-T/2}\mathbf{\Omega}\exp\left[-(1/2)\mathrm{tr}\left(V\mathbf{\Omega}^{-1}V'\right)\right]. \tag{3}$$

By substituting for V from the reduced form (2), and subsequently substituting for Π and $\mathbf{\Omega}$ from (2), this is transformed in two steps to

$$\begin{aligned} &= -(1/2)\mathrm{tr}(Y - X\Pi)\mathbf{\Omega}^{-1}(Y' - \Pi' X\Pi')\exp\mathbf{\Omega}\det^{-T/2}(2\pi)^{-GT/2} \\ &= (2\pi)^{-GT/2}\det^{-T/2}\left(\Gamma^{-1'}, \sum\Gamma^{-1}\right) \\ &\quad \times \exp\left[-(1/2)\mathrm{tr}(Y\Gamma + XB)\sum^{-1}(\Gamma' Y' + B' X')\right]. \end{aligned} \tag{4}$$

Then the logarithm of this likelihood function is maximized with respect to the parameters B, Γ,

and Σ, subject to the identifying restrictions. The result is the full-information maximum likelihood estimator of B, Γ, and Σ.

These developments created a revolution in the theory and practice of econometrics. Subsequent work by associates of Koopmans led to the limited information maximum likelihood estimator, which is much simpler than the computationally demanding full-information estimator. Later work by Theil, Zellner, and many others led to the still simpler two-stage least squares estimator and related estimators such as three-stage least squares. Koopmans can fairly be said to be the father of simultaneous-equations econometric methods, though it is clear that there were grandfathers and great-grandfathers too.

In addition to econometrics, Koopmans made outstanding contributions in several areas of economic analysis, both theoretical and applied. The extent to which the two aspects complement each other is particularly striking in his work in activity analysis and linear programming. On the applied side, Koopmans's interest in this area seems to stem from an investigation into tanker freight rates and tankship building (1939). The book on this subject, apparently his earliest published work in economic (as distinct from econometric) analysis, has the subtitle *An Analysis of Cyclical Fluctuations,* and is indicative of his interest in the major macroeconomic issue of the 1930s, the business cycle. Other contributions dealing with business cycles appear in the early 1940s (1940, 1941, 1949b), although mainly concerned with econometric orientation. Subsequently Koopmans's macroeconomic interests shifted to the prevention of threatened post-Second World War inflation, a concern prevalent in the early 1940s (1942a, 1943). But his responsibilities with the Combined Shipping Adjustment Board pushed him in the direction of efficient resource allocation problems, applied to Allied freight shipping during the Second World War period. A memorandum (1942b), published for the first time in the *Scientific Papers of T.C. Koopmans* (1970), lays the foundation for what subsequently would be called activity analysis and linear programming. More specifically, the 1942 memo and more elaborate treatment (1949a) presented in 1947 at the International Statistical Conference deal with efficient utilization of transportation systems, a problem treated again (jointly with Reiter) in a more general setting in a paper presented at a memorable conference held in Chicago at the Cowles Commission in 1949 (1951). Koopmans' 1942 work on the transportation problem was done without awareness of the earlier (1941) study by Hitchcock and of the contributions due to Kantorovich (1939, 1942), von Neumann (1935), and Dantzig (1951a, b, c). The product of their insights and analyses, named *activity analysis*, is a model of production involving not only commodities (inputs and outputs), but also explicit recognition of the processes used in the course of production. With each *process* is associated a non-negative (scalar) variable, called the *level of activity* representing that process. Let x_k denote the level of kth activity (from among K possible ones), and let y_n be the net output of the nth commodity (from among N commodities present), with a negative value corresponding to an input. Technological information defines relations specifying the net outputs as a function of activity levels, say

$$y_{nk} = f_{nk}(x_k), n = 1, ..., N; k = 1, \ldots, k. \quad (5)$$

Thus for a given level x_k of the kth activity, the function f_{nk} specifies the amount of y_{nk} of resulting net output (positive, negative, or zero) of the nth commodity.

The equation system (5) allows for non-linear production relations, but most early work postulates linearity, in the sense that the ratio of net output to activity level is independent of the level of that activity. So (5) is specialized to

$$y_{nk} = a_{nk}x_k, \quad \begin{matrix} n = 1, ..., N; \\ k = 1, \ldots, k \end{matrix} \quad (6)$$

where a_{nk} is a constant independent of x_k. Furthermore, as was already implicit in our notation, when several processes are carried on simultaneously, it is assumed that they do not interfere with each other. Hence the aggregate output, say

y_n, of the nth commodity is formed additively from the amounts contributed by the simultaneous activities, and so

$$y_n = \sum_{k=1}^{k} y_{nk} = \sum_{k=1}^{k} a_{nk} x_k, n = 1, ..., N. \quad (7)$$

In this setting a number of problems have been studied. *Optimization* calls for maximization or minimization of a function, say $g(x_1, \ldots, x_k)$ of the activity levels. In linear programming models this function (like the technological relations (6)) is linear so that

$$g(x_1, \ldots, x_k) \equiv \sum_{k=1}^{K} c_k x_k. \quad (8)$$

Formally, then, we have the problem of maximizing

$$\sum_{k=1}^{k} c_k x_k$$

with respect to the non-negative variables $x_k \geq 0$, subject to the technological relations (7), as well the resource constraints

$$y_n \geq -\eta_n, n = 1, \ldots, N, \quad (9)$$

where η_n is the amount of the n-th good initially available. The most important technique for solving such a linear programming problem, known as the simplex method, is due to Dantzig. Dantzig's pioneering contributions in formulating the model itself were repeatedly stressed by Koopmans, who felt that Dantzig should have shared in the Nobel prize. This recognition in no way detracts from Koopmans's own role in formulating and developing the activity analysis model and analysing its properties. Most importantly, he built a bridge between activity analysis and the conceptual framework of classical economics. This involved distinguishing between primary, intermediate, and final commodities, the analysis of the efficiency concept, and the role of prices and profits. In the latter areas, again, Koopmans was careful to recognize the relationship of his analysis to the earlier contributions, especially those of Lange (1938) and Lerner (1944). In particular, Koopmans dealt with efficiency in production by defining it in terms of the vectorial ordering in the commodity space as follows. A commodity vector $y = (y_1, \ldots, y_N)$ is called *possible* if it satisfies the technological constraints, without taking into account the limitations due to resource availability. Then a possible point y is called *efficient* if there is no other possible point y' such that y' vectorially dominates y, that is, such that $y'_n \geq y_n$ for all $n = 1$ and $y'_r \geq y_r$ for some r.

An important contribution of Koopmans is the characterization of efficient points with the help of 'accounting' (also called 'shadow') prices, the condition being that no activity permits a positive profit and that the profit on activities actually carried out to be zero. The relationship of these conditions to those for competitive profit maximization under constant returns to scale is evident. Indeed, Koopmans formulated a resource allocation 'game' whose equilibria would be efficient when 'players' follow specified behaviour rules, with activity managers expanding profitable activities, avoiding activities yielding losses, and keeping constant levels for activities yielding zero profit. Other participants for this 'game' are 'commodity custodians', whose function is to adjust prices according to the difference between demand and supply, and a 'helmsman', choosing prices of final goods according to specified objectives (tastes). As Koopmans pointed out, only static properties of the game follow from the rules.

Of particular significance is Koopmans's emphasis on the informational decentralization of this 'game': a manager only needs to know the technology of his own process; a custodian needs only to know the availability and demand for the commodity he is in charge of. Koopmans stressed the applicability of the model both in a competitive economy (where the role of the 'helmsman' would be played by the consumers' competitive bidding) and in planned economies (where prices are an accounting rather than market phenomenon).

Koopmans' contribution in the area of activity analysis are of significance not only for their

content, but also for their form and style. Their rigour and clarity became a standard, or at least an ideal, for later mathematical economics with emphasis on explicit definitions, postulates, and theorem formulations. His meticulous attention to (and acknowledgement of the work of) predecessors as well as generosity in evaluation of the contributions of others invite emulation. (See, for instance, the Introduction to the *Activity Analysis* volume and his two notes on Kantorovich's work, 1960b, 1962.)

In a brief article, it is impossible to do justice to Koopmans' own accomplishments. His expository talents are particularly striking in the first of his *Three Essays* [1957], which is a model for exposition of classical welfare economics, making particularly clear which propositions depend on which assumptions – for example, absence of convexity postulates in proving the Pareto optimality of competitive equilibria.

Perhaps the most important of Koopmans's theoretical contributions are those dealing with problems involving infinite horizon economies. A number of papers deal with optimal economic growth (for example, 1965a, b, jointly with Beals; and 1973). But of particular interest are the papers (1960a, and 1964, jointly with Diamond and Williamson) concerning preferences and their representation by numerical (real-valued) utility functions over infinite horizons. Koopmans formalized the concept of impatience (introduced by Böhm-Bawerk into the theory of the rate of interest) and showed, surprisingly, that impatience is a necessary logical consequence of a set of postulates concerning utilities over infinite time horizons. Among the postulates are those of continuity and stationarity (that is, independence of calendar time).

An additional postulate is required to imply the discounted form of the utility function,

$$U(x_1, x_2 \ldots) = \sum_{t=1}^{\infty} a^{t-1} u(x_1)$$

where $0 < a < 1$ and $U(\cdot)$ is the utility function for the infinite programme $(x_1, x_2, \ldots)$. Here x_t denotes the choice x_t at time t, and $u(x_t)$ is the instantaneous 'felicity' experienced at time t. For instance, x_t may be the consumption vector, $x_t = (x_{t1}, \ldots, x_{tl})$ in a l-dimensional commodity space. More generally, all the x_t are assumed to be drawn from the fixed choice space X, a connected subset of n-dimensional Euclidean space.

Koopmans returned to the problem of utility representation of preferences over infinite programmes in two papers (1972a, b), differing from the earlier work by its formulation of the underlying postulates in terms of the preference relations rather than of a utility representation, whose existence was assumed previously in the hypotheses. In the later work, it is the preferences that are assumed to be continuous and stationary as well as to satisfy a condition of independence over time. Under these postulates the utility function of an infinite programme is shown to have certain additivity properties. A stronger conclusion is obtained, for the space of all programmes that are 'bounded in utility.' [A programme $x = (x_1, \ldots), x_t$ in the choice space X, is said to be bounded in utility if there exist vectors x^* and x^{**} in X such that $x^{**} \geq x_t \geq x^*$ for all $t = 1, 2, \ldots$, where the symbol $\geq$ represents the (weak, that is, reflexive) preference relation. (We may note that 'bounded in preference' would have been a better term, since numerical utility is not involved in the definition.)] On the space of all programmes bounded in utility preferences can again be represented by the discounted from

$$U(x_1, x_2, \ldots) \equiv \sum_{t=1}^{\infty} a^{t-1} u(x_t), 0 < a < 1.$$

Among other contributions involving the infinite time horizon, we shall only mention Koopmans's work on exhaustible resources, in particular the problem, of such interest in the 1970s and early 1980s, of transition from exhaustible to renewable resources. Closely related to this area of interest was Koopmans's work on the modelling of alternative energy futures reflected in (1980) and the guidance he provided as chairman of the Modeling Resources Group of the Committee on Nuclear and Alternative Energy Systems (CONAES) of the National Academy of Sciences (1975–8).

The latter study exploited Koopmans' lifelong interest in the relationship between economics and physical sciences. His first published papers were in physics, and his presidential (American Economic Association) address in 1978 was entitled 'Economics among the Sciences' (1979).

This talk was in part based on observations made in the course of the energy modelling study and dealt with the difficulties in communication between physical scientists, engineers, and economists, illustrated by several examples, including the problems of discounting future costs and benefits. The address also pointed to the university procedures for academic appointment and promotion as barriers to interdisciplinary contacts.

While concerned about the relationship to physical sciences, Koopmans did not neglect the ethical issues implicit in the various criteria of optimal growth, especially the problems of balancing the consumption levels of successive generations (1967a, b). Technically, the problem arises because an 'optimal' solution may fail to exist in an infinite horizon setting. When future enjoyments are discounted but the discount factor falls below a critical value, it turns out that a further postponement of some future consumption raises the utility of the overall programme. Since, with an infinite horizon, a postponement is always conceivable, no programme is 'best'. Koopmans' conclusion was that 'one cannot adopt ethical principles without regard to the anticipated population growth and to the anticipated technological possibilities', and that 'ethical principles . . . need mathematical screening to determine whether in given circumstances they are capable of implementation.'

In some models, given the discount rate, the existence of an optimum depends on the shape of the instantaneous 'felicity' function $u(\ldots)$, and so does the shape of the optimal path when existence conditions are satisfied. Koopmans regards as debatable whether the choice of the felicity function $u(\ldots)$ is an empirical or ethical question. He points out the paucity of empirical evidence concerning the asymptotic elasticity of marginal felicity at high consumption levels which is critical for the existence of an optimum. He then expresses concurrence with a remark due to Malinvaud that ethical judgments may be easier to base on comparison of optimal paths generated by alternative felicity assumptions than on 'direct and aprioristic' comparisons of the felicity functions themselves.

The depth and breadth of his scientific contributions as well as his influence on others (including these writers) amply justify the judgment of the Nobel Committee, as well as Scarf's (1985) characterization of Koopmans as the 'leader of a scientific revolution', a revolution ranging over econometrics and economic analysis.

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Korea, Economics in

Young Back Choi

Abstract

The study of economics in Korea is a modern development, starting around the turn of the 20th century, influenced by the West, at first through Japan and since the end of the Second World War mainly through the United States. Over time, it has become a clone of economics in the USA, with an overriding concern for mathematization and econometrics. Even so, the Korean term for economics, *kyung-je-hak*, which derives from a classical Chinese expression for good governance, reveals the prevailing conflation of science and governing techniques.

Keywords

Classical economics; German Historical School; Japan, economics in; Korea, economics in; Korean Economic Association; Marginal economics; Marxist economics; Neoclassical synthesis; Protectionism; United States, economics in (after 1945)

JEL Classifications

B2

The 19th Century

Before the turn of the 20th century, there was not much economic analysis to speak of in Korea. Of course, as a country settled continuously over

2,000 years, Koreans had a variety of administrative techniques concerning tax collection, budgeting, coinage, government monopolies and so forth. But there was hardly an attempt to organise observations on economic matters along general principles. The situation in Korea was not very different from that in most pre-industrial economies.

In the 18th century, in the aftermath of a series of foreign invasions from Japan and Manchu, a group of reform-minded thinkers, Shil-Hak-Pa, wrote pamphlets proposing measures to ameliorate economic devastation and social instability. But there was no economic analysis beyond the simplest form of common sense; and the school was subsequently suppressed as subversive. At the end of the 19th century, when Korea was encircled by imperialist powers and its independent status became precarious, a few Korean students were sent to Japan to study the secrets of a 'prosperous nation and strong army'. Some thereby encountered classical economics and viewed free competition as a means of creating a prosperous nation. The attempts to learn from the West and reform the country, however, came too late; Korea became a Japanese colony in 1910.

The Japanese Colonial Period

During this period, Korean economists, mostly trained in Japan, were few in number and predominantly Marxists, doing economic history from a Marxian perspective. The reasons had to do with contemporary economics in Japan and what many colonial people took Marxism to be at the time.

Earlier, in the mid-19th century, classical economics was studied in Japan. From the 1880s, however, the German Historical School, critical of classical economics and providing a rationale for protectionism and nationalism, became the vogue among Japanese economists. (Note that economists in the United States were also heavily influenced by the Historical School, giving rise ultimately to American Institutionalism.) Another import from Germany was Marxism. By the 1920s, Marxism and the Historical School had become the dominant traditions in Japan. Protectionism and Keynesianism were later introduced, but they had a limited influence on the Japanese during this time.

Broadly speaking, Korean students had to choose between the two dominant traditions in Japanese economics. As the Historical School was seen as providing a rationale for Japanese fascism, most Korean students of economics were attracted to Marxism, which represented anti-imperialism and anti-capitalism. As the Japanese did not appoint Koreans to faculty posts in Japanese universities (not even those located in Korea), Korean economists taught at a handful of private colleges founded by Koreans. However, from the early 1940s the Japanese repression of Korean nationalism and communism meant that most Korean academics were imprisoned and students sent either to the front line or to armaments factories. The surrender of Japan at the end of the Second World War and the liberation of Korea abruptly ended this state of affairs.

Post-Second World War to the Korean War

In the liberated Korea Marxist economists were restored and became dominant, as in Japan. Korea was partitioned and occupied by the two victors of the Second World War, the northern half by the USSR and the southern half by the United States. Ideological conflicts ensued as the occupiers delegated power to the locals and Korean Marxists abandoned all academic pretensions. During the subsequent internecine Korean War (1950–3), Marxists and their sympathisers were completely eradicated from South Korea; they all moved to Communist North Korea, where they were subsequently purged. What was left in South Korea at the end of the war, therefore, was only a handful of non-Marxist Korean economists who had been trained in Japan.

Post-Korean War to the Present

Since the post-war era economics in South Korea has by and large become Americanized. Although

a worldwide phenomenon, this is particularly pronounced in Korea, since the country became completely dependent on US military and economic aid after the destructive war.

In the late 1950s and the early 1960s the US government and UN organisations sent advisers, many of whom were New Dealers and/or Keynesians. During this period some Korean economists formerly trained in Japan visited American universities, or received additional training there. The first fruit of the initial contacts with the United States was a flurry of translations of economic literature, ranging from classical, neoclassical and Keynesian economics to development economics.

In the 1970s there was a noticeable slowdown in translations and the concomitant publication of a number of popular economics textbooks in Korean, which closely resembled the then popular American economics textbooks in the tradition of the neoclassical–Keynesian synthesis. From the late 1980s, popular American textbooks began to be used, untranslated, in elite Korean universities. Since the 1980s translations of scholarly books in economics have become popular again, but not to the same degree as in the late 1950s. This in part reflects the rapid increase in the number of American-trained economists who can directly access economic literature in English. The paucity of translations also reflects the shallow roots of economics in Korea.

From the late 1960s, Koreans with doctorates in economics from American universities began to return to Korea in significant numbers, increasing from the 1970s and peaking in 1990, when the figure reached over 60. In 1993, the Korean Economic Association had over 1,800 members with a Ph.D. in economics. Of these, 55 per cent had a Ph.D. from a foreign university and 43 per cent from an American university. The proportion alone understates the impact of Americanization, as the US-trained economists have come to occupy a disproportionately large share of key positions in academia, research institutes and central government in Seoul. For example, in 1993 at the top three Korean universities, the proportion of American- trained economists in the economics faculty reached over 70 per cent. In one of them, all but one had an economics Ph.D. from the United States.

The process of Americanization was greatly aided by the job market for economists in Korea, which can best be characterised by institutional inbreeding and credentialism. The former is the practice of hiring graduates of one's own department, a legacy of the Japanese colonial period, and the latter the practice of hiring based on the quality of credentials. Initially, the custom of obtaining an academic post in Korea was first to get a BA (or even an MA) at an economics department in an elite Korean university, and then get an American Ph.D.

Competition for credentials has become more intense. In the 1960s, an American Ph.D. was sufficient to gain an academic post. As the number of American Ph.D.s increased over time, the prestige of the school awarding the degree became significant. As more and more Koreans get their Ph.D.s from elite American universities, some teaching experience in the United States and even publications in English-language journals have become crucial for employment prospects. Economics in Korea, through the process of competition for better credentials, has come to reflect the prevalent practices of the economics department at elite American universities, with the overriding concern for publication in top journals, which necessarily implies emphasis on mathematical economics, model building, and econometrics. From the late 1980s, increasing competition for credentials has extended the period of scientific endeavours well beyond graduate school, and a few Korean economists have managed to gain mobility across the national border.

Yet there is no great man in economics *in* Korea. Of course, there have been economists who have been celebrated on account of their contributions in the popular media, or economists who have authored popular economic textbooks, or commanded much respect on account of having taught many able students. But no economist in Korea has attained eminence in economic science as one might have expected from the investment of so many resources. The reason is only in part that economics in Korea is essentially a post-

Korean War development, or that many Korean economists decided not to return to Korea after their graduate training. The main reason is the pragmatic orientation of the majority of Korean economists (which has only very recently begun to shift).

Economics in Korea gained its prestige under the economic dirigisme of President Park (1961–79). The administration and legitimization of planning development programmes required the services of economists, which many were eager to supply. For aspiring economic advisors or policymakers, the primary concern is political expedience; during the period 1961–79, it was as if Korean economists entertained scientific concerns only while their credentials were being established, that is, during their graduate training in the United States. Afterwards, even as they taught students what they had learned in the USA, the majority of them ended up taking on diverse extra-curricular activities, including extra teaching, consulting for government bureaux and cultivating political connections. This pragmatic approach to economics has produced an army of economists who are very competent in importing techniques, but quickly cease to be members of the scientific community. The pragmatism of Korean economists is reflected in the absence of doctrinal disputes or distinctive schools of thought. Academic fashions have come and gone, largely reflecting, if with a time lag, debates that took place in the United States during students' graduate training.

One exception has been doctrinaire Marxists whose number has increased in South Korea since the late 1980s, precisely when Marxism was being discarded elsewhere. This surprising development against the worldwide trend has been an outgrowth of reactions to the authoritarian rules of Presidents Park and Chun, in which anti-authoritarianism, pro-democracy, socialism, Marxism and nationalism had been all conflated. There is little debate between Marxists and non-Marxists, however. Marxists are more than willing to be engaged in doctrinal debate, though their concern largely focuses on who has a more faithful reading of the canon. Non-Marxist economists, the majority of Korean economists who are either US-trained or trained by other US-trained Korean economists, are pragmatists in their teaching and advice, generally seconding the popular preference for a welfare state of the European variety.

Outwardly, economics in Korea has become fully internationalised. Over 50 per cent of Korean economists with a Ph.D. have been trained overseas, the overwhelming majority in the United States. Most are competent in the techniques of modern economics, familiar with the relevant literature, an increasing number of them are publishing in international journals, and a few have even gained international job mobility. Yet if economics in Korea is to progress beyond the stage of competently importing the latest academic trends and techniques, more Korean economists will have to become less pragmatic and begin to examine basic questions.

See Also

► Japan, Economics in

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Koyck [Also Known as Koijck], Leendert Marinus. (1918–1962)

A. P. Barten

Dutch economist, born in Mijnsheerenland (The Netherlands) in 1918, died there 1962. Studied economics at the Netherlands School of Economics in Rotterdom (now part of the Erasmus University, Rotterdam), where he obtained the degree of doctorandus in 1946. He joined the Netherlands Economic Institute in Rotterdam as research associate in 1946 to become one of its directors in 1954. He was appointed lecturer in economics at the Netherlands School of Economics in 1948 and promoted to professor in 1954.

His teaching included courses in macro- and microeconomics, and in statistics. Among his various research topics three dominate: time shape of economic reactions, consumer demand, and growth and capital. In 1954 he obtained the degree of doctor in economics with his dissertation on the specification and treatment of lag patterns in investment demand (J. Tinbergen supervisor), which was subsequently published under the title *Distributed Lags and Investment Analysis*. He has used the approach taken there earlier in the context of production and foreign trade. This approach with which his name has become associated has turned out to be of great practical importance for applied econometrics.

To appreciate its nature consider by way of example the following regression equation:

$$y_t = \alpha + \beta \sum_{i=0}^{n} \mu_i x_{t-i} + u_i. \qquad (1)$$

Here t denotes a period or moment in time, y_t is the value of the response variable for t, the x_{t-i} are the successive values of the impulse variable, u_t is a random component (with zero mean) which is not correlated with the x_{t-i}. The α and β are parameters to be estimated. The μ_i are all positive and add up to one. Thus the weighted sum of the x_{t-i} is a moving average, while β presents the long run effect of x and y.

In principle, the μ_i can be estimated freely from a set of observations on y_t and x_{t-i}, given n. In practice, this frequently does not lead to plausible point estimates, because of collinearity between the x_{t-i} which makes it difficult to separate out the effect of an individual x_{t-i}. This problem has been met by not estimating the μ_i but imposing a particular pattern like equality: $\mu_i = 1/(n+1)$ or linear reduction: $\mu_i = 2/(n+1-i)/(n+2)(n+1)$ (Irving Fisher). With such specifications one also needs to fix n, the maximum lag, *a priori*, while they may be costly in terms of the length of the time series of observations: one needs n observations more on x than on y, frequently meaning not using the first n observations on y.

Koyjck approached these issues by taking n to be infinite and to specify $\mu_i = (1-\lambda)\lambda^i$ with $0 \leq \lambda < 1$. This pattern implies geometrically declining weights. The speed of reduction depends on λ. A high value of λ means that impulses from long ago still matter. With his specification (1) becomes

$$y_t = \alpha + \beta(1-\lambda) \sum_{i=0}^{\infty} \lambda^i x_{t-i} + u_t. \qquad (2)$$

The estimation problem is handled by first multiplying through the one-period lagged version of (2) by λ and next rearranging terms to obtain

$$\beta(1-\lambda) \sum_{i=0}^{\infty} \lambda^i x_{t-i} = \lambda y_{t-1} - \alpha\lambda - \lambda u_{t-1}$$

This result is used in (2) to arrive at

$$y_t = \alpha(1-\lambda) + \beta(1-\lambda)x_t + \lambda y_{t-1} + u_t - \lambda u_{t-1} \qquad (3)$$

which can also be written as

$$y_t = \alpha' + \beta' x_t + \lambda y_{t-1} + e_t \qquad (4)$$

with $\alpha' = \alpha(1-\lambda)$, $\beta' = \beta(1-\lambda)$ and $e_t = u_t - \lambda u_{t-1}$.

Equation (4) can be estimated by simple linear regression methods. Only one extra observation on y is needed. The data determine λ and thus the effective length of the delay. A point estimate of β

can be easily obtained from point estimates of β' and λ. The transition from (2), (3) or and (4) is known as the *Koyck transformation*.

A problem with the approach, as Koyck himself pointed out, is the serial correlation in the composite random term e_t which, combined with the presence of y_{t-1} among the regressors, causes least squares to be inconsistent. In spite of this defect the Koyck transformation is widely used, in particular when one works with time series of annual observations which are relatively short and where degrees of freedom are easily exhausted.

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Kravis, Irving B. (1916–1992)

Alan W. Heston

Keywords

Bureau of Labor Statistics (BLS) (USA); Country-product dummy (CPD) method; Exchange rates; Income distribution; International Comparison Programme (ICP) (UN); International price competitiveness; International trade: and economic growth; Kravis, I.; Kuznets, S.; Laspeyeres index; Law of one price; Maddison, A.; Organisation for European Economic Co-operation (OECD); Paasche index; Penn World Table; Purchasing power parity; World Bank

JEL Classifications

B31

Irving Kravis is best known for his pioneering empirical estimates of country purchasing power parities (PPPs) and real products based on detailed price and expenditure comparisons. This research began in the early 1950s at the Organisation for European Economic Co-operation (OEEC, now OECD) in collaboration with Milton Gilbert. It was continued on a world scale when he jointly directed the United Nations International Comparison Project from 1968 to 1982. However, these contributions were just the most notable in a career that included yeoman service to the University of Pennsylvania: in building up the Department of Economics, in serving as Associate Dean of the Wharton School and chair of the University Senate, and in active participation in many important committees of the School of Arts and Sciences and the university.

With the exception of the Second World War, Kravis's career was all at the University of Pennsylvania, where he studied as both undergraduate and postgraduate and to which he returned as a faculty member in 1947. His mentor at Penn was Simon Kuznets, whose influence on Kravis's work shows in many ways, including the strong belief in and practice of making research replicable. Like many of his generation with economic and statistical training, he worked for the War Production Board during the Second World War, but only partly in Washington. Raymond Bye at Penn and Kravis wrote *Economic Problems of War* in 1942. Kravis also served in Kunming, China, as a logistics officer and worked with Claire Chenault's Flying Tigers involved in tracking supply missions.

Kravis joined the Bureau of Labor Statistics (BLS) prior to returning to Penn. With Irwin Friend of Wharton's finance department, Kravis directed an 18-volume BLS–Wharton Study of Consumer Expenditures culminating in a major conference in 1959. As part of this research Kravis explored facets of income distribution, which remained one of his long-term intellectual interests.

Kravis maintained a long collaboration with Robert Lipsey, focusing on international price competitiveness. Their 1985 article 'Towards an Explanation of National Price Levels' continues to be influential in making clear the many frictions that lead to persistent divergence of both levels and changes in the relationship between purchasing power parities and exchange rates. The law of one price is a fundamental insight in spatial economics, but, as Kravis and Lipsey make clear in much of their joint work, the *flaw of one price* is that, in the world in which we live, the exceptions are frequent, persistent and often systematic.

Kravis had very broad interests in the global economy, including contributions to productivity comparisons, the role of multinationals in international trade and the construction of export and import price indexes. His important 1970 article 'Trade as a Handmaiden to Growth' sets forth his view that expanded international trade is better viewed as accompanying rather than causing economic growth. This article continues to capture the attention of economic historians and development economists.

Kravis began his work on PPPs at the OEEC in collaboration with Milton Gilbert, Director of Economics and Statistics, and other staff members including Angus Maddison. They undertook systematic binary purchasing power comparisons between the United States and the four largest European economies, comparing prices of items with written specifications for consumption and investment. These were combined with indirect estimates of government expenditure to make international real product comparisons at the GDP level. Gilbert and Kravis concentrated on binary comparisons with the United States that produced both Paasche and Laspeyeres indexes, as was sometimes done for price indexes at the time. The spreads in these indexes were much larger than had been anticipated, especially for Italy; but it turned out to be a characteristic of such comparisons that was even more pronounced as the range of countries compared increased.

Parallel purchasing power studies were being carried out in the 1950s by the then Economic and Social Commission of Latin America, the European Economic Commission, and the Council for Mutual Economic Assistance (CMEA). These purchasing power studies were important landmarks leading to the establishment of the International Comparison Programme (ICP) of the United Nations in 1968, where Kravis served as a joint director, based at Penn, with a counterpart at the UN Statistical Office. Under his direction benchmark comparisons were carried out for 1970 for 10 and 16 countries, and for 34 countries in 1975, all involving monographs by Kravis and others. In these studies multilateral methods for purchasing power comparisons were worked out, including the country-product dummy (CPD) method of Robert Summers, which has been extended widely in recent BLS and ICP work. An extension of the benchmark work to a total of 100 countries was published in 1978; it became the basis for the current Penn World Table of Alan Heston, Robert Summers and Bettina Aten.

Acceptance of the results of the ICP was slow in coming, but by the late 1980s many economics textbooks were using PPP comparisons. After the 1975 benchmarks responsibility for this work became international, and the European Union and the OECD now routinely carry out comparisons for their 50 member and associate countries. Currently the World Bank is coordinating a global 2005 ICP benchmark comparison involving about 150 countries, a major legacy of Kravis's leadership. While the methods used in the initial ICP work are being modified, the basic multilateral framework pioneered by Kravis remains in place. During a heated debate on methods following presentation of the results of the first ICP benchmark, the late Nancy Ruggles observed that the important thing was not which method was used but rather that a multilateral PPP

comparison was actually completed. It took the focus, patience, wisdom and good humour of Kravis to produce these initial multilateral PPP comparisons in a timely manner and of a quality that has led to their adoption on a global basis.

See Also

- Balassa, Béla (1928–1991)
- Cassel, Gustav (1866–1944)
- Geary, Robert Charles (1896–1983)
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- Poverty Lines
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Krugman, Paul (1953–)

Steven Pressman

Abstract

This article discusses the main economic contributions of Paul Krugman. Krugman developed the *new trade theory*, which analyses the determinants of international trade when trade takes place among oligopolistic firms, and the *new economic geography*, which studies where firms locate nationally and worldwide. His also drew out the policy implications of these new theories. Finally, the article discusses Krugman's early work on exchange rate regimes and his more recent work on economic slumps.

Keywords

Currency crises; Depressions; New economic geography; New trade theory

JEL Classifications

F1; F3; R1; E6

Introduction

Among the general public Paul Krugman is known as a *New York Times* columnist and

blogger. Among professional economists he is known for developing the *new trade theory*, which analyses the determinants of international trade when production and trade take place among oligopolistic firms, and the *new economic geography*, which studies where firms locate nationally and worldwide. His work in international macroeconomics explains why currency crises arise and why some countries continue to experience high unemployment.

After a brief biographical sketch, this article summarises Krugman's main professional contributions. It concludes with a discussion of Krugman's recent foray into macroeconomics and policy advocacy.

Krugman was born in Albany, New York, in 1953 and grew up in Great Neck, an affluent suburb of New York City. His grandparents came to the USA from Belarus. His parents were both New Deal Democrats; his father worked for Equitable Life Insurance on Long Island.

As a boy Krugman read Isaac Asimov's *Foundation* trilogy and became obsessed with a main character, the psychohistorian Hari Seldon, who used mathematics to predict human history thousands of years into the future (but could not predict individual behaviour). He was also politically active – marching against the US invasion of Cambodia and working for liberal political candidates (Krugman 2007, p. 3). Krugman went to Yale intending to study history and follow the path of the fictitious Seldon. But he soon realised it was economics that could help understand and predict the future (also without being able to predict or understand individual behaviour). So Krugman majored in economics, although taking many history courses at Yale (described in *Incidents from My Career*, referred to subsequently as 'Incidents').

Graduating from Yale in 1974, he went to MIT to do graduate work in economics. The mid-1970s were the heyday of rational expectations in macroeconomics. Krugman (2012, p. 102) describes his excitement with the mathematical rigour of this approach when he was a graduate student. The MIT economics department, however, was more Keynesian, dominated by Paul Samuelson and Robert Solow. Krugman took Solow's class on imperfect competition, but remained outside the controversies in macroeconomics ('Incidents'); instead, he was drawn to the debates in international finance. The world had just abandoned the Bretton Woods system of fixed exchange rates that had operated since the end of the Second World War. When Rudiger Dornbusch, a well-known international economist, arrived at MIT in 1975, he became Krugman's mentor and dissertation advisor.

After receiving his doctorate in 1977, Krugman taught at Yale, MIT, Stanford and Princeton. In late 1982 and early 1983 he briefly left academia. Martin Feldstein, President Reagan's chief economic advisor, recruited Krugman to be the international expert on the Council of Economic Advisors. However, Krugman was neither a Reagan Democrat nor a Reagan supporter. He thought supply-side economics was nonsense, and called his experience in Washington 'disillusioning' ('Incidents'). He thought senior Washington officials engaged in bad economic thinking, and that Washington was filled with people who told politicians what they wanted to hear because they got ostracised if they didn't. Krugman was not that sort of person.

Currently he is Professor of Economics and International Affairs at Princeton University; he lives in what he has described as a 'McMansion' near Princeton, New Jersey. In 1991 Krugman received the John Bates Clark Medal, awarded to the American economist under the age of 40 who has made the most significant contributions to economics. In 2008 he received the Nobel Prize in Economics 'for his analysis of trade patterns and location of economic activity'.

In the 1990s Krugman began writing for a general audience. His first foray into popular economics, *The Age of Diminished Expectations* (Krugman 1990), explained why the US economy survived Reaganomics. *Peddling Prosperity* invoked technological change and the economics of superstars to help explain growing income inequality in the USA, but concluded that economists do not really understand why inequality started to increase during the 1980s (Krugman 1994, p. 150). *Pop Internationalism* (Krugman 1996) criticised industrial policy advocates because countries do *not* compete against one other.

To reach an even larger audience, Krugman began writing for magazines and newspapers in the 1990s. His regular columns appeared in *Fortune* and *Slate* during the 1990s. Since 1999 he has written a twice-weekly op-ed column in the *New York Times*. When the *Times* approached him, he was torn, afraid of sullying his academic reputation (MacFarquhar 2010, p. 41). But he decided that having a positive influence on public opinion was more important than the opinion of his colleagues.

In further pursuit of this goal, Krugman expanded his *Times* articles and developed them into books for the educated public. *Fuzzy Math* (Krugman 2001) attacks the Bush administration for seeking to bankrupt the government, privatise Social Security, and increase income inequality. Parodying the title of Barry Goldwater's biography, *The Conscience of a Liberal* (Krugman 2007) blames conservative think tanks and conservative politics for poor US economic performance and rising income inequality in the 2000s. Finally, *End This Depression Now*! (Krugman 2012) holds bad economic policy responsible for continued high unemployment throughout the developed world and supports a Keynesian stimulus program.

New Trade Theory

Bruce Elmslie (2010, p. 2) calls Krugman's contributions to the theory of international trade 'paradigm-shifting'. Before Krugman, international trade theory followed a well-hewn path set forth by David Ricardo. It began by assuming perfect competition and constant returns to scale. It then demonstrated that when two nations produced what each could do relatively better, and then traded with each other, both nations would gain. Ricardo took comparative advantage as given. The standard international trade model, Heckscher–Ohlin–Samuelson, expanded Ricardo's analysis and showed how factor endowments drove comparative advantage and trade patterns. According to this model, what each country exports is determined by the quality and quantity of resources they possessed. Saudi Arabia exports oil because they have a plentiful supply underground, and Canada will never export coffee (barring major climate change).

This approach encountered several empirical problems. First, trade in raw materials is not the mainstay of world trade. Rather, services and manufactured goods get traded among developed countries. This leaves a lacuna in standard trade theory. It cannot explain why Japan exports cars while Belgium exports chocolates. Second, with a comparative advantage in capital, the USA should export capitalintensive goods. However, Wassily Leontief (1953, 1956) demonstrated that advanced countries (eg the USA) with lots of capital tend to export labour-intensive goods. Third, there was little specialisation in the decades after the Second World War; most international trade took place among industrial nations selling similar goods to each other. The theory of comparative advantage implies that similar countries, such as Germany and the USA, should not trade with each other. What can be produced in one can be produced in the other at around the same cost. When adding the cost of moving goods across the Atlantic, it is not clear why German firms sell Volkswagens in the USA and Ford sells Fiestas in Germany.

Krugman (1979b, 1980) explained these empirical puzzles by relying on the notions of increasing returns and a desire for diversity. He began with monopolistic models of the firm developed by Avinash Dixit and Joseph Stiglitz (1977); then he showed how economies of scale or increasing returns, and demand for diversity, determine trade patterns.

Adam Smith held that international trade enables firms to sell to a larger market at lower per unit cost. Likewise, for Krugman trade expands markets and leads to efficiency gains because larger production runs are possible. Krugman (1979b, 1980) demonstrated that increasing returns leads to specialisation and trade (in addition to factor endowments and comparative advantage). Furthermore, according to Krugman, increasing returns was the most important determinant of foreign trade in contemporary economies.

Krugman used his new trade model, along with the idea that consumers crave diversity, to explain why similar nations trade similar goods with each other. Some consumers prefer the safety of the Volvo; others prefer the reliability of German engineering; yet others prefer the styling of Japanese

cars. And people don't want to eat the same sort of chocolate or cookie all the time. This desire for diversity, plus the different skills needed to produce different goods and services, explains why we don't trade sugar cookie recipes with Denmark rather than actual cookies (Feenstra 2009, p. 99).

This analysis also explains observed trade patterns throughout the world. Countries with large domestic demand for a particular good tend to export that good because production runs can be larger. This lowers their production costs, and compensates them for the greater transportation costs of exports (Krugman 1980). In addition, it allows for improved products that satisfy diverse consumer demands. Belgians consume a great deal of chocolate, enabling Belgian firms to experiment with high-quality chocolates and then export them. Domestic demand thus determines which country produces which goods and also international trade patterns. Large countries have an advantage over smaller countries because it is easier for them to take advantage of economies of scale in their home or domestic market. This explains why the European Union sought to expand from a set of relatively small countries to one large market and why the USA remains the dominant economy in the world.

Many real-world implications follow from this analysis. Since demand is generally more elastic in export markets, firms that export charge less in foreign markets than in their home country, resulting in a form of price discrimination that maximises profits for imperfectly competitive firms that sell their goods throughout the world. Moreover, since firms must absorb these costs to compete in foreign markets, everyone is technically dumping goods abroad (Krugman and Brander 1983).

Another implication concerns the impact of international trade on wages. The Stolper–Samuelson (1941) theorem holds that when a rich country trades with a poor country the returns to each factor of production become more equal. Labour in the rich country receives lower wages due to competition from low-wage countries, while wages rise in low-wage countries due to increased demand for their goods. US trade with China should therefore reduce wages for low-skilled US workers, who must now compete with Chinese workers getting lower pay and benefits. On the other hand, Chinese workers should see their wages increase as demand for their services rises.

According to the new trade theory, trade liberalisation may not lead to factorprice equalisation. Krugman (1981) showed how trade can be win–win. With increasing returns, each country is able to specialise and produce at lower cost. Cheaper imports, as well as lower domestic prices due to greater competition, increase real incomes. This gain can exceed the loss of nominal wages. As a result, the standard of living for US workers can improve as a result of trade with China, and the return to *all* factors of production can rise in both countries. However, when comparative advantage is strong and economies of scale are weak, the standard Stolper–Samuelson results hold.

Yet another implication of the new trade theory concerns trade policy. According to standard trade theory, a tax on imported goods cannot increase exports; tariffs lower the demand for foreign goods and reduce competitive pressures on domestic firms. With higher costs and lower foreign demand, exports should fall. Krugman (1984a) showed that this result did not hold for oligopolistic industries facing increasing returns. In this case, protecting the home market lets firms produce for domestic consumption and allows them to take advantage of economies of scale, which can lower prices and increase exports. The gains from lower costs and greater exports can even exceed the value of government subsidies to exporters or the higher costs that result from restricting imports.

Under these circumstances, the case for free trade becomes a bit murky. On the one hand, governments can help national industries develop through subsidies, protectionist policies and tax breaks. Because economic success does not always start on its own, there is a role for government policy and multiple equilibria. Building the Erie Canal helped make Manhattan the financial centre of the world (Krugman 1994, p. 224), a real-world example of how government investment can create economic success. In a similar vein, the automobile

bailout during the Great Recession saved the US auto industry, along with it the many firms making engines, tyres and other auto parts.

On the other hand, Krugman strongly supports free trade. He remains sceptical that government officials can pick winners, as advocates of industrial policy contend. He also fears powerful interests influencing government policy decisions against the national interest. Baldwin and Krugman (1988) found that import protection in the Japanese semiconductor industry led to higher prices for semiconductors and losses for exporters that needed these parts.

New Economic Geography

The question of trade between two regions of one country is not that different from the question of international trade between two countries. New trade theory showed how imperfect competition, increasing returns and multiple equilibria can explain international trade patterns. After developing this theory, Krugman took the next logical step and studied where firms locate within a country. This branch of economics, the new economic geography or location theory, studies why some areas grow (while some remain poor) and why specialisations develop in particular regions. For example, why did the movie industry arise around Los Angeles and the financial industry in New York?

One standard answer appeals to factor endowments. Areas with abundant natural resources and ambitious individuals thrive; places with neither of these advantages do not. Krugman found this view unacceptable. It couldn't explain why Japan flourished after the Second World War with virtually no natural resources or why Nigeria remains poor despite its great oil wealth. Another standard answer focuses on access to markets. Geographers usually contend that firms locate where people live in order to sell more to consumers, while at the same time reducing their transportation costs. This explanation provides only a partial explanation for location decisions, according to Krugman. It explains why child care and concrete manufacturing is done locally, but not why finance has located in New York. A third standard answer to the location question looks to government policy. Conservatives have argued that areas with high taxes and excessive government regulation will stagnate. According to this view, government policy can do little to aid economic development besides minimising taxes and regulations to encourage firms to set up operations locally. Again, this fails to explain the success of the Nordic countries, which have high taxes and large governments, or the success of New York City despite its high tax rates.

After rejecting these standard explanations, Krugman (1991a, b, d) took a different approach to the location decision. Three key elements of his analysis were historical accident, a sort of home field advantage in conjunction with increasing returns (as Krugman argued for in his trade theory), and cumulative or circular causation.

The random part, or the historical accident, stems from the fact that it is somewhat arbitrary where firms start up. Peculiar historical circumstances determine which city becomes the financial center of the world and where the motion picture industry locates. One good example of the importance of randomness is the QWERTY keyboard layout. David (1985) argues that the keyboard layout we have all come to know was designed to slow typing down on typewriters so that keys would not hit one another, stick and have to be manually separated. Once everyone learned to type on one keyboard, and one keyboard gets produced for everyone, it is hard to change. There is a lock-in effect.

Geography and Trade (Krugman 1991a, Chapter 2) tells a similar story about carpet-making. Catherine Evans, a teenage girl living in Dalton, Georgia, made a tufted bedspread as a wedding gift for a friend in 1895. This soon became a popular product in the area. By 1900 a handicraft industry developed in the area. Catherine and her friends were producing and selling tufted bedspreads; people living in the area developed skills in tufting. After the Second World War this technique was used to manufacture tufted carpets. Firms congregated around Dalton, along with supporting industries such as dyeing fabrics and making carpet backings. Krugman (1991a, b, d) shows that random factors

determine where industries set up operations. Path dependence and lock-in effects keep them there.

But location is not completely arbitrary. This is where something akin to home field advantage comes in. Because of economies of scale, there is a tendency to set up production facilities where local demand is great and sell what gets produced there in other areas. Also, government policy can affect location decisions. There may be multiple equilibria. Which of these is the actual equilibrium or situation depends on historical accident and government policies.

Michael Porter's (1990) *Competitive Advantage of Nations*, which stresses how regional clusters contribute to growth and international competitiveness, gave Krugman the final insight he needed for analysing firm location decisions. Porter focused on the macroeconomic determinants of regional clusters and the government policies that supported particular groups of industries. Krugman (1991d) sought to explain the rise of agglomeration in terms of microeconomic decisions made by firms and workers. Once industries start up in some area, skills develop among locals, new workers are attracted to the industry, related firms open nearby and synergies develop as well as economies of scale. Transportation costs for suppliers are minimised and the area provides a ready source of skilled labor (Baldwin and Krugman 2004). Workers move into the area because economies of scale and minimal transportation costs to and from work reduce their cost of living (Krugman 1991a, b).

As with new trade theory, the new economic geography has important policy implications. First, there does not need to be a regional race to the bottom through low taxes and lax regulation. There are also benefits from agglomeration that can be taxed by local governments without driving firms to areas with lower taxes or less regulation, since there are many other benefits to remaining in the area. Taxes that fund high-quality public schools and other public amenities will attract families wanting their children to receive a good education and play in safe parks. At the same time, economies of scale and agglomeration gains attract firms to an area because these gains will counter the higher taxes that they must pay.

When location outcomes are arbitrary to some degree, the case for the free market is weakened and the door opens for interventionist policies. Government policies can aid industries, thereby creating a national comparative advantage in some goods (Krugman 1994, p. 238). A country can gain an advantage for its domestic industry in the world economy through helping domestic firms. Some real-world examples of this would be government R&D in military technology leading to benefits for the US airline industry and government R&D in medicine generating benefits for the pharmaceutical industry. Still, Krugman has opposed governments trying to pick winners. He fears rent-seeking behaviour and thinks governments cannot discover which industries and what support would yield net positive returns.

Exchange Rates

Krugman began his professional career studying international finance, particularly exchange rate regimes. He later became interested in currency areas and sovereign debt as these became key macroeconomic issues in the late twentieth century.

Trade between two countries with different monies requires some system for exchanging one currency for another. Broadly speaking, there are two main possibilities. Countries can fix the value of their currencies to one another or they can let their exchange rate fluctuate. The gold standard and Bretton Woods are two examples of fixed exchange rate regimes. Floating exchange rate systems allow the value of a country's currency to change by any amount at any time based on the forces of supply and demand.

Each system has its advantages and disadvantages. Fixed exchange rates make it easier for two nations to trade, since large exchange rate changes are a problem for exporters and can sharply curtail exports. There may be political advantages as well. After the Second World War, the European Coal and Steel Commission was created to make Germany dependent on French steel and French steel mills dependent on German coal. It was

thought that mutual dependence would reduce the probability of another world war since it would disrupt production in both nations.

However, fixed exchange rates have some disadvantages, which are also the advantages of flexible exchange rates. With fixed exchange rates, countries must use monetary policy to keep exchange rates fixed, since interest rates drive (to a large extent) the movement of money across national borders (in search of better returns). This takes away one key policy tool to influence the domestic economy. Flexible exchange rates let monetary policy focus on the domestic economy, but they can become volatile, thus hindering trade.

Krugman (1988, 1989b) explained why flexible exchange rates were so volatile. Part of his answer is that capital markets were not efficient. He (Krugman 1979b) also explained why fixed exchange rate regimes tend to end quickly under a sudden speculative attack. Krugman (1999a) argued there could be multiple exchange rate equilibria, each dependent on different psychological beliefs (which are self-fulfilling and self-reinforcing). Attacks move us quickly from one equilibrium to another, and can spread from one country to another. Loss of confidence in the currency from one area results in currency attacks that validate prior beliefs. This also has negative macroeconomic consequences because of its impact on domestic firms. It worsens their balance sheet because they tend to borrow money in foreign currency.

Seeking to take advantage of some benefits from each type of exchange rate, John Williamson (1983) suggested currency bands or exchange rate target zones. These are ranges around which currencies are allowed to fluctuate. For example, the US dollar and the euro might move anywhere between \$1 = h0.5 and \$1 = h0.7, but not outside that range. This provides for some stability, since exchange rates will likely remain within this range, encouraging trade between the USA and continental Europe; but central banks usually won't have to worry about maintaining the value of their currency.

Krugman (1979a) showed how fixed exchange rates could collapse due to speculative pressure. The same is true of currency bands. Krugman (1991c) demonstrated that this would not be true if the target bands were credible (i.e. if traders believe governments and central banks will support them); in this case the target zone increased stability. Krugman (and Rothemberg 1992) explained that when currency bands are not credible, there would be speculative attacks as traders believed currencies would go outside the band while governments try to keep currencies within the trading band.

Contemporary Macroeconomic Issues

The Japanese slump of the 1990s, following a huge housing bubble, led Krugman to focus more on macroeconomic issues. His analysis of Japan's problems relied on several tools of Keynesian macroeconomics that went out of vogue as a result of the rational expectations revolution – Hicks' IS–LM model and the notion of a liquidity trap, a point below which interest rates could not fall (because they were at zero and we cannot get negative interest rates).

Krugman (1998a) argued that since the 1990s Japan has experienced a liquidity trap, where the equilibrium interest rate leading to full employment was below 0%. The Central Bank of Japan pushed interest rates to near zero, leaving little in the monetary policy arsenal. In addition, everyone believed that once the economy began to expand again interest rates would be increased, keeping effective real rates at 0%. In such a case, increases in the money supply did not lower interest rates because rates were effectively zero and could not fall further. One way to escape the trap would be for central banks to credibly promise higher inflation for several years, or as Krugman (1998a, p. 161) phrases it 'credibly promise to be irresponsible'. This would push real interest rates below zero, encourage more borrowing and generate more spending. Another solution pushed by Krugman was greater reliance on fiscal policy – more government borrowing and spending. His analysis of the Japanese slump harshly criticised the Japanese government for not spending enough to generate full employment.

Krugman (1999b, 2008a) then became concerned that the problems facing Japan (a housing bubble that burst leaving 'zombie banks' that are effectively bankrupt) would soon become problems in the USA, and he pressed for regulatory actions to rein in a financial system that was out of control. Following the 2008–09 financial crisis, Krugman (and Eggertsson 2011) applied a similar analysis to the USA. As Irving Fisher (1933) stressed, during bad economic times, prices tend to fall and real debt tends to rise, reducing consumption and slowing economic recovery. A debt–deflation problem requires active government intervention to both stimulate the economy and reduce consumer debt.

According to Krugman (2012), the policy response to these problems has been inadequate in the USA. He strongly criticised Ben Bernanke for avoiding the more radical measures that Bernanke himself suggested to the Bank of Japan during Japan's slump in the 1990s (such as a target of increasing inflation to 4%, which would reduce the real burden of existing debt). Regarding fiscal policy, for Krugman, President Obama's stimulus plan was too small given the problems facing the USA and given that its failure would make it politically impossible to pass another stimulus. As for debt reduction, Krugman points out that numerous Obama programs to aid homeowners have resulted in little refinancing or debt reduction. Similarly, Krugman has criticised European governments for engaging in austerity programs to reduce budget deficits rather than stimulative Keynesian policies. Going further, Krugman (2011b) blames the economics profession for abandoning Keynesian economics and policies; with stronger professional support, he believes that appropriate macroeconomic policy would have shortened the current economic crisis and mitigated its harmful effects.

This more recent work in macroeconomics plus his work as a *New York Times* columnist has resulted in much criticism of Krugman. Some of this can probably be written off as professional jealousy. But some of the criticism is substantive. Elmslie (2010) bemoans the opportunity cost of losing Paul Krugman the brilliant academic economist. Other economists criticise him for becoming too political and thereby losing his economic objectivity. Nevertheless Krugman's scholarly accomplishments – those contributions that earned him a Nobel Prize – remain highly regarded by economists (see Behrens and Robert-Nicoud 2009; Dixit 1993; Neary 2009).

See Also

- ▶ Currency Crises
- ▶ Depressions
- ▶ New Economic Geography

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Kuczynski, Jurgen Peter (Born 1904)

J. Foster

The son of the statistician and demographer R.R. Kuczynski, J.P. Kuczynski was educated at Berlin and Heidelberg universities. He became economic editor of *Rote Fahne* in 1930 and head of the KPD's information department in 1933. In 1936 he emigrated to Britain, where he began publication of his comparative studies of living standards (Kuczynski 1939, 1944). From 1945 he resumed work in Germany, becoming professor of economic history at Humboldt University, Berlin, and publishing his 38-volume history of workers' conditions under capitalism (Kuczynski 1964).

Kuczynski was the first economist to elaborate and scientifically test what he described as 'the Marxist theory of absolute deterioration . . . that under capitalism the size of the proletariat tends to increase . . . and the working and living conditions of the proletariat tend to deteriorate' (Kuczynski 1944, p. 14). He sought to define this deterioration on the same terms as Marx (1867, pp. 190–92 and 575 ff. 1905, p. 16) by arguing that the minimum subsistence required by a worker was conditioned by the historically changing character of labour and that living standards encompassed the intensity and duration of labour, physical and mental health and the quality of the environment. He also insisted that any calculation must include all labour, at home and overseas, employed by the capital of a particular country (Kuczynski 1944, pp. 18–24).

Reviewing his evidence on living conditions in Britain and its empire in 1940, he concluded: 'what cannot be asserted is that under the capitalist system the conditions of all workers employed by one country's capital have improved from one trade cycle to another' (1944, p. 18).

Kuczynski's thesis has been directly and indirectly challenged by Ashton (1949), Hartwell (1961), Lindert (1983) and Blaug (1985). Material

broadly in support can be found in Hobsbawm (1957), Sowell (1960), Barnsby (1971), Lis (1977), Coleman (1981), and O'Brien (1981). Braverman (1974) has since advanced a somewhat similar, though less carefully qualified, thesis on 'the degradation of labour'.

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Kuh, Edwin (1925–1986)

David A. Belsley

Edwin Kuh was a leader in econometric modelling, an applied econometrician, and a socially aware economist. He was born in Chicago, Illinois on 13 April 1925 and died in Cambridge, Massachusetts on 9 June 1986. Educated at Williams College (BA, 1949) and Harvard University (PhD, 1955), he was awarded the Wells Prize at Harvard for his doctoral dissertation and began teaching in 1953 as a Lecturer at The Johns Hopkins University. In 1955 he was appointed Assistant Professor at the Sloan School of Management at MIT and was promoted to Associate Professor in 1959. In 1962 he became Professor of Finance and Economics in the Sloan School and Professor of Economics in the Department of Economics. He was Director of the NBER Computer Research Center from 1971 to 1977 and became Co-Director of the Center for Computational Research in Economics in Management Science (CCREMS) at MIT at its formation in 1978, a position he held until his death. In 1963–4 he was acting principal investigator for the joint Econometric Model Project of the Brookings Institution and the Social Science Research Council.

Kuh's far-ranging research includes seminal studies into the relation of productivity to the business cycle, specification and estimation of large-scale macroeconometric models, and assessment of the reliability of econometric models. Perhaps his greatest research asset was his ability to see when persons working in different disciplines were in fact doing related research of mutual interest. This ability was manifest in the strongly interdisciplinary research he promoted as Director of CCREMS at MIT. There, the efforts of econometricians, statisticians, numerical analysts, data analysts, and programmers combined to produce research into tools and methods for building and assessing econometric models that could not readily have occurred

elsewise. One mainstay of these efforts was the TROLL system, a large-scale, interactive, econometric computer modelling environment, of which Kuh was the 'spiritual father'.

Kuh also turned his economic talents toward social and political issues. With J.K. Galbraith and Lester C. Thurow, he devised proposals for affirmative action plans in 1971. He was an advisor to Robert F. Kennedy in his 1968 presidential bid and headed the economic advisory panel for Senator George McGovern's 1972 presidential campaign, proposing a potentially far-reaching programme of tax and welfare revisions. He was a member of the President's Materials Policy Commission in 1951 and of the economic advisory panel of the U.S. Postal Service. He was also a consultant to the US Treasury in 1959 and to the US General Accounting Office. Further, at various times, he served as advisor to the governments of China, Greece, and Costa Rica.

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Kuznets Swings

S. N. Solomou

Abstract

Kuznets swings refer to variations in economic growth with an average cyclical period of 20 years. The evidence suggests that for the period before the First World War long swings were a dominant and pervasive aspect of national economic growth. Abramovitz (1968) argued that Kuznets swings were a feature only of the pre-1913 era, partly because the migration restrictions introduced in the New World during the interwar period changed the causal process. We consider this idea and argue that, although the features of long swings are time-varying, the idea of a 'passing of the Kuznets cycle' needs to be re-evaluated.

Keywords

Currency unions; Economic and monetary union (EMU); Fixed exchange rates; Gold standard; International capital flows; International migration; Kuznet swings; Long swings in economic growth; Migration; Multiplier–accelerator interaction; Population; Real exchange rates; Terms of trade

JEL Classifications

E3

Kuznets swings refer to variations in economic growth with an average cyclical period of 20 years. The average period of the swings found varies depending on the specific smoothing and trend elimination techniques employed (Bird et al. 1965). Kuznets (1958), Abramovitz (1959) and Lewis and O'Leary (1955) found mean swings of 22, 14 and 19 years respectively. The existing historical evidence suggests that for the period before the First World War long swings were a pervasive aspect of national economic growth, being observed in a wide set of

economies, including the United States, Argentina, Australia, Brazil, Britain, Canada, France and Germany (Solomou 1987). Similar results have been reported for Japan (Ohkawa and Rosovsky 1973; Ohkawa 1979; Shinohara 1962).

Long swings have often been explained as the outcome of the pre-1913 economic structure, with population-sensitive investments playing a central role. The emphasis has been on the Anglo-American economies, with the aim of explaining the economic impact of international migration. Kuznets (1958) suggested that internal and international migration responded to development opportunities in the American economy, inducing multiplier-accelerator effects via the building sector. Abramovitz (1959, 1961) and Easterlin (1968) have offered similar explanations. Working from the migration perspective, Thomas (1973) attempted to explainmigration and aggregate long swings in terms of the framework of the 'Atlantic Economy' (of Britain and America). The high degree of economic integration in the Atlantic economy implies that the availability of factors of production was a constraint on economic growth within the region. An increase of investment in one region was assumed to result in a decrease of investment in the other region. Since construction activity was greatly influenced by population changes, which, in turn, were influenced by migration movements, migration was seen to be the main force generating inverse swings in output and investment in the Atlantic economy.

That *exogenous* migration movements can generate macroeconomic swings is theoretically plausible. However, to the extent that migration patterns are influenced by economic considerations, Thomas's (1973) model is misleading; the description of endogenous economic processes has been confused with an exogenous explanation of economic change. Moreover, the emphasis on migration as the *causal* variable has led to a neglect of other important determinants of long swings in economic growth.

Cairncross (1953) focused on the variation of the international sectoral terms of trade between manufacturing and agriculture in the world economy. Britain, France and Germany were representative of industrial economies producing manufactured commodities while much of the rest of the world was taken to represent the primary-producing sector. Investment flows in the international economy were determined by the relative profitability of these two sectors. Migration flows were not an exogenous force generating long swings but were merely a response to these underlying economic variations. In Cairncross's framework, sectoral terms of trade changes reflected long-run sectoral imbalances in the world economy:

> One would expect to find, therefore, that during, or immediately after, a fairly long period in which the terms of trade were relatively unfavourable to Britain there would be heavy investment in the countries supplying her with imports … On the other hand, when capital goods were expensive and foodstuffs were in over-supply, the continuance of a rapid opening up of agricultural countries would be distinctly surprising. (Cairncross 1953, p. 189)

Cairncross argued that a similar experience is also observed for the other major capital exporters. All these early studies of pre-1913 long swings emphasize monocausality, partly due to the limited macroeconomic and sectoral data available to the early researchers. Solomou (1987) has shown that long swings were observed for, *inter alia,* aggregate investment, profitability, output, productivity, agricultural output, construction output, weather variables, monetary growth, sectoral terms of trade and migration flows. The swings also have international dimensions; they are observed for overseas investment, international terms of trade and international relative profitability movements, and the balance of trade. Such evidence raises strong doubts about the simple migration and terms of trade explanations for these swings – instead, these variables are best seen as part of a broader causal structure for the observed swings.

Abramovitz (1968) argued that Kuznets swings were a feature only of the pre- 1913 era, partly because the migration restrictions introduced in the New World during the interwar period changed the causal process for long swings. However, in arguing the case for 'the passing of the Kuznets swing' Abramovitz is relying on the validity of the prior hypothesis that growth swings of this duration were the outcome of *international* migration swings. As argued above, this offers a partial perspectiveon pre-

1913 growth swings. Abramovitz's idea of the passing of the Kuznets swing is inconsistent with evidence on historical economic growth that suggests that long swings were observed after 1913, implying that a much broader causal framework is needed. For example, in the US economy the long-swing pattern of macroeconomic growth continues into the interwar and post-war eras (Hickman 1974), with *domestic* migration swings playing an important role in the period after 1914 (Easterlin 1968; Hickman 1963). In Japan long swings of growth are observed throughout the period before the Second World War (Shinohara 1962; Solomou and Shimazaki 2007), accounted for by a broader causal structure than is emphasized in the traditional long-swing literature. This suggests that seeking an explanation for change in the features of long swings is more useful than seeking an explanation for a unique 'passing'.

After surveying American long swings in the period 1840–1914, Abramovitz (1959, p. 462) concluded,

> It is not yet known whether they are the result of some stable mechanism inherent in the structure of the US economy, or whether they are set in motion by the episodic occurrence of wars, financial panics, or other unsystematic disturbances.

What Abramovitz seems to have had in mind is that the question of endogeneity is an open one. A useful general perspective on long swings is to view the features of this cycle as being a product of the specific policy framework. During the rules- based policy framework of the gold standard, a necessary outcome was the need for cyclical adjustment. This type of adjustment was manifested in a number of ways. In the case of the core industrial countries before the First World War, they were able to sustain the gold standard rule as their policy framework and were able to use migration, capital flow, trade and *real* exchange rate adjustment to cope with a changing and stochastic economic environment (Catão and Solomou 2005). The slow-relaxing nature of these variables meant that most of the cyclical movement is observed in the long-swing frequency rather than the shorter business-cycle frequency. To this extent Abramovitz is right to say that interwar swings were of a different nature from previous ones; however, this does not constitute a passing of the cycle. In fact, we could argue that during the interwar period, as the conventional adjustment processes of the gold standard epoch disintegrated, discretionary policy became a new adjustment tool determining growth outcomes.

This analysis of Kuznets swings suggests that an understanding of the observed swings requires us to understand the episodic changes that have been observed in different historical periods. This emphasis on policy framework suggests that Kuznets swings could become of increasing relevance in the future. As different policy blocs attempt to establish fixed exchange-rate regimes and single currency areas, the adjustment to shocks in the future will once again become policy-constrained. For example, Europe's commitment to a single currency under economic and monetary union must imply that a number of adjustment mechanisms (such as migration and capital flows) will have to be activated as equilibrating mechanisms to national-specific shocks if we are not to observe persistent divergence across different countries. Such flows could generate economic–demographic interactions on the cyclical process, which has clear homologies with the gold-standard pattern of international adjustments.

See Also

- ▶ Kondratieff Cycles
- ▶ Kuznets, Simon (1901–1985)

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Kuznets, Simon (1901–1985)

Richard A. Easterlin

Keywords

American Economic Association; American Statistical Association; Business cycles; Koopmans, T. C.; Kuznets cycles; Kuznets, S.; Measurement; Mitchell, W. C.; Modern economic growth; National Bureau of Economic Research; National income accounting; National product accounting; Social accounting

JEL Classifications

B31

Kuznets was born in Pinsk, Russia, on 30 April 1901 and died in Cambridge, Massachusetts, on 9 July 1985. After a brief period as youthful head of a statistical office in the Ukraine under the early Soviet regime, Kuznets emigrated to the United States, where he received his BA in 1923, MA in 1924, and Ph.D. in economics in 1926, all from Columbia University. He was a member of the research staff of the National Bureau of Economic Research in New York from 1927 to 1961, and held professorial appointments in economics at the University of Pennsylvania (1930–54), Johns Hopkins University (1954–60), and Harvard University (1960–71). After his retirement, Kuznets continued an active research career for another decade. During the Second World War he was associate director from 1942 to 1944 of the Bureau of Planning and Statistics of the US War Production Board. Kuznets was elected president of the American Economic Association in 1954 and the American Statistical Association in 1949, and was the 1971 recipient of the Nobel prize in economics.

Kuznets's foremost contribution, for which he received the Nobel prize, is an empirically founded comparative study of the economic growth of nations. In this work Kuznets identifies, documents and analyses the emergence of a new epoch in economic history, which he calls 'modern economic growth' (Kuznets 1966). Modern economic growth first makes its appearance in north-western Europe in the latter half of the 18th century. In the course of the 19th century it diffuses southward and eastward throughout Europe, and by the end of the century its beginnings can be identified in Russia and Japan. Mirroring the diffusion pattern within Europe is

a somewhat parallel development in overseas areas settled by Europeans. Modern economic growth appears first in areas initially settled by migrants from north-western Europe – the United States in the first part of the 19th century, followed by Canada, Australia, and New Zealand – and subsequently in parts of Latin America where migration from southern and eastern Europe was especially important. In the 20th century, especially since the Second World War, the initial signs of modern economic growth have become more widespread in parts of Asia, and, to a lesser extent, Africa.

Three conditions especially set off the epoch of modern economic growth from prior forms of economic organizations – the growth rate of real per capita income, the industrial and occupational distribution of the labour force, and the form of population settlement. In economies experiencing modern economic growth the rate of increase of real per capita income has typically averaged around 15 per cent or more per decade over periods of a century or more. In this epoch, there may be shorter or longer fluctuations in the growth rate (such as business cycles, Kuznets cycles, or Kondratieff cycles) but there is no clear evidence of systematic long-term retardation or acceleration. A sustained growth rate of 15 per cent or more per decade is unprecedented in economic history.

In prior epochs of economic organization, economic activity was concentrated in the primary, extractive, sector of the economy, and took the form of agriculture, or, at an earlier time, hunting, gathering and fishing. The era of modern economic growth has witnessed a vast diversification and proliferation of industries and occupations. In today's developed economies, extractive pursuits often account for as little as 5 per cent or less of the labour force; the secondary sector, chiefly manufacturing and construction, may account for around another third; and the tertiary service sector for the remainder. Within the service sector, a sizeable share of the labour force, approaching the importance of manufacturing in magnitude, is employed in the transportation and distribution of goods, while the remainder is engaged in activities such as personal and professional services, and government. On the occupational side, white collar jobs (managerial, clerical, professional, and sales), of small importance in prior epochs, grow significantly in proportion to blue collar (manual) labour.

Associated with the shift out of agriculture is a major transformation in place of residence of the population. In prior epochs nomadic or village life was the overwhelming form; in contrast, the epoch of modern economic growth has seen the emergence and dominance of spatial concentration, in cities and surrounding suburbs. As a consequence, in many developed economies rural depopulation has been a pervasive phenomenon.

Underlying the acceleration in the growth rate of real per capita incomes and associated reallocation of resources by industry, occupation and location has been a technological revolution, most easily identified by the increased flow since the 18th century of inventions and innovations in economic activity. At bottom, this new technology stems from the emergence of modern science in the 16th and 17th centuries and the empirical outlook to which it gave rise. Modern technology is distinct from the technology of prior epochs in its reliance on inanimate sources of power, the growth in importance of minerals relative to fibres as raw material, the spread of mechanization and an associated increase in optimum scale of manufacturing production leading to replacement of artisanal by factory organization, and new forms of transportation and communication.

To some the epoch of modern economic growth is identified with industrialization and capitalism, but in Kuznets's view this is a misconception. 'Industrial' work in the sense of manufacturing and construction, accounts, as has been noted, for a minority share of economic activity in presently developed countries, and, in some of these countries, modern economic growth has been based primarily on the commercialization and technological modernization of agriculture rather than on industry. Moreover, the phenomenon of modern economic growth transcends specific institutional forms such as capitalism, socialism or communism. As Kuznets demonstrated in numerous works, the dramatic rise in the growth rate of real per capita income,

the immense reallocation of resources among economic activities, the spatial concentration of population, the adoption of a common modern technology, and many other features of contemporary economic development have been essentially similar in the United States and the Soviet Union, western and eastern Europe, and, in incipient stages today, China, India and Brazil.

The analysis of modern economic growth was the logical culmination of Kuznets's earlier work. The organizing framework for his comparative study was national income and its components, in whose conceptualization and measurement Kuznets was the foremost pioneer. Indeed, so great are his accomplishments in the measurement of national income and so close the identification of national income with his name that American economists frequently cite this work as the basis for his Nobel award. Certainly, there is no doubt that this work too is a landmark in the evolution of economic science.

Today figures of gross national product (GNP) are taken for granted, but before the First World War there was almost total ignorance of such elementary facts of the economy's size and structure. Kuznets was not the first to seek to close this gap, but his work on national income and product was so distinctive and comprehensive that it became the benchmark in the field. It encompassed estimates of total output and income by final product, industry of origin, and type of income; capital formation and savings; and the distribution of income between rich and poor. This work, coinciding with the new demands for economic information generated, first, by the Great Depression of the 1930s and then by the mobilization requirements of the Second World War, laid the foundation for the establishment of official estimates of total GNP and its components by the federal government, a task in which Kuznets played a leading role. As mentioned, it also provided the basis for Kuznets's subsequent programme of research on economic growth, which was built upon historical series of national income and product for as many countries as possible.

Kuznets's work on national income played a crucial role in the transition of economics from a deductive to a quantitative science. This transition required a union of theory, economic measurement and statistical methodology. In the 1930s the new macroeconomic theories of John Maynard Keynes had aroused much interest because of their relevance to the worldwide economic crisis. Kuznets's concurrent and independent effort to develop measures of the consumption, savings, and investment components of national income provided the empirical counterparts of the Keynesian concepts. This advance in economic measurement and its concordance with new theoretical formulations was a key step in the development of econometrics, the statistical techniques for systematic quantitative modelling of the economic system pioneered by Ragnar Frisch and Jan Tinbergen.

In one of his earliest works, on secular movements in production and prices, Kuznets identified fluctuations of 15–25 years' duration in a number of economic time series in the United States. Subsequently he returned to this subject several times, widening the range of observation to other developed countries and incorporating demographic as well as economic time series. These movements, although still somewhat controversial, are commonly referred to today as 'Kuznets cycles', in recognition of his pioneering contribution.

In the history of economic thought, Kuznets stands in a line of descent tracing back through the American institutional school to the German historical school and thence to Karl Marx. The common thread is a search for laws or generalizations about long-term economic development based on comparative study of historical experience. The unique feature of Kuznets's work, which endows it with the prospect of more enduring success, is its foundation in quantitative measurement. In using national income as the key organizing principle of his comparative studies, Kuznets made possible the replication and extension of his work by others and thus the cumulation of a body of systematic knowledge about economic development forming the basis for tested generalizations.

Although Kuznets identified modern economic growth as a distinctive epoch in economic organization, he did not extend his empirical approach

to the study of earlier epochs. In this respect, Kuznets was much like Marx and Joseph Schumpeter, in that he focused his attention on the study of a single, contemporary stage of economic evolution, although, unlike them, he did not see this stage as confined to the boundaries of capitalism.

Kuznets's approach to economics and to economic research may best be understood in terms of his intellectual heritage. Although Kuznets' convictions about the importance of quantitative measurement and knowledge of economic history antedated his emigration to the United States, they received strong reinforcement from his mentor at Columbia, Wesley C. Mitchell. Mitchell's scepticism about the reliance of economics on deductive economic theory and his belief in the need for quantitative facts had been instrumental in the establishment in 1920 of the National Bureau of Economic Research, a non-profit research organization devoted to basic economic science, the first of its kind in America. Mitchell brought Kuznets into the NBER, where he conducted his national income studies and came to head the bureau's programme in that field. This project, and that on business cycles, headed by Mitchell and Arthur F. Burns, were the central pillars of the bureau's work, and the basis for the national and international reputation that the bureau established in the 1930s and 1940s. Two themes of the NBER's work – a respect for facts and the cumulation of economic knowledge through quantitative measurement – were key ingredients in Kuznets' research strategy.

The quintessential criticism of the NBER approach was captured in the title of Tjalling Koopmans' famed 'Measurement without Theory' review of the Burns–Mitchell treatise on business cycles (Koopmans 1947). In Kuznets's view, however, measurement can never be divorced from economic theory, and is necessarily guided by theory. Indeed, in the late 1940s Kuznets broke with the official estimators of GNP, because he considered their increasing emphasis on 'social accounting' to be an abandonment of the fundamental Marshallian and Pigovian theoretical concept of national income as a measure of economic welfare. Throughout his career, Kuznets's monographs, although structured around tables of data, were infused with 'tentative' interpretations and explanations based on economic theory.

Admittedly Kuznets was reserved in his use of economic theory and sceptical of formal mathematical and econometric models. This arose, however, not from a rejection of theory but from another feature of his approach that he shared in common with the historical school. This notion is the historical relativity of economic theory. To Kuznets, much economic writing and theorizing was geared to current conditions and claimed validity far beyond the limits that would be revealed by an empirical test. His reservations about economic theory also stemmed from what he felt was its limited coverage of social reality. Particularly in the study of economic growth was an expansion of disciplinary boundaries necessary. Much of Kuznets' work on modern economic growth was carried out under the auspices of the Committee on Economic Growth of the Social Science Research Council. This committee, which Kuznets chaired and directed for the two decades of its life, included important representation from anthropology, sociology, and political science, and organized 16 interdisciplinary conferences. Some of Kuznets' own research involved interdisciplinary cooperation, notably in his collaboration with the distinguished sociologist, Dorothy S. Thomas, in their study of population redistribution and economic growth in the United States.

Simon Kuznets was a devoted family man and warm with intimates. Perhaps his happiest moments, however, were those frequent long mornings spent over a calculator, bending the diverse facts of reality to manageable size. A brief anecdote may capture the spirit of the man. Once, after his retirement, Kuznets was invited to prepare a paper for a forthcoming conference, and, in reply, he asked how long it would be before the conference proceedings were published. When his interrogator quipped, 'Why, Simon, you're not still interested in "publish or perish", are you?', he responded with a twinkle, 'Well, in a sense, I am.'

Though one of the first Nobel prize winners in economics, Kuznets was in important respects a maverick. In a discipline where deductive analysis

is the hallmark of accomplishment, Kuznets, though himself a creative and original thinker, was notable for his insistence on facts and measurement. In a field that prides itself as ' queen of the social sciences', Kuznets reached out to other disciplines both in teaching and research. And in a subject where sweeping ideological prescriptions for reform abound, Kuznets was in both words and example a passionate believer in the ultimate value of science.

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Kydland, Finn Erling (1943–)

Carlos E. J. M. Zarazaga

Abstract

Finn Kydland's contributions to economics science have changed the terms of the debate in two important and related counts: the theory

of policymaking and of business cycles. In his Ph.D. dissertation, Finn showed that a complex 'credibility problem', inherent to the policymaking process, prevented the evaluation of economic policies with the optimal control theory techniques applied until then. His work with Edward Prescott on business cycles identified supply shocks as one of the primary causes of economic fluctuations, with the counter-intuitive and therefore resisted implication that the perfect smoothing of the business cycle may not be a sensible policy objective.

Keywords

Assignment problem; Bellman's principle of optimality; Business cycles; Friedman, M.; Keynesianism; Kydland, F.; Lucas, R.; Monetarism; Monetary shocks; Neoclassical growth theory; Norwegian School of Economics and Business Administration; Optimal control theory; Output-consumption correlation puzzle; Phillips curve; Prescott, E.; Rules vs. discretion; System-of-equation approach; Targets; Technology shocks

JEL Classifications

B31

Finn was born in Bjerkreim, Norway, in the southern tip of the country, and grew up in nearby Søyland with his mother Johanna, his five younger siblings, and his father Martin, who ran a family business that hauled milk and sheep.

Finn was the only one among his classmates to further his education beyond elementary school: at the early age of 15, he moved by himself to Bryne, 20 miles away from home, to be able to attend the nearest high school. His excellent grades there allowed him to apply to the Norwegian School of Economics and Business Administration (abbreviated NHH in Norwegian) at Bergen. He was at first rejected because the secondary school he had attended didn't have a business orientation. With his usual determination to fight adversity, Finn studied some more to acquire the necessary qualifications and finally started his business degree at the NHH in August 1965.

There, in the winter of 1968 he would be hit by a major real shock that would derail him for ever from a business career track. The source of the shock was Sten Thore, the professor of economics teaching a managerial sciences course, in which Finn wrote his first computer program (in FORTRAN) doing dynamic programming, a tool he would use repeatedly throughout his career. According to Sten Thore's testimony (2005), 'Finn quickly established himself as the smartest kid in the class'. It became obvious to him that this low-key farmer boy with a scientific mind had not been born for the business world. Secretly hoping that Finn would find his true calling in life, in the winter of 1968 Sten asked Finn to be his research assistant, 'grasping him in the nick of time after his graduation, before he had time to disappear into the commercial world'.

A few months later Sten was given the opportunity to spend a year as a visiting professor at the Graduate School of Industrial Administration (GSIA), at Carnegie- Mellon University, and asked Finn to accompany him as his research assistant. When Finn joined Sten in Pittsburgh in the summer of 1969, his fate was sealed.

In that exciting intellectual atmosphere, it didn't take Finn long to catch the economics bug, apply formally to the graduate programme, and be promptly admitted. There, in the following spring, while attending a course by young professor Robert Lucas, Finn would see unfold on the blackboard, as it was conceived, Lucas's seminal paper 'Expectations and the Neutrality of Money' (1972). Without either of them knowing it, two future Nobel prizewinners were tuning their minds in the same classroom.

Another fortuitous encounter took place in August 1971, when Finn ran into Edward Prescott, a newly hired professor who asked him what he was working on.

At that time, Finn had become interested in the so-called assignment problem. The problem, formulated in the context of the system-of-equation framework dominating macroeconomics at the time, was to determine the most effective policy instrument for targeting each of multiple, potentially conflicting policy objectives (such as maintaining low inflation and full employment).

Finn was taking an out-of-the-box approach, not in terms of the usual system- of-equations but of a game between the monetary and fiscal authorities. Prescott was curious because he had been doing related research with Robert Lucas. But he was taken aback by the discovery that Finn was about to make: that the outcome of the game was different, depending on whether the players were forced to make all their decisions for the entire future at the beginning of the planning period (the open-loop solution in the so-called sequence space) or allowed to choose their actions one period at a time (the feedback solution in the so-called policy space).

Engineers and physicists routinely using optimal control theory had not considered that possibility because, by Bellman's principle of optimality, both solutions are equivalent in their 'mechanical' world. Intuitively, the reason is that a mechanical device implements instructions exactly as written in the program currently fed into it, regardless of whether in the future it will be asked to implement a different program. Put differently, machines are incapable of conditioning current behaviour on the future.

It was not surprising that economists at the time thought that the results from optimal control theory carried over automatically to economic policy questions. They had been trained in the system-of-equations tradition, which modelled the behaviour of economic agents as if they were machines in the sense that households and firms were allowed to make decisions using only information from the past, even if humans, unlike machines, can anticipate the future and therefore condition current actions on the economic programs (or policies) they expect to be implemented in the future. That artificial assumption ensured the absence of feedback from the future to the present necessary for the principle of optimality to hold.

It is not by chance that Finn had his first Nobel-calibre insight at the GSIA and at that time. After all, it was there, in the spring of 1970, that he witnessed Lucas produce a path-breaking paper showing the serious shortcomings of evaluating alternative policies with the mechanical behavior of economic agents imbedded in the system-of-equations approach. However, in Lucas's 1972 paper the principle of optimality held because he could make his point about the constant money growth policies advocated by Milton Friedman, keeping intact the 'single-player against nature' structure underlying the system-of-equations approach with the policymaker – a random money growth process – instead of households behaving like a machine.

In his dissertation, Finn took Lucas's contribution one step further by assuming that the policymaker (a dominant fiscal authority) didn't behave mechanically but was forward-looking as well, picking policies strategically, depending on the reactions of the other optimizing agents (households or a follower monetary authority). With both participants in the policy game reacting strategically to each other's future decisions, the condition of no feedback from the future to the present required for the principle of optimality to hold was not met. As a consequence, decisions made one at a time are different from decisions made once and for the entire future.

That result had far-reaching consequences for the theory of policymaking. It implied that the reason governments around the world seemed to be unable to implement policies that were the best according to optimal control theory was not necessarily, as it was widely believed, myopic or incompetent policymakers. Rather, it was the inherently dynamic nature of the policymaking process, when there is feedback from the future to the present and societies lack commitment mechanisms to bind the decisions of not-yet-born policymakers. The profession at large would become fully aware of the importance of this revelation only later, after Finn joined forces with Ed Prescott to address the issue of optimal selection of policies in uncertain, dynamic environments that Prescott had been exploring earlier with Lucas.

But first Finn had to finish his degree, which he did in May 1973 with a gold medal. He then returned to Bergen as an assistant professor at the NHH, to fulfil the conditions of the fellowship he had received from that school. There he managed to publish the stunning discovery of his dissertation in a 1975 International Economic Review paper.

He also got Ed Prescott to visit the school for the 1974–5 academic year. In the spring of 1975 they came out with a paper with the provocative title 'On the Inapplicability of Optimal Control for Policy Making'. The paper was received with the same scepticism as Finn's dissertation's first draft: everyone was expecting the principle of optimality to hold and trying to spot the error. Those difficulties persuaded Ed Prescott to add a conventional Phillips curve example to their paper before resubmitting it to the *Journal of Political Economy,* where it appeared in 1977.

Aware of the theoretical result in the paper, Finn was nevertheless surprised by the quantitative finding reported in it: that the time-consistent plan (the 'decisions- one-period-at-a-time' solution), arguably the one that governments will be most tempted to implement, represented a sizable loss of welfare relative to the optimal plan (the 'decisions-for-the-entire-future' solution). The theoretical contribution in his dissertation was not just an intellectual curiosity: it had concrete implications for the real world. This result surely accounts for the huge impact that the paper had in the profession and may help to explain the quantitative focus of Finn's subsequent research.

The rules-rather-than-discretion paper reopened the US market to Finn. In 1976–7 he spent the academic year as visiting faculty at the University of Minnesota. In 1978, the economics department at Carnegie-Mellon appointed Finn as associate professor at the GSIA, breaking an almost inviolable rule among US universities of not offering permanent faculty positions to their own Ph.D. graduates. Finn became full professor there in 1982.

That was also the year in which the other seminal contribution by Kydland and Prescott appeared in *Econometrica.* 'Time-to-build and Aggregate Fluctuations' is a testimony of the quantitative focus that the rules-rather-than-discretion paper impinged on Finn's research agenda. The question that the time-to-build paper set out to answer was: 'If total factor productivity (or technology) shocks were the only source of impulse, what portion of business-cycle fluctuations could they account for?' The answer was more than one-half, later raised to around 70 per cent.

That finding sent shockwaves throughout the profession because it undermined fundamental tenets of the monetarist and Keynesian rival schools of thought then dominating the profession. The monetarists couldn't come to terms with the finding that technology shocks, and not monetary shocks, were the most significant source of economic fluctuations. The Keynesians weren't amused either: they had been attributing economic fluctuations to demand-side shocks, and not to supply side shocks like the ones Kydland and Prescott had just unveiled.

Adding insult to injury, the time-to-build paper seriously challenged both schools' long-held presumption that only models with nominal rigidities in prices and/or wages would be capable of producing fluctuations like the ones observed in the real world. Kydland and Prescott proved that presumption wrong: a neoclassical growth model with flexible prices fed with productivity shocks like the ones observed in the United States was perfectly capable of accounting for about two-thirds of that country's post-war cycles. Therein lay the methodological beauty and conceptual significance of the paper: it derived the quantitative business-cycle implications of well-established growth theory. It is hard to understand in retrospect why such a sensible research project ruffled so many feathers in the profession.

The answer lies in the policy implications: Kydland and Prescott's model, calibrated to US long-run economic growth features, suggests that that country's business-cycle fluctuations since the Second World War can be attributed mostly to the optimal responses of the private sector to exogenous (independent of economic policies) productivity shocks. Under that interpretation, the perfect smoothing of the business cycle that monetarists and Keynesians had been advocating not only is not a sensible policy objective, but can also result in large welfare losses. Neither camp has surrendered, but interestingly enough their subsequent attempts to overturn the finding of the time-to-build paper have preserved many of its distinctive features: money is not explicitly included in the analysis (as in Woodford's 'cashless' economy, 2003), agents exhibit forward-looking and optimizing behaviour and, more

ironically, prices are a lot more flexible than in pre-1982 monetarist or Keynesian models. Unlike with the rules-rather-than-discretion paper, the controversy generated by the time-to-build paper rages on, eloquent testimony of the indelible mark it has left in the profession.

That paper was by no means Finn's last accomplishment. He has continued publishing consistently in the top journals of the profession, recruiting coauthors who share his methodological views and taste for quantitative questions motivated by anomalies and puzzles. For example, international economists have been trying to account for the 'output-consumption correlation puzzle' ever since he and coauthors David Backus and Patrick Kehoe uncovered it in a 1992 *Journal of Political Economy* paper.

Recognizing the calibre of his contributions, the Bank of Sweden awarded to Finn the Nobel Prize in Economics on 11 October 2004, jointly with another giant of the profession, his coauthor Edward Prescott. Shortly before, Finn had accepted the Jeffrey Henley Chair in Economics at the University of California at Santa Barbara. Shortly after, he married Tonya Engstler at their home in Vancouver, Canada.

Inevitably a busy scholar, Finn nevertheless finds time to see his four children from a previous marriage (Martin, Eirik, Camilla and Kari), listen to blues over beers with his colleagues, ride his Ducati, and watch or play soccer. In fact, no award exhibits him more unashamedly than the lifetime membership bestowed upon him in November 2004 by Club Atlético Boca Juniors, the Argentine soccer team he became an unruly fan of while watching, in my company, famous Diego Maradona play for that team in Buenos Aires the last game of his professional career.

See Also

- ▶ Calibration
- ▶ Central Bank Independence
- ▶ International Real Business Cycles
- ▶ Keynesianism
- ▶ Lucas, Robert (Born 1937)
- ▶ Monetarism
- ▶ Neoclassical Synthesis
- ▶ Prescott, Edward Christian (Born 1940)
- ▶ Rational Expectations
- ▶ Real Business Cycles
- ▶ Time Consistency of Monetary and Fiscal Policy
- ▶ Welfare Costs of Business Cycles

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Kyrk, Hazel (1886–1957)

Robert W. Dimand and Richard A. Lobdell

Keywords

Consumer economics; Consumer price index; Family economics; Kyrk, H; New home economics; Reid, M. G

JEL Classification

B31

The University of Chicago economist and home economist Hazel Kyrk was a pioneer in the study of consumption decisions and of the allocation of time in households. Born in Ashley, Ohio, Kyrk was the only child of Elmer Kyrk, a drayman, and Jane Benedict Kyrk, a homemaker who died while her daughter was a teenager. After finishing high school, Hazel Kyrk taught for 3 years before entering Ohio Wesleyan University in 1904, where she supported herself by working as a mother's helper in the household of Leon Carroll Marshall, an economics professor. When he was hired by the University of Chicago, Kyrk went with the family. She graduated from the University of Chicago in 1910 with a Ph.B. in economics and a Phi Beta Kappa key. After a year as an instructor in economics at Wellesley College, Kyrk returned to the University of Chicago to study for a Ph.D. in economics, writing her dissertation with the economic demographer James A. Field. From 1914, she also taught at Oberlin College, first as an instructor, then as an assistant professor. Taking leave from Oberlin in 1918–1919 to work on her thesis, she followed her adviser to London, where she served as a statistician for the American Division of the Allied Maritime Transport Council. Her dissertation, accepted in 1920, was published as *A Theory of Consumption* (1923) and won the prestigious, thousand-dollar Hart, Schaffner and Marx Prize for economic research. In that book and in *The Economic Problems of the Family* (1929), Kyrk discussed how social psychology shapes consumer choice and how the economic role of the housewife was moving beyond household production to being a 'director of consumption'.

Hazel Kyrk worked at the Food Research Institute of Stanford University in 1923–1924, co-authoring a study of the American baking industry, and taught at Iowa State College (1924–1925). From 1925 until her retirement in 1952, she taught at the University of Chicago, appointed to both the Departments of Economics and Home Economics, with promotion to full professor in 1941. She made the University of Chicago the leading centre of consumer and family economics, supervising many dissertations, notably Margaret Reid's *The Economics of Household Production* (1934). Reid, the first female Distinguished Fellow of the American Economic Association, returned from Iowa State to Chicago as a full professor of economics and home economics in 1951, a year before the retirement of her mentor, Kyrk. Active in consumer economics beyond the university, from 1938 to 1941 Kyrk spent the summers as principal economist in the Bureau of Home Economics of the Department of Agriculture, working on the 20-volume Consumer Purchases Study which,

among other contributions, established base-year prices for the cost of living index. From 1943 she chaired the Consumer Advisory Committee of the wartime Office of Price Administration. In 1945–1946, she returned to Washington to chair the Technical Advisory Committee of the Bureau of Labor Statistics, helping to create a 'standard family budget' and to revise the consumer price index. Kyrk was also active on the boards of the Chicago Women's Trade Union League and a consumer cooperative in Chicago's Hyde Park neighbourhood, and from 1922 to 1925 she taught at the Bryn Mawr Summer School for Women Workers. Never married, Kyrk took charge of bringing up and educating a teenage cousin.

The economic analysis of household time-allocation and production and consumption decisions by Kyrk and her Chicago students (most notably Reid) prefigured the later Chicago 'new home economics' of Gary Becker (see Reid 1977). Kyrk's *Theory of Consumption* is also recognized as a landmark in the history of marketing thought (Zuckerman and Carsky 1990).

See Also

- ▶ Becker, Gary S. (Born 1930)
- ▶ Family Economics
- ▶ Household Production and Public Goods
- ▶ Reid, Margaret Gilpin (1896–1991)

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