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## Marx Keynes Kalecki Seminar

Anwar Shaikh PhD

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cept. In this model each firm maximizes profits given the behaviour of the other firm. An equilibrium is a pair of outputs which is optimal for each firm given that the other firm is playing its equilibrium strategy (or output). In this model, each firm must know its own and its opponents' payoff function but each firm must also know that the opponent knows this information. This is clearly the case since the opponent's strategy will depend upon whom he thinks he is playing against. Moreover the opponent should know that the first firm knows that the opponent has this information. This chain must be continued indefinitely in order to achieve a Cournot-Nash equilibrium. Clearly for a Cournot-Nash equilibrium to obtain, i.e. for the common knowledge requirement to be valid, a great deal of information is required.

Another game theoretic equilibrium concept is the core of an economy. The general equilibrium model is a very natural setting for the cooperative notion of the core. The relationship between the purely game theoretic idea of the core and the general equilibrium concept using prices again illustrates the importance and role of information in a Walrasian general equilibrium model. The core of a general equilibrium economy is defined as the set of outcomes or allocations which cannot be improved upon by any coalition or group of agents. This means that, for any allocation in the core, no subset of agents can band together, trade among themselves using their own endowments and make each agent as well off and at least one agent better off than with the allocation in the core. The core is a cooperative game with complete information. Since the idea of a core involves coalitional or cooperative behaviour the core and competitive equilibrium are quite different. In particular the price taking assumption is incompatible with cooperative behaviour. Hence it is not surprising that more information seems to be needed to find the set of core allocations. The surprising result is that for economies with a continuum of players the set of core allocations coincide with the set of competitive allocations. The use of a continuum of agents is a natural way to model price taking behaviour since no individual agent has power to affect prices. The notion of a core for large economies involves the use, by each agent, of considerably more information than the competitive economy, and yet for large economies the informational content of both notions is exactly the same. Moreover even for finite economies a similar, although not identical, statement can be made. This result is surprising since the core does not contain any explicit reference to prices. However the relationship between competitive equilibrium and the core does show that prices are implicitly contained in the idea of a core. The relationship also underlines the fact that more information than contained in prices is needed to find a general competitive equilibrium.

The discussion thus far has centred on perfect information in a general equilibrium model without uncertainty. Putting uncertainty into the model involves changing the specification of the market structure and the informational flow of the model. It is now necessary to know when the uncertainty is resolved to specify how the market reacts. Moreover it is also necessary to specify the agent's subjective beliefs about the likelihood of the various states of nature. Although the advent of uncertainty raises many interesting questions about imperfect or incomplete information - for example, moral hazard problems when actions are unobservable or adverse selection problems when information is unobservable - questions remain about perfect information in models with uncertainty. In particular consider an Arrow-Debreu world under uncertainty. In this model the information requirements

are analogous to the requirements in a general equilibrium model under certainty with perfect information. In this economy trading takes place for contingent claims or Arrow-Debreu commodities. More precisely, since each state of the world can be distinguished, trading for commodities occurs for each commodity for each state of the world. This increases considerably the number of markets and the number of trades. However except for information about which state of the world has occurred there are no extra informational requirements in this model. Each agent, knowing his own tastes and endowments in each state of the world, must know only prices. To actually find equilibrium prices, however excess demands must be known in each possible state of the world.

Perhaps a more reasonable economy under uncertainty is to allow trading to take place on the basis of expectations or beliefs about the likelihood of the states of the world and not to assume that the state of the world is known after trading occurs, i.e. not to allow contingent trades. The informational requirement in this model is quite different than in the Arrow-Debreu model. In this model there is only one market clearing price for each commodity rather, as in the Arrow-Debreu world, than a price for each commodity in each state of the world. The agents (or auctioneer) need not know which state of the world actually occurred. However they must know which states are possible. Finally the equilibrium in this model depends crucially on the subjective beliefs of the agents, whereas in the Arrow-Debreu model subjective beliefs do not affect the equilibrium outcomes.

This difference in market structure and information requirement in these two models leads to a loss in efficiency. In the Arrow-Debreu model equilibrium is always Pareto optimal but in the noncontingent claims model it will, in general, not be Pareto optimal. Noncontingent claims equilibrium will in general be *ex ante* but not *ex post* Pareto optimal. In fact if the market were to reopen after the realization of the state of the world and trading were allowed to take place, a Pareto optimal Arrow-Debreu equilibrium would result.

LEONARD J. MIRMAN

See also ASYMMETRIC INFORMATION; UNCERTAINTY.

perfectly and imperfectly competitive markets. In the competition between economic models, the theory of perfect competition holds a dominant market share: no set of ideas is so widely and successfully used by economists as is the logic of perfectly competitive markets. Correspondingly, all other market models (collectively labelled 'imperfectly competitive' and including monopoly, monopolistic competition, dominant-firm price leadership, bilateral monopoly and other situations of bargaining, and all the varieties of oligopoly theory) are little more than fringe competitors.

Although it is not surprising that perfect competition should play a central role as a benchmark for normative purposes, the dominance of perfectly competitive forms of analysis in descriptive and predictive work is remarkable. First, economic theorists seem to be increasingly of the view that something like imperfect competition is the fundamental idea, in that perfect competition should be justified by deriving it from models where imperfectly competitive behaviour is allowed and, in particular, agents recognize the full strategic options open to them and any monopoly power they have. This view has led to a large volume of work over the last twenty-five years that, for the most part, suggests that perfect competition

corresponds to an extremely special, limiting case of a more general theory of markets. Second, as the idea of perfect competition has been made more precise and the conditions supporting it have become better understood, it has become completely evident that no important market fully satisfies the conditions of perfect competition and that most would not appear even to come close. This is not to say that models should be descriptively accurate; the only way a map could approach descriptive accuracy would be for it to have a scale of 1 : 1, but such a map is useless. Still, it is striking that economists so consistently opt for a mode with so little apparent descriptive value. Third, the received theory of perfect competition is a theory of price competition that contains no coherent explanation of price formation. That such a fundamental incompleteness does not severely limit the value of the theory is striking.

Given all this, the dominance of perfectly competitive methods should probably be viewed as a reflection of the weakness of imperfectly competitive analysis. There is in fact no powerful general theory of imperfect competition. Instead, there is a myriad of competing partial equilibrium models of imperfectly competitive markets, and the only general equilibrium theories either rely on questionable assumptions or embody institutional specifications that are no more satisfactory than those associated with perfectly competitive analysis.

Despite the unsatisfactory state of both perfectly and imperfectly competitive market theory, recent work based on game-theoretic methodology holds promise of providing a more satisfactory theory of imperfectly competitive markets, of yielding better insight into why perfectly competitive analysis seems to work so well, and of unifying these theories.

**PERFECT COMPETITION.** The idea of perfect competition has many aspects: absence of monopoly power; demand and supply curves that, to the individual, appear horizontal; negligibility of an individual's quantities relative to aggregates; price-taking behaviour (with respect to publicly quoted prices); zero profits and equality of returns across all activities; prices equalling marginal costs and factor returns equalling the values of marginal products; and Pareto-efficiency of market allocations and the efficacy of the Invisible Hand. Stigler (1957) has traced the historical development of the idea of perfect competition essentially through the 'imperfect competition revolution' of the 1930s, noting the appearance of many of these features and documenting the increasing recognition of the stringency of the conditions that appeared to be necessary and/or sufficient for perfect competition. Together these include: large numbers; free entry and exist; full information and negligible search costs; product homogeneity and divisibility; lack of collusion; and absence of externalities and of increasing returns to scale.

The theory about which Stigler wrote still largely corresponds to what is presented in intermediate textbooks and probably to the way most economists think about perfect competition when doing applied work. Firms and consumers are treated as making quantity choices at given prices, because with large numbers, it is suggested, individual quantities are 'negligible' relative to the aggregate, upon which prices are assumed to depend. (These arguments derive from Cournot, 1838.) But how prices are determined is not modelled. This approach is justified by informal arguments that prices are actually set by individual agents, but that, with many agents on each side of the market, any individual would be unable to deviate significantly from the prices charged by others without losing all demand or being overwhelmed by buyers. This idea is connected to the work of Bertrand (1883), but is not

supported by formal arguments showing that the outcome of such price setting would be perfectly competitive under the assumed structural conditions (large numbers, homogeneity, free entry, etc.).

When Stigler wrote, Arrow, Debreu and MacKenzie had already provided their path-breaking formal analyses of Walrasian general equilibrium, and within two years Debreu published *Theory of Value* (1959), which is still the standard treatment of this subject. In this theory, competition is given a behavioural definition. There is a given list of consumers and of firms and a given list of commodities. A single price for each good is introduced, and perfectly competitive behaviour is then defined. It involves each consumer selecting the net transactions that maximize utility, subject to a budget constraint defined under the assumptions that the consumer can buy or sell unlimited quantities at the specified prices and that the consumer's purchases do not influence the profits he/she receives. As well, each firm selects the inputs and outputs that maximize its net receipts, again given that the firm can buy and sell any quantities it might consider without influencing prices. Finally, equilibrium is a price vector and perfectly competitive choices for each agent at these prices that aggregate to a feasible allocation, that is, such that markets clear.

Three fundamental results are proved for this model. These give conditions on tastes, endowments, and technology under which competitive equilibria exist (existence), equilibrium allocations are Pareto-optimal (efficiency), and, with an initial reallocation of resources, any Pareto optimum can be supported as a competitive equilibrium (unbiasedness). The efficiency and existence theorems together formalize Adam Smith's argument of the invisible hand leading self-interested behaviour to serve the common good, while the unbiasedness result indicates that the competitive price system does not inherently favour any group (capitalists, workers, resource owners, consumers, etc.). The non-wastefulness result requires few assumptions beyond those built into the structure of the model: it is enough that not all consumers are satiated. The existence theorem, however involves much stricter conditions, including especially the absence of any increasing returns to scale. (This is also needed for the unbiasedness result.)

Many of the conditions arising in less formal treatments of perfect competition are embodied in Debreu's formulation. For example, the very definition of a commodity involves homogeneity, and divisibility is explicitly assumed. Strikingly, however, free entry and large numbers play no explicit role in this theory: all the theorems would hold if there were but a single potential buyer and seller of any commodity.

This numbers-independence property relies crucially on the theory being only an *equilibrium theory*, that is, one which specifies what happens only if behaviour is exactly as stipulated and prices are set at equilibrium, market-clearing values. No examination is offered of what would happen if prices were not at their Walrasian levels, nor indeed, of how prices are determined. Further, not even the famous story of a disinterested Walrasian auctioneer and *tâtonnement* (no trade at nonequilibrium prices) supports this equilibrium by giving a consistent model price formation with rational actors. Instead there would be incentives to misrepresent demands, responding consistently to each price announcement by the auctioneer as if one had different preferences than actually obtain, with the object of effecting monopolistic prices and outcomes (Hurwicz, 1972).

The ability of an individual to manipulate price formation by an auctioneer does disappear once one moves to a model where individuals truly are negligible. Such a model was first

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introduced by Aumann (1964), where the set of agents is indexed by a continuum endowed with a non-atomic measure. This measure is interpreted as giving the size of a group of agents in comparison with the whole economy. The absence of mass points implies that no individual's excess demands represent a positive fraction of the totals. Thus, any individual's withholding of supply affects neither the magnitude of excess demand (as measured on a per capita basis) nor, correspondingly, whether particular prices clear markets. Thus price-taking is fully rational if prices can be considered to be set by a disinterested auctioneer.

The infinite economy framework captures the large numbers, negligibility, and (with an auctioneer) price-taking aspects of perfect competition. Infinite models also provide a setting where numerous other models of production and exchange agree with the Walrasian in their outcomes. However, infinite models clearly are an extreme abstraction, and the real issue is the extent to which they approximate finite economies. This question leads to consideration of sequences of increasingly large finite economies in which each individual becomes relatively small, perhaps with many others like him or her being present. The identification of perfect competition with such sequences of economies and the asymptotic properties of their allocations dates back to Cournot (1838) and Edgeworth (1881) and has become the basis of several major lines of research.

The most complete of these shows that the core converges to the Walrasian allocations (see Hildenbrand, 1974). However, recently attention has focused on the programme initiated by Cournot of obtaining perfect competition as the limit of imperfectly competitive behaviour and outcomes (see Mas-Colell, 1982).

There are three approaches to this problem. One, represented by Roberts and Postlewaite (1976), effectively takes some version of the auctioneer story as given and examines the incentives to respond to price announcements using one's true demands. Here it is shown that if the economy grows through replication or if the sequence of economies under consideration converges to one at which the Walrasian price is locally a continuous function of the data of the economy, then correct revelation of preferences and price-taking is asymptotically a dominant strategy. The second line of work builds more directly on Cournot's model. Agents select quantities and prices somehow arise to clear markets, with some agents (usually the firms) recognizing the impact of their choices on prices and others (consumers) taking prices as given. The central results here are due to Novshek and Sonnenschein (1978), who showed that the free-entry Cournot equilibria converge to the Walrasian allocations as the minimum efficient scale becomes small, provided that a condition of downward sloping demand is met. Finally, the game-theoretic models of noncooperative exchange initiated by Shubik (1973) also lead asymptotically to Walrasian equilibria (see Postlewaite and Schmeidler, 1978). A significant feature of these game-theoretic models is that they explicitly treat out-of-equilibrium behaviour: the outcome of any pattern of behaviour is specified, not just what happens in equilibrium. This is an important advance. However, in these models, prices appear only as the ratio of the amount of money bid for a good to the amount of the good offered, and are not directly chosen by agents.

A complementary approach to perfect competition (Ostroy, 1980) relates to marginal productivity theory and to horizontal demands. Central to this approach is a non-surplus condition that, agent by agent, the rest of the economy would be no worse off if the agent's resources and productive capability

were removed from the economy. No-surplus allocations correspond to the economy's having Walrasian equilibria at the same prices with or without any single agent (so demands are horizontal). An economy is defined as perfectly competitive if the no-surplus condition is met. This can happen with a finite number of agents, but typically it requires an infinity.

Thus, various pieces of formal theory capture most of the aspects of the intuitive notion of perfect competition, but this theory points to perfect competition being a limiting case associated with many agents in each market or existence of close substitutes for each firm's output, as well as with properties of continuity of the Walras correspondence and downward sloping demand. Also, this theory lacks models in which prices are explicitly chosen by economic agents. None of these results gives much reason for the success that economists have using perfectly competitive analysis.

**IMPERFECT COMPETITION:** Formal modelling of markets begins with Cournot's (1838) treatment of quantity-setting, noncollusive oligopoly. Cournot's model yields prices in excess of marginal cost, with this divergence decreasing asymptotically to zero as the number of firms increases. The 19th century saw two other important contributions to imperfect competition theory: Bertrand's (1883) price-setting model which, with constant costs, yields perfectly competitive outcomes from duopoly, and Edgeworth's (1897) demonstration that introducing capacity constraints into this model could prevent existence of (pure strategy) equilibrium.

Thus, even before the important competition revolution, the theory of imperfectly competitive markets was subject to one of the standard complaints still made against it: that it consists of too many models that yield conflicting predictions. This complaint intensified with the proliferation in the 1930s and later of models of firms facing downward-sloping demands. These models usually capture some element of actual competition (or at least appear more realistic than the perfectly competitive alternative). However, it sometimes seems that one can concoct an imperfect competition model that predicts any particular outcome one might wish.

A second complaint against imperfectly competitive analysis is its lack of a satisfactory multiple market formulation.

The first significant contribution to a general equilibrium theory of imperfect competition was Negishi's (1961) model, with later contributions from numerous authors during the 1970s. Although these models differ on important dimensions, the basic pattern in this work involves supplementing the Arrow-Debreu multi-market model of an economy by allowing that some exogenously specified set of firms perceive an ability to influence prices. (These firms may or may not perceive the actual demand relations correctly.) Equilibrium is then a set of choices (prices or quantities) for each imperfect competitor that maximizes its perceived profits, given the behaviour of the other imperfect competitors and the pattern of adjustment of the competitive sectors (under Walrasian, price-taking behaviour) to the choices of the imperfect competitors.

This theory, as it stood in the mid-1970s, was obviously incomplete on several grounds. Most fundamentally, there was no explanation of why some agents should take prices as given while other agents, who formally might be identical to the price-takers, behave as imperfect competitors. Moreover, it then emerged that there were serious flaws in the crucial existence theorems that purported to show that the models were not vacuous.

These theorems obtained profit maximizing choices for the imperfect competitors that were mutually consistent by use of fixed-point arguments based on Brouwer's theorem. To use these methods, the optimal choices of any one agent must depend continuously on the conjectured choices of the others. This role of continuity of reaction functions is analogous to that of continuity of demand functions in the Arrow-Debreu model. However, unlike the continuity of demand, continuity of reaction functions was not derived from conditions on the fundamental data of the economy. Rather, it was either directly assumed or obtained by supposing that the imperfect competitors' perceptions of demand yielded concave profit functions.

Roberts and Sonnenschein (1977) showed that this approach was problematic by displaying extremely simple, nonpathological examples in which reaction functions are discontinuous and no imperfectly competitive equilibrium exists. The source of these failures is nonconcavity of the profit functions, and no standard conditions on preferences ensure the needed concavity: it can fail with only a single consumer or when all consumers have homothetic preferences. (Note, however, that existence ceases to be a problem in general equilibrium Cournot models if the economy, including the number of imperfect competitors, is made large enough through replication.)

These problems with imperfect competition theory perhaps explain some of the popularity of perfect competition models. However, they also suggest two important, positive points. First, the multiplicity of models and the divergence in their predictions indicates that, at least in small numbers situations, institutional details are important. Economists, habituated to the use of perfectly competitive methods, typically are imprecise about such factors as how prices are actually determined, whether decisions are made simultaneously or sequentially, whether individuals select prices, quantities, or both, and what happens when agents' plans are inconsistent. These factors cannot be treated so cavalierly in dealing with imperfectly competitive models and probably ought not to be when actual markets are being analysed. Second, both the failure of existence in models of imperfectly competitive general equilibrium and the unexplained asymmetry of assumed behaviour in these models suggest that a simple grafting of imperfect competitors onto the standard Arrow-Debreu model will not yield a satisfactory theory. Rather, one ought to start afresh from the foundations with a more careful modelling.

**STRATEGIC MODELS OF COMPETITION.** An approach to both of these points is provided by the methods of the theory of noncooperative games and especially games in extensive form. Recent work using this approach has resulted in significant improvements in the partial equilibrium theory of imperfect competition, and there is reason to hope that these same methods can provide a satisfactory general equilibrium theory. Moreover, this approach also offers hope of ultimately yielding a unified theory of competition that would encompass both perfect and imperfect competition.

To model a market as a game in extensive form, one must specify the set of participants, the beliefs each has about the characteristics of the other agents, the order in which each acts, the information available to each whenever it makes a decision, the possible actions available at each decision point, the physical outcomes resulting from each possible combination of choices, and the valuations of these outcomes by the agents. Thus, such a model involves a complete specification of a particular set of institutions. This aspect might be viewed as

a drawback, but it is in fact a potential strength of these methods.

(Note that adopting this approach does not require that price formation be modelled by having prices be chosen by agents in the model. Indeed, Cournot's original model is a well-specified game, but price formation is not explicitly modelled. However, this framework does facilitate and encourage such a specification.)

Given a game, one next specifies a solution concept. In principle, there is great freedom in making this specification, but most researchers opt for the Nash equilibrium or some refinement thereof. Note that adopting the Nash equilibrium does not rule out collusion if opportunities to coordinate and to enforce agreements are modelled as part of the game. Nor does it mean that the agents are acting simultaneously: the order of moves is part of the specification of the game, and the Nash equilibrium applies equally to simultaneous or sequential moves. To illustrate, the von Stackelberg solution corresponds to subgame-perfect Nash equilibrium in a game where the designated leader moves first and the follower observes the leader's choice before making its own. Finally, the Nash criterion does not restrict analysis to one-shot situations; it is equally applicable to models of repeated play.

When von Neumann and Morgenstern's (1944) treatise on game theory first appeared, there was hope among economists that these methods would unify and advance the analysis of imperfect competition. When these hopes were not quickly realized, many economists wrote off game theory as a failure. This position is still reflected in many intermediate textbooks. However, in the last decade these hopes have been revitalized by actual accomplishments of these methods.

The first contribution of this work has been to begin unifying the existing theory of imperfect competition. This has been done on one level by providing a common language and analytical framework in terms of which earlier work can be cast and understood. In this line, game theoretic treatments have made formal sense out of such ideas as reaction curves and kinked demand curves by obtaining equilibria of well-specified, dynamic games that have these features. As well, various of the older theories that appeared to be in conflict have been shown to be consistent in that they arise from a common, more basic model. For example, the Cournot and the von Stackelberg solutions can both be attained as Nash equilibria in a single model where the timing of moves is endogenous. In a similar vein, the Cournot, Bertrand and Edgeworth models have been integrated by showing that equilibrium in a two-stage game where duopolists first select capacities and then compete on price yields the Cournot quantities.

A second contribution has been to provide models embodying aspects of imperfect competition that had been widely discussed in the industrial organization literature but previously lacked formal expression. The best example here is work showing how limit pricing, predatory pricing, and price wars can arise as rational behaviour in the presence of informational asymmetries between competitors (see Roberts, 1986). Further examples include explanations of sales and other discriminatory pricing policies, the determination and maintenance of product quality, the use of capacity and other investments in commitment to deter entry, and the opportunities for and limitations on implicit collusion. This work is revolutionizing the field of industrial organization.

The third contribution has been to permit the analysis of realistic models of institutions for exchange actually present in the economy. The best-developed example of such work is that on auctions to sell a single object to one of many potential

buyers (see Milgrom, 1986), but important work has also been done on multi-object auctions and other monopoly pricing institutions (including posted prices, priority pricing, and nonlinear pricing), bilateral monopoly and bargaining, and bid-ask markets or oral double auctions. In this work, the rules of the institution being modelled, the distribution of information about tastes, costs, etc., held by the various participants, and the preferences of these agents together induce a game in extensive form. This game captures the full strategic options open to all the participants, specifying completely the prices and allocations resulting from any choice of actions. Thus, the Nash equilibrium of this game yields explicit predictions of the choices of prices and of the volume, timing, and pattern of trade. Often these predictions are both remarkably tight and in agreement with observed behaviour.

This work is providing a more complete description and a clearer theoretical understanding of the operation of actual markets. Moreover, by providing detailed predictions of the outcomes of equilibrium behaviour under different institutions, it gives the basis for a theory of the choice among market institutions (see, for example, Harris and Raviv, 1981). Finally, it provides an approach to unifying the theories of perfect and imperfect markets and market behaviour. In this work, agents' behaviour is rationally strategic relative to the given economic situation. However, in particular environments this imperfectly competitive behaviour may be very close to perfectly competitive or may yield outcomes that are essentially competitive (see Wilson, 1986). By determining the situations in which this is true, we may finally understand when and why perfectly competitive analyses succeed.

JOHN ROBERTS

See also COMPETITION; IMPERFECT COMPETITION; MONOPOLISTIC COMPETITION AND GENERAL EQUILIBRIUM; NASH EQUILIBRIUM.

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performing arts. In the past two decades a substantial international literature on the economics of the arts has accumulated. Aside from the importance of the cultural contribution made by the arts, interest in the subject among economists has been elicited by some special attributes of the economics of the arts which have proved interesting analytically and whose analysis has had significant applications outside the field. Notable is the 'cost disease of the performing arts' which has been proposed as an explanation for the fact that, except in periods of rapid inflation, the costs of artistic activities almost universally rise (cumulatively) faster than any index of the general price level. Another major theoretical issue with which the literature has concerned itself is the grounds on which public sector funding of the arts can be justified.

ORGANIZATION AND FUNDING. The structure of the performance industry is similar in many of the industrialized countries. The largest enterprise in terms of budget and personnel is the opera, followed, in rank order, by the orchestra, theatre and dance. The theatres are the only group that contains a substantial profit seeking sector. All of the others, and many of the theatres as well, receive a substantial share of their incomes from government support and private philanthropy. The US, with its policy of tax exemptions, is probably the only country in which the share of private philanthropy is large, and there it exceeds the amount of government funding by a large margin. In many countries the bulk of such financing is provided by only a single agency, while in the US an arts organization whose application has been rejected by one funding source can usually turn to others for reconsideration.

The available statistical evidence suggests that demand for attendance is fairly income elastic but quite price inelastic, at least in the long run. This suggests that the widely espoused goal of diversity in audiences prevents ticket prices from rising more than they have, although fear that such rises will cause temporary but substantial declines in revenues and will reduce

preindustrial economy of Europe was marked by a succession of long cycles of demographically driven expansions and contractions, following a basically Malthusian dynamic. He then went on to argue, in Ricardian fashion, that during the up phase of these cycles declining returns in agriculture (declining productivity) determined rising rents, falling wages, and terms of trade running in favour of agricultural and against industrial goods, while in the down phase, rising returns in agriculture determined just the opposite trends. Postan's interpretation followed lines which had begun to be sketched by the German demographic historian Wilhelm Abel and it influenced, in turn, the work of the French agrarian historian of the early modern period, Emmanuel Le Roy Ladurie. By the later 1950s, Postan's demographic view already had been so widely accepted as the key to the interpretation of preindustrial economic change, that H.J. Habakkuk could reasonably conclude, in a synthetic essay on 'The Economic History of Modern Britain' for the *Journal of Economic History* in 1958, that

For those who care for the overmastering pattern, the elements are evidently there for a heroically simplified version of English history before the nineteenth century in which the long-term movements in prices, in income distribution, in real wages, and in migration are dominated by changes in the growth of population.

Postan further developed his interpretation in a long series of specialized studies on all aspects of the medieval economy – agricultural technique, agricultural investment, the legal status of the peasantry, etc. – as well as in a number of major syntheses. In all these works, he remained guided by the conviction that the best results would come by linking, as closely as possible, generalizations derived from economic theory with the results of exhaustive primary research.

ROBERT BRENNER

See also FEUDALISM; POWER, EILEEN EDNA.

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post-Keynesian economics. This is a portmanteau term which is used to contain the work of a heterogeneous group of economists who nevertheless are united not only by their dislike of mainstream neoclassical theory and the IS/LM general equilibrium versions of 'Keynesian' theory but also by their attempts to provide coherent alternative approaches to economic analysis. (They are not too fond either of the

developments of Keynesian theory associated with Clower and Leijonhufvud, on the one hand and the disequilibrium theories of the French economists, on the other.) We say 'approaches' because several strands may be identified. To understand the differences between them it is helpful to examine the different routes that came out of (or were discerned as coming out of) classical political economy.

The first route leads to Marshall, who directly influenced Keynes and those post-Keynesians who start from the *Treatise* and the *General Theory*, Sidney Weintraub, Paul Davidson and (to a lesser extent) Kregel and Minsky. The second route leads to Marx. It contains the approach that was revived by Sraffa and it recently has had Keynes's contribution of effective demand added, principally in the work of Garegnani (1978, 1979), Krishna Bharadwaj (1978, 1983), Eatwell (1979, 1983), Milgate (1982, 1983) and Pasinetti (1962, 1974, 1981). Dobb and, later, Meek, who played exceptionally important roles in keeping Marxian economics afloat in the UK from the 1920s to the 1950s, were equally as important in the task of relating Sraffa's contributions to classical and Marxian political economy in the 1960s and 1970s. The third route also goes through Marx and then comes through Kalecki's adaptation of Marx's schemes of reproduction in order to tackle the realization problem, to Joan Robinson and her followers. (Towards the end of her life, Joan Robinson became sceptical of any attempt to provide an alternative 'complete theory'. She considered this 'would be only another box of tricks' (Robinson, 1979, p. 119).)

As well as these major groups there are some outstanding individual figures, the most notable of whom is Kaldor. He has made immense contributions: through the so-called Keynesian theory of distribution in which the different values of the saving propensities of profit-receivers and wage-earners play a vital role; through his theories of growth; through his models of the development of the world economy, in which he emphasizes Allyn Young's insights concerning dynamic increasing returns and cumulative causation; and through his imaginative and innovative contributions to policy debates, often as an adviser to governments. (His critique of Keynes's system with regard to the endogeneity of money has found a sympathetic hearer in Basil Moore in the USA.) Finally, Godley and his colleagues in the Department of Applied Economics at Cambridge are in the tradition of Keynes's theory of effective demand but they depart from Keynes's emphasis on flow equilibrium in order to emphasize stock equilibrium.

I. The core of classical economics, that which is now called the surplus approach, implies that theories of value and distribution need to be related to the ability of the economy to produce a surplus over and above the necessities of production, including in them the wages of the workers and the replacement of the means of production used up in the periodic process of production. The manner in which the surplus is created, extracted, distributed and used in the capitalist system as analysed by the classical political economists and especially by Marx derives from the ability of the capitalists as a class to make the wage-earners as a class work longer than they need in order to produce their own necessities. A theory of value was required in order to measure the surplus so that its composition and distribution may be analysed at a point in time and its size may be compared over time. A separate theory is needed to explain the level of the wage (or alternatively, the level of the rate of profits), so that a given exogenous value may be introduced into the 'core' in order to determine the pattern of relative



prices and the other distributive variables in a system of free competition. The prices themselves – classical natural prices or Marxian prices of production – are associated with the capacity of the system to reproduce itself. In so far as demand and supply factors are relevant at all, it is in the explanation of market prices. The principal object of economic analysis is to explain the characteristics of the long-period position of the economy, the natural prices of commodities and the natural rates of wages, profits and rents, as determined by dominant and persistent forces.

The general price level was then explained by the quantity theory of money. Crises and cycles were thought of as short-run and, on the whole, monetary deviations around the central long-period position, itself a centre of gravitation. Thus theories of value and distribution, on the one hand, and of money, cycles and crisis, on the other, belonged in separate volumes. Money was a veil over the real workings of the economy in which, in most versions, Say's law implied that a general glut of commodities could not occur in the long-period position. There was not, therefore, any need for a separate theory of the overall level of output.

Marshall preserved the above dichotomy but emasculated its theory of value by explaining the long-period position and the long-period normal prices associated with it in terms of the forces of supply and demand. Though in the text of the *Principles* he used only partial equilibrium analysis, in the appendices he explicitly sketched in a general equilibrium model in which all prices and quantities were determined simultaneously. The normal position of the economy exhibited simultaneously the theory of money, of the general price level, Say's Law and the theory of fluctuations and crises were also to be in the second volume. There, had it ever been fully written out, there would have been an account of causes of deviations from these normal positions and of how money management could be used both to minimize deviations from a given position and to guide the economy to another, when tastes and/or technical conditions changed. The classical concept of the surplus disappeared, prices no longer reflected reproduction but became indexes of scarcity which reflected the subjective factors that underlay demand and supply functions. Prices and quantities were determined together and the general price level was explained by the quantity of money.

Keynes inherited this way of seeing and modelling the world and used it to good effect in the *Tract* and, he thought, in the *Treatise*. But in setting up his fundamental equations in the *Treatise* he inadvertently provided a rival theory to the quantity theory, one of sectoral price levels, in which the money-wage level and the profit margin respectively were the main determinants of price levels. The realization that he had emancipated himself from the quantity theory liberated him to write the *General Theory*. There, he also refuted the main tenet of neoclassical economics (as it had come down to him from Marshall) Say's Law, which was a *sine qua non* for the quantity theory to hold. However, in the *General Theory* itself, he did not liberate himself entirely from a supply and demand theory of prices. Nevertheless his concept of aggregate demand, his dichotomy of consumption and investment expenditure whereby planned investment is not constrained by current income but is predominantly determined by expected profitability, allowed him to develop a theory of underemployment equilibrium. The labour market could remain uncleared when the product market cleared because there were no effective means by which the unemployed could signal to entrepreneurs that it would be profitable to employ them. Indeed, even if they could signal, it still would not be possible

to employ them because there was no mechanism (such as there was thought to be in neoclassical theory through the rate of interest) to ensure that planned investment could be such as to absorb full employment saving.

II. The implications of the *Treatise* and the *General Theory* were the base on which the American post-Keynesians built. They stressed uncertainty, the necessary integration of money from the start of analysis of the workings of the economy, the central position of the money-wage as both the major determinant of the price level and of the stability (or instability) of the economy, and the stock-flow interrelationship of the process of capital accumulation. Thus Weintraub took what we would now call the microeconomic foundations of the aggregate supply function as his base and developed a macro theory of distribution as well as of output and employment. He also pioneered anti-inflation schemes which used penalties and incentives to decision makers, especially with regard to money-wages, which would give an overall outcome that would be acceptable with respect to changes in the general price level. Davidson too used the Marshallian framework of the *Treatise* and the *General Theory* to analyse the development of a production and monetary economy operating in an uncertain environment in which Marshall's 'reasonable' people do the best they can. In his theory of accumulation he relates current flows of investment spending to existing stocks, using Keynes's theory of spot and future markets to connect the two. The same contrast between spot and future markets (and their respective prices) is used by Davidson (1972, 1978), and Kregel (1983) to illuminate the analysis of Chapter 17 of the *General Theory* where, they argue, the real forces associated with accumulation and the monetary forces determining the rate of interest come together. The vital clue is the peculiar and essential properties of money-liquidity – whereby under-employment equilibrium is possible because switching demand from goods to money does not necessarily create employment opportunities, due to the latter's negligible elasticities of production and substitution. Minsky's financial instability hypothesis which is located by him in the *General Theory* (Minsky, 1975), concerns an endogenous theory of cyclical fluctuations resulting from the interaction of real and monetary factors. Non-realization of expected cash flows creates exaggerated real movements (in the sense of having greater amplitude than otherwise would be the case) as firms respond to the implications of financial commitments, the liabilities side of their balance sheets, into which they entered on the basis of their initial expectations.

The second strand, usually known as the neo-Ricardians, takes on Keynes's theory of effective demand, in that desired saving is equalized to desired investment through changes in the level of income. They argue, however, that it is, or it should be, a theory of a long-period level of income and employment (in the sense of the ultimate outcome of persistent forces) which is to be placed alongside the classical theories of value and distribution in the core. This involves rejecting the supply and demand determination of prices and the vestiges of neoclassicism in Keynes's analysis of investment – the downward sloping marginal efficiency of capital (and investment) schedules, the demand schedules for assets discussed in chapter 17. All these constructions are argued to be inconsistent with the findings of the capital theory debates with regard to reswitching and capital-reversing, for example, that there is no presumption that either the *mec* or the *mei* schedule should be downward sloping. Moreover, the use of the liquidity preference theory of the rate of interest in the argument of chapter 17 of the *General Theory* whereby the

money rate of interest rules the roost is regarded as an example of the use of 'imperfections', a use which is inadmissible in long-period theory. By contrast they argue that getting the long-period theory of output and employment correct clears the way for a coherent theory of accumulation with which to replace the neoclassical theory that is built on a Fisherian base.

The capital theory results also affect other areas. Steedman, often in the company of Metcalfe, has reworked much of international trade theory to see how the results of the orthodox theory stand up to the critique, especially that aspect of the analysis which brings out the implications of commodities being produced by commodities. Not surprisingly, the answer is that many results do not (Steedman, 1979). Secondly, Steedman (1977) has argued that most Marxian insights may be gained by starting from the Sraffian production system rather than from labour values which many modern economists find objectionable. He and Schefold have investigated problems of joint production and technical change, considerably extending Sraffa's results in these and other areas.

The third strand also starts from classical and Marxian economics. The social relationships of the sphere of production determine the potential surplus available at any moment of time. That is to say, at any moment of time, the real wage is historically determined by the state of the class war (amongst other factors), and it determines in turn the maximum rate of profits available. Whether what is potentially there is realized in fact as a rate of profits and a rate of accumulation depends upon the forces of effective demand. These are summarized in the interplay between the accumulation function, Joan Robinson's 'animal spirits' function, whereby the planned rate of accumulation is dependent on the expected rate of profit, on the one hand, and a saving function, in which the distribution of income plays a pivotal role (because of differing saving propensities as between classes), on the other. Kalecki is the pioneering figure. The theory of investment behaviour that he tried all his working life to develop was intended to be an endogenous theory of accumulation. It was to be the key to the cyclical growth pattern of capitalism in which 'the long-run trend [would be] but a slowly changing component of a chain of short-period situations ... [not an] independent entity' (Kalecki, 1971, p. 165). Moreover, on average, there would not be full employment of either labour or the stock of capital goods. (Josef Steindl, a former colleague of Kalecki, makes a unique contribution at this juncture with his theories of cycles and stagnation within the context of modern monopoly capitalism.)

These theories have been principally developed by Joan Robinson and her followers (especially Asimakopulos, 1969, 1975, 1977, 1980-81) - witness her famous banana diagram (Robinson, 1962a, p. 48). It illuminates the two-sided relationship between accumulation and profitability - expected profitability induces accumulation, while realized accumulation itself creates the profitability which makes accumulation possible, partly through the supply of internal funds. It also reflects her later views on method:

The short period is here and now, with concrete stocks of the means of production in existence. Incompatibilities in the situation will determine what happens next. Long-period equilibrium is not at some date in the future: it is an imaginary state of affairs in which there are no incompatibilities in the existing situation, here and now' (Joan Robinson, 1962b, p. 690).

Initially Joan Robinson had gone along with the criticisms associated with the capital theory debate (indeed, she initiated some of them), welcoming the results of the reswitching and capital-reversing debates, and always loath to accept the legitimacy of the neoclassical theory of profits for understanding capitalism. However, she was later to diverge from the neo-Ricardian group. She preferred to emphasize another, separate, criticism, the illegitimacy of using comparisons of long-period positions, independently of whether they were associated with the revival of classical theory or with orthodox, neoclassical, supply and demand theory, as a means of examining processes of distribution and accumulation in capitalist economies. She returned to this theme many times; perhaps the most succinct account is her 1974 paper, *History versus Equilibrium*, the title of which sums up her objections to the method.

In the Kaleckian tradition, therefore, the stress is on macro theories of activity and distribution. The spending decisions of the capitalists as a class, principally their investment decisions, create both the overall level of activity and the distribution of income as both combine to give the saving associated with such investment spending. The macro relationships in turn have micro foundations in the decisions of firms with regard to pricing. This usually is set in oligopolistic price-making environments. In Kalecki's own work this is associated with his 'degree of monopoly' theory. This subsequently has been refined and modified by various mark-up theories, some of which are associated with the normal cost pricing hypothesis of Neild (1963), Godley and Nordhaus (1972) and many others. In other versions the finance of investment is linked to the ability of firms to set prices which raise their financial requirements, directly through retention of profits and indirectly through the effects on their ability to raise external funds, see, for example, Ball (1964), Eichner (1976), Harcourt and Kenyon (1976), Wood (1975).

Sometimes the sizes of the mark-ups are related in turn to an underlying Sraffian theory of prices of production because there is a stress on the long-period nature of the factors which determine the prices which are set, as opposed to the short-period nature of price setting in markets for raw materials where Marshallian supply and demand factors are held to hold sway (a dichotomy which Kalecki was amongst the first to make). Thus, Bhaduri and Joan Robinson (1980) make this link, while Kaldor's model of the operation of the world economy is built around two different pricing behaviours, one for industrial goods, one for primary products. Kaldor (1985) combines this with the view that dynamic economies of scale are more to be found in the industrialized countries producing industrial products, while the less developed countries depend more on the production of primary products, either food or raw materials for the industrialized countries.

In recent years Hicks (1976) has used a similar distinction to good effect in his analyses of world inflation and the problems of growth. Kaldor's work has influenced Cornwall (1977, 1977, 1983) who has studied the processes of growth in modern capitalist economies as the outcome of the interrelationship of demand and supply factors. He blurs the sharp distinction between the two that is to be found in the Harrod-Keynesian tradition, on the one hand, where  $g$  is postulated as independent of  $g_w$  and  $g$  itself, and the stress in the neoclassical growth theories on population growth, substitution and technical change, to the neglect of demand as the necessary means of embodiment, on the other.

III. With the exceptions of Kaldor, Hicks and the neo-Ricardians, the theories so far have been concerned with either

the short-period theory of employment and the distribution of income or with cyclical growth. But, of course, in the post-war period the theory of growth has been a principal preoccupation of all these groups. Pasinetti (1974, 1981) probably has carried the analysis further and has created a more unified system than anyone else. For 30 years he has been developing a multi-sector growth model which encompasses both classical and Keynesian concerns. It is classical in the sense that it is concerned with the origin of profits in the characteristics of the production and distribution systems; it is Keynesian in the sense of a preoccupation with effective demand and the conditions necessary for full employment, both at a point in time and over time. His distinctive contributions are not only his work on the rate of profits and the distribution of income within a growing economy in which investment is constrained to be at levels that are needed to maintain full employment growth over time, but also a very considerable extension to take account of changing patterns of demand as income grows, because the demand for individual products grow at different rates over their life cycles. He also considers the problems of production interdependence, technical advance and exhaustible resources from the point of view of maintaining overall balance over time, deriving an intricate and comprehensive set of conditions. For Pasinetti, as for most post-Keynesians, relative prices are related not so much to scarcity as to the conditions for reproduction and expansion.

Richard Goodwin's contributions in a sense serve to link aspects of the Kalecki-Robinson approach with Pasinetti's approach. Prior to his most recent work, his thoughts had evolved along two separate lines - on the one hand, the nature of cyclical processes in aggregative models, on the other, the nature of production interdependence in multi-sector models (Goodwin 1982, 1983). The two have now come together, integrated into an impressive whole. The work is extremely eclectic; the influence of Marx, Schumpeter, Keynes, von Neumann, Joan Robinson, Sraffa and Kalecki may all be discerned. So, too, may the developments of catastrophe theory and the concept of 'bifurcation', together with the older biological analogy drawn from the Volterra prey-predator model. Thus Goodwin concentrates on the nature of evolutionary structures which experience from time to time large jumps and breaks, which he regards as the key to the cyclical development of economies characterized by production interdependencies. IV. Finally, we come to Godley and his colleagues who, of all these groups, stand apart because their distinctive contribution concerns in the main stocks and not flows. The balance sheet, and the flow of funds statement, rather than the profit and loss account, and income and expenditure flows, is the crucial framework in their approach. In a sense they take as their theoretical reference point the end, in effect, of a Marshallian long period (applied to the economy as a whole) where stocks as well as flows are in equilibrium. Their object is to see whether the ultimate Marshallian long-period position constitutes a sensible outcome to the flow relationships themselves, when these are constrained by certain key stock-flow relationships, for example, the desired wealth to income ratio (see Godley and Cripps, 1983). In addition, they investigate the nature of the price mechanism which is consistent with what they call inflation neutrality, making an empirical judgement that the world is not too far away from this position most of the time.

G.C. HARCOURT

See also IMPERFECTIONIST MODELS.

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Postlethwayt, Malachy 1707-1767). Malachy Postlethwayt gave vent to the most comprehensive expression of mercantilist thought on behalf of British imperial interests. Fay (1934, p. 3) justifiably called Postlethwayt, alongside Joshua Gee, a major "spokesman" for 18th-century England. Postlethwayt's mercantilist vision emphasized (1) the slave trade to Africa and mercantilist vision emphasized (1) the slave trade to Africa and slavery in the Caribbean as vital stimuli to development of British manufactures; (2) the Royal African Company as an instrument of management of 'the African trade'; (3) the necessity of competition with France for control of the slave trade; and (4) the general principle that government must promote trade and industry.

His monumental *Universal Dictionary of Trade and Commerce*, twenty years in the making before its first edition was published in instalments over the interval 1751-55, included an entry entitled 'Africa', summarizing his views on the relationship between African slavery and British industry. Despite acknowledging the brutality of the trade and allusion to some future date when a 'Christian spirit' might be moved to end the trade, Postlethwayt was wholly pragmatic. After all, he concluded, the gains for Britain from the slave trade were substantial - being a 'trade (that) is ... all profit' and a trade that 'occasionally gives so prodigious employment to our people both by sea and land'.

This perspective resonated throughout Postlethwayt's pamphlets (see his *Selected Works*). Sir James Steuart may have been the 'last' British mercantilist, but he certainly was not the purest. For that we must turn to Postlethwayt, whose vision was undiluted by vestiges of humanitarianism.

Although foreign trade, with the slave trade as a key component, was Britain's engine of growth for Postlethwayt, there was great breadth in the matters he viewed as relevant to British economic development. Scientific and technical advances, maintenance of low or zero interest rates (see Viner, 1937, p. 47), sport and leisure (Dorfman, 1971, p. 7), the public debt (Johnson, 1937, pp. 190-5), agricultural policy (Johnson, 1937, pp. 196-201), maintenance of low wages, and development of securities markets were among the many factors he identified as influences on the rate of economic expansion. Nevertheless, the overseas 'plantations' or 'colonies' lay at the heart of Postlethwayt's mercantile system, and for Postlethwayt, full development of the plantations required slaves. Indeed, Postlethwayt's writings provided compelling evidence for Eric Williams's view in *Capitalism and Slavery* (1944) that British mercantile strategists were aware of slave-trading and slavery's ramifications as a spur to British industrialization.

Postlethwayt's *Universal Dictionary* (4th edn, 1774) purported to be a translation of Jacques Savary's *Dictionnaire universel du commerce*, but as Schumpeter (1954, pp. 156-7) noted, it was really much more. Nevertheless Schumpeter (p. 372, n. 15) viewed Postlethwayt as a writer whose name survived despite 'substandard performance'. Schumpeter added that E.A.J. Johnson's careful bibliographic efforts 'reduced to its proper proportions the charge of plagiarism that has been frequently leveled against Postlethwayt, though the case remains bad enough' (Schumpeter, 1954, pp. 156-7). But Johnson himself concluded that his efforts 'relieve[d] Postlethwayt, at least partially, from an ill-founded charge' (Johnson, 1937, p. 405). Nonetheless, substantial portions of Richard Cantillon's *Essai* first appeared in English in Postlethwayt's *Dictionary* (Higgs, 1905, pp. ix-xiii) without acknowledgement.

Postlethwayt apparently sought, with mixed results, to become a well-heeled sycophant to British royalty through his work (Johnson, 1937, pp. 186-7). Johnson even speculated that Postlethwayt may have been a paid agent of the Royal African Company. He died abruptly in relative poverty in 1767 and was buried in Old Street churchyard in the Clerkenwell section of London. It is probable that he was the brother of James Postlethwayt, author of a major history of British public revenue.

WILLIAM DARITY, JR.

SELECTED WORKS

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poverty. Concern for poverty has been expressed over the centuries, even if its priority on the agenda for political action has not always been high. Its different meanings and manifestations have been the subject of study by historians, sociologists and economists. Its causes have been identified in a wide variety of sources, ranging from deficiencies in the administration of income support to the injustice of the economic and social system. The relief, or abolition, of poverty has been sought in the reform of social security, in

intervention in the form of economic policy. Poverty today claim on our distribution of wealth within countries. in Africa, Asia would be agreed suggested that people living in of whom about about 150 million East/South-East of living, the vulnerability to those in advance urgently in the cause of such food or whether situation in an indicator of the countries.

Such mass poverty in advanced War on Poverty Americans with for a family of average income line is to be Department of reflects the prevalence well be argued countries, at a unjustified and applied. The deckchairs on not, however, position of those vessel. The over as rapidly as po also be concerned exposure on redistribution of should have priority countries, defined on the list of countries.

The fact that senses highlight the discussion need to be elaborated of poverty in issues. What is employed in measures of poverty and discussed in standard is a requirements but 'relative'. We differing needs. we have established central concern poor? This is in particular cl is it associated composition of

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**Harrod, Roy Forbes (1900-1978).** Roy Harrod was born in February 1900 and died in 1978. His father, Henry Dawes Harrod, was a businessman and author of two historical monographs. His mother, Frances (née Forbes-Robertson) was a novelist, and sister of the notable Shakespearean actor-manager, Sir Johnston Forbes-Robertson. Henry Harrod's business failed in 1907, but Roy won a scholarship to St Paul's School in 1911 and a King's Scholarship to Westminster in 1913. He became Head of his House, and in 1918 won a Scholarship in History to New College, Oxford, and was his father's College. He enlisted in September 1918 and was commissioned in the Royal Field Artillery, but the war ended before his training was completed.

He went up to Oxford in early 1919 and first read Literae Humaniores (Classical Literature, Ancient History and Philosophy). He might well have devoted his career to academic philosophy and he valued his publications in that subject more highly than his seminal contributions to economics. He has remarked that significant economic problems have only attracted the attention of profound thinkers for about two hundred years and interest in them might well disappear in another two hundred. In contrast deep thought has been devoted to the great philosophical problems (such as the validity of inductive methods of thought) for more than two thousand years and new contributions will be read

for so long as civilized life remains. But his philosophy tutor at New College, H.W.B. Joseph, deterred him from devoting his life to that subject, by reacting extremely negatively to his essays. Harrod has left an account of a seminar on Einstein's theory of relativity in Oxford in 1922 where Joseph drew attention to a few terminological problems and believed this had undermined the theory. Einstein's theory of relativity survived, but Harrod was persuaded not to pursue a career in academic philosophy. In later years he published in the distinguished philosophical journal, *Mind*, and his *Foundations of Inductive Logic* (1956) has received serious critical attention from philosophers as distinguished as A.J. Ayer (1970), but his main scholarly work was not to be in Philosophy.

He followed his First Class Honours in Literae Humaniores in 1922 with a First Class in Modern History just one year later, and in 1923, Christ Church, Oxford elected him to a Tutorial Fellowship (confusingly described as a Studentship in that College) to teach the novel subject, Economics, which was to be part of Oxford's new Honour School of Politics, Philosophy and Economics.

Harrod was allowed two terms away from Oxford so that he could learn enough economics to teach it, and it was suggested that he might spend this time in Europe, but he first went to Cambridge where he attended a wide range of lectures and wrote weekly essays on Money and International Trade for John Maynard Keynes. He was equally fortunate when he returned to Oxford, for while he was critically discussing the economics essays of Christ Church's undergraduates he was himself writing weekly microeconomic essays for the Drummond Professor of Political Economy, Francis Ysidro Edgeworth.

In addition to his new academic work Harrod took a notable part in the administration of his College (where he was Senior Censor in 1929-31, the most responsible office a Student of Christ Church can be called upon to discharge), and also the University where he was elected to Oxford's Governing Body (the Hebdomadal Council) in 1929 before he was thirty. In the University and in Christ Church, he fought powerful campaigns on behalf of Professor Lindemann (subsequently Lord Cherwell) who held Oxford's Chair of Experimental Philosophy (Physics), and became principal scientific adviser to Winston Churchill's wartime government and a member of his postwar cabinet.

By 1930 his economics had developed to the point where he was able to publish his first important and original contribution, 'Notes on Supply', in which he was the first 20th-century economist to derive the marginal revenue curve. This should have appeared in 1928 to produce a claim for international priority, but Keynes, the editor of the *Economic Journal*, sent the article to Frank Ramsey who first believed there were difficulties with the argument. He subsequently appreciated that his objections rested on a misunderstanding, but Harrod's new contribution was less startling in 1930 than it would have been in 1928. He followed this initial contribution to the imperfect competition literature with an important article, 'Doctrines of Imperfect Competition' (1934), in which he summarized the essential elements of the new theories of Edward Chamberlin and Joan Robinson.

During the 1930s Harrod frequently stayed with Keynes and he was increasingly drawn into the group of brilliant young economists which included Richard Kahn and Joan Robinson who were helping him develop the new theories which culminated in *The General Theory of Employment, Interest and Money*. Harrod had written a number of important and influential articles in the press advocating new reflationary

policies in the early 1930s and these together with his extension of Kahn's employment multiplier to international trade in his *International Economics* (1933) prompted Joseph A. Schumpeter to write in 1946 in his obituary article on Keynes, 'Mr Harrod may have been moving independently toward a goal not far from that of Keynes, though he unselfishly joined the latter's standard after it had been raised.'

Shortly after the *General Theory* appeared, Harrod published *The Trade Cycle* (1936) in which he developed some of the dynamic implications of the new theory of effective demand. The conditions where output would grow were a central theme in Adam Smith's, *The Nature and Causes of the Wealth of Nations*, and it had been much analysed in the great 19th-century contributions of Malthus, Ricardo, Mill and Marx, but the long-term dynamic implications of immediate changes to particular economic variables received virtually no attention in the neoclassical work that followed the marginal revolution. In the *General Theory* Keynes mostly went no further than to work through completely the immediate effects on a formerly stationary economy of a variety of disturbances such as an excess of the saving which would occur at full employment over the investment businessmen considered it prudent to undertake. Harrod went a vital step further and showed what could be expected to occur if saving was permanently high in relation to the long-term opportunity to invest. In 1939 he followed *The Trade Cycle* with 'An Essay in Dynamic Theory', and after the war he developed his growth theory further in the book, *Towards a Dynamic Economics* (1948). Important articles followed including a 'Second Essay in Dynamic Theory' (1960), and 'Are Monetary and Fiscal Policies Enough?' (1964). It is almost certainly because of Harrod's rediscovery of growth theory in the 1930s and his notable contributions to it that Assar Lindbeck, the Chairman of the Nobel Prize Committee, chose to state that he was among those who would have been awarded a Nobel Prize in Economics if he had lived a little longer. The nature of Harrod's original contribution, and the gradual evolution of his theory from 1939 to 1964 is set out in the second part of this article. The detailed technical characteristics of Harrod's growth model are the subject of a separate article, *The Harrod-Domar Growth Model*.

In the Second World War Harrod's friendship with Lindemann and his increasing distinction as an economist led to an invitation to join the Statistical Department of the Admiralty (S Branch) which Churchill set up when he again became First Lord in 1939. This moved to Downing Street when Churchill became Prime Minister in 1940, but Harrod did not have a particular talent for detailed statistical work and he developed an increasing interest in the international financial institutions, the International Monetary Fund and the World Bank, which would need to be set up as soon as the war was won, and from 1942 onwards he pursued this work in Christ Church. In the immediate postwar years he took a strong interest in national politics, and stood for Parliament unsuccessfully as a Liberal in the General Election of 1945 and for a time he was a member of that Party's Shadow Cabinet. He had served on Labour Party committees before the war, and in the 1950s with Churchill's support he unsuccessfully sought adoption as a Conservative parliamentary candidate: his economic advice was warmly welcomed by Harold Macmillan, Conservative Prime Minister in 1957-63. Harrod received the honour of knighthood in 1959 in recognition of his public standing and his notable academic achievements in the prewar and postwar decades.

He had succeeded Keynes as editor of the *Economic Journal* in 1945, and in partnership with Austin Robinson (who looked

after the book reviews) he sustained its reputation and quality until his retirement from the editorship in 1966.

His own postwar academic work included important contributions in three areas. In addition to the continuing development and refinement of his prewar work on dynamic theory, he published extensively on the theory of the firm and on international monetary theory which had been his particular concern during the war.

The Oxford Economists' Research Group had begun to meet prominent British industrialists before the war. A group of Oxford economists which generally included Harrod invited individual industrialists to dine in Oxford, and after dinner they were questioned extensively on the considerations which actually influenced their decisions. This led to the publication of a number of much cited articles and the book, *Oxford Studies in the Price Mechanism* (1951) to which Harrod himself did not contribute. Propositions which emanated from these dinners included the notion that businessmen took little account of the rate of interest in their investment decisions, and that they did not seek to profit maximize, but priced instead by adding a margin they considered satisfactory to their average or 'full' costs of production. In his important articles, 'Price and Cost in Entrepreneurs' Policy' (1939) and 'Theories of Imperfect Competition Revised' (1952), Harrod set out a theoretical account of how firms price in which industrialists follow something like these procedures. Their object is especially to achieve a high market share and by setting prices low enough to deter new entry, they actually succeed in maximizing their long-run profits and avoid the excess capacity that Chamberlin and Joan Robinson had considered an inevitable consequence of monopolistic or imperfect competition. This attempt to reconcile the 'rules of thumb' that the businessmen revealed with the propositions of traditional theory was more highly regarded outside Oxford than some of the books and articles in the new tradition.

His work on the world's international monetary problems occupied a good deal of his time and attention in the postwar decades. Keynes himself had considered the breakdown in international monetary relations a crucial element in the collapse of effective demand in so many countries in the 1930s, and he devoted much of the last years of his life to the creation of new institutions which would avoid a repetition of these disasters. Harrod believed he was continuing this vital work when he devoted much thought and energy to these questions. He arrived at the conclusion that there was bound to be some inflation in a world which was successfully pursuing Keynesian policies, and that the liquidity base of the world's financial system was bound to become inadequate if the price of gold failed to rise with other prices. He believed that underlying world liquidity which rested on gold in the last resort must be allowed to rise in line with the international demand for money. He therefore came to focus on the price of gold, and in his book, *Reforming the World's Money* (1965), he proposed that a substantial increase in the price of gold would be needed if subsequent international monetary crises were to be avoided. Harry Johnson (1970) has summarized his contribution to this debate.

Harrod took a great interest in actual developments in the United Kingdom economy, and published seven books and collections of articles in the first two postwar decades which were directly concerned with the policies Britain should follow. There was in addition an immense range of articles in the academic journals, the bank reviews and the press on these questions, not to mention monthly stockbrokers letters for Phillips and Drew. Harrod argued strongly and powerfully that nothing was to be gained by running the economy below

full employment, which meant an unemployment rate of less than 2 per cent in the 1950s and the 1960s. In the late 1950s he was deeply concerned that the removal of import controls would render it increasingly difficult for Britain to pursue such Keynesian policies, and he was a vigorous opponent of European Common Market entry. He attached more significance than some distinguished Keynesians to holding down inflation but he published statistics in *Towards a New Economic Policy* (1967) to show that in Britain, this had tended to be faster when the economy was in recession than when output was allowed to expand. He argued therefore that deflationary policies could play no useful role in policies to control the rate of cost inflation, which he considered the essential element in inflation in Britain. Policy swung sharply away from this Keynesian tradition in the last years of his life, and he wrote a final letter to *The Times* on 21 July 1976 in which he praised the economics of Tony Benn and Peter Shore for their opposition to the Labour government's public expenditure cuts, for, 'To cut public spending when there is an undesirably high rate of unemployment is crazy.'

His advocacy of import controls and his adverse reaction to deflationary policies at all times might suggest that he was an economist of the Left, but his willingness to support each of the British political parties at various times underlines how his approach to economic and social problems cannot be typecast. The lines of policy he supported always followed directly from his understanding of the significance of the major interrelationships, and it was his belief that Keynesian theory (which he had so notably helped to refine and develop) provided the appropriate tools for the analysis of Britain's economic problems that led him towards the expansionist policies he so consistently advocated. But further theoretical and empirical relationships which he believed were equally well founded led him to advocate a series of social policies to which very Right wing labels can be attached.

Just before the 1959 election his article, 'Why I Shall Vote Conservative', in *The Sunday Times*, put forward the startlingly unfashionable argument that only the Conservatives would allow more money to go to the better off who had most to contribute to the future of Britain. Harrod's strong belief in the importance of the *quality* of the country's population stock (which, he held, mattered no less than the physical capital) lay behind this article. Harrod thought the quality of the population would be bound to deteriorate if the middle classes continued to have fewer children than the poor. He was a strong believer in the inheritance of every kind of ability, and a provocative conversational conclusion he drew was that in an ideal world, one-third of Christ Church's much sought after undergraduate places should be sold to the rich. Their children often had insufficient academic ability to perform well in examinations, but they had inherited abilities of other kinds which would take them to the highest positions, so they should go to Oxford first. Harrod's reasoning on the inheritance of ability and its implications is set out in detail in the Memorandum he submitted to the Royal Commission on Population in 1944. There he suggested that a difficulty in finding servants was one reason why the middle classes had fewer children. Among his suggestions to remedy this state of affairs was that Diplomas in Domestic Service should be established, and that it should become common practice for servants to have latch-keys and the same rights as their mistresses to enjoy social lives with no questions asked. His Memorandum reads strangely in the 1980s when it is widely regarded as unacceptable that any practical conclusions may be drawn from the proposition that human abilities are inherited. Harrod never hesitated to carry his arguments to

their limits, and he always went where his reasoning took him, irrespective of the predictable reactions of others.

The unselfconsciousness of both his academic and his public writing comes out especially in his two biographical volumes, the official life of Keynes (commissioned by the executors) which he published in 1951 and *The Prof* (1959), his personal sketch of Lord Cherwell. As well as providing magnificent accounts of their subjects from the standpoint of one who had known them intimately (and who profoundly understood the economic problems Keynes wrestled with), these books contain extensive autobiographical passages which will enable later generations to know more of Harrod than any biographer can begin to convey.

He ceased to lecture in Oxford in 1967 upon reaching the statutory retirement age of 67, but as a Visiting Professor he continued to teach in several distinguished North American Universities. He died in his Norfolk home in 1978 eleven years after his Oxford work came to an end.

**HARROD'S REVIVAL OF GROWTH THEORY AND HIS CONTRIBUTION TO KEYNESIAN MACROECONOMICS.** Harrod was intimately involved in the origins and development of Keynesian economics. As the galley proofs of the *General Theory* emerged from the printers from June 1935 onwards, copies were sent to Harrod, to Kahn and to Joan Robinson and with their assistance, Keynes rewrote extensively for final publication. Harrod helped to clarify the relationship between Keynes's new theory of the rate of interest and the then ruling neoclassical theory where this depended upon the intersection of ex-ante saving and investment schedules. In the course of their correspondence, Harrod showed Keynes how well he understood the essence of the *General Theory* by setting out its novelty and its principal elements in ten lines on 30 August 1935:

Your view, as I understand it is broadly this:-

Volume of investment determined by	{ marginal efficiency of capital schedule rate of interest
Rate of interest determined by	{ liquidity preference schedule quantity of money
Volume of employment determined by	{ volume of investment multiplier
Value of multiplier - determined by	{ propensity to save

Keynes responded, 'I absolve you completely of misunderstanding my theory. It could not be stated better than on the first page of your letter.'

Almost immediately after the appearance of the *General Theory*, Harrod published *The Trade Cycle* which contained for the first time in the Keynesian literature the concept of an economy growing at a steady rate. Keynes wrote of it to Joan Robinson on 25 March 1937, 'I think he has got hold of some good and important ideas. But, if I am right, there is one fatal mistake', and to Harrod himself on March 31, 'I think that your theory in the form in which you finally enunciate it is not correct, being fatally affected by a logical slip in the argument.' Harrod replied devastatingly on April 6th, 'There is no slip ... The fact is that you in your criticism are still thinking of once over changes and that is what I regard as a static problem. My technique relates to steady growth.' Harrod's slip was in fact the first step towards the reinstatement of growth theory into mainstream economic analysis.

Harrod convinced Keynes, who, on 12 April congratulated him for 'having invented so interesting a theory', but with the reservation, 'I should doubt whether any reader who has not talked or corresponded with you could be aware that the whole of the last half of the book was intended to be in relation to a moving base of steady progress.' Keynes added that it was vital that Harrod carry his ideas further and restate them more comprehensibly.

Harrod made important progress in the next fifteen months, and on 3 August 1938 he sent Keynes a preliminary draft of the article, 'An Essay in Dynamic Theory', and wrote in his accompanying letter,

my re-statement of the dynamic theory ... is, I think, a great improvement on my book ... I have been throwing out hints in a number of places of the possibility of formulating a simple law of growth and I want to substantiate the claim. It is largely based on the ideas of the general theory of employment; but I think it gets us a step forward.

A lengthy correspondence then developed between Harrod and Keynes in which the two most original elements in Harrod's contribution which later excited much interest and controversy in the economics profession were extensively discussed.

Harrod's principal innovation was the invention of a *moving equilibrium growth path* for the economy, and he described this as the 'warranted' line of growth. Harrod had perceived before he wrote *The Trade Cycle* that there was a fundamental contradiction between the assumptions prevalent in the microeconomic theory of the firm and industry, to which he had made notable contributions, and the new Keynesian macroeconomics. In the theory of the firm, long-term investment was zero, for firms had no motivation to undertake further investment once they were in long period equilibrium. But the new Keynesian macroeconomics required that there be net investment by firms or the government whenever there was any net saving in the macroeconomy. A theory compatible with both macro and microeconomic equilibrium therefore required that firms invest all the time, so that they can continually absorb total net saving. Harrod's formulation of the warranted rate of growth, his novel discovery, was an attempt to set out this necessary equilibrium growth path that industrial and commercial investment decisions must all the time follow in order to achieve a complete economic equilibrium.

Harrod's moving equilibrium or warranted growth path required that saving (of  $s$  per cent of the national income) be continually absorbed into investment, so he asked the question: at what rate of growth will firms all the time choose to invest the  $s$  per cent of the national income, which equilibrium growth requires? To answer this question, he made use of the acceleration principle or 'the relation' as he called it, that firms need say  $C$ , units of additional capital to produce an extra unit of output. It follows from these premises that the warranted rate of growth of output will be  $s/C$ , per cent per annum. Since each rise in output by 1 unit entails that  $C$ , extra units be invested, a rise in output by  $s/C$ , per cent of the national income will call for an equilibrium investment of  $C$ , times this which is precisely  $s$  per cent of the national income, the ratio of ex-ante saving in the national income. In Harrod's examples at this time, he suggested a typical  $s$  of 10 per cent of the national income and a  $C$ , of 4, to produce a warranted rate of growth of  $2\frac{1}{2}$  per cent.

This idea that if there is continual saving, then equilibrium entails a continual geometric growth in production came as a

considerable surprise to Keynes and the other members of the 'circus'. As Harrod had already explained in April 1937,

The static system provides an analysis of what happens where there is no increase [in output] which entails (as in Joan Robinson's long-period analysis) that saving=0. Now I was on the lookout for a steady rate of advance, in which the rates of increase would be mutually consistent.

But Harrod's second discovery had equally radical implications. Suppose the actual growth of output is marginally above the equilibrium or warranted rate of growth. In Harrod's numerical example with  $s$  10 per cent and  $C$ , 4, it can be supposed that output actually grows 0.1 per cent faster than the warranted rate, that is by 2.6 per cent instead of 2.5 per cent. Then with 2.6 per cent output growth, the acceleration principle or relation will entail that 4 times 2.6 per cent be added to the capital stock, so that ex-ante investment is 10.4 per cent of the national income. With ex-ante saving limited to 10.0 per cent, the 0.1 per cent excess of actual growth over warranted growth then produces an excess in ex-ante investment over ex-ante saving of 0.4 per cent of the national income. Any excess in ex-ante investment over ex-ante saving will be associated with extra expansion of the national income according to the economics of the *General Theory*. Thus if the actual rate of growth exceeds the warranted rate of  $s/C$ , per cent, the tendency will be for actual growth to rise and rise, for as soon as actual growth rises from 2.6 to say 3 per cent, required investment will rise further to 4 times 3 per cent which equals 12 per cent and so exceed the 10 per cent savings ratio by a still greater margin. Conversely, when actual growth comes out at a rate just short of the warranted 2.5 per cent, ex-ante investment will be below the 10 per cent savings ratio, which will cause the rate of growth to decline. This second discovery, which became known as Harrod's knife-edge, was therefore that any rate of growth in excess of the equilibrium or warranted path he had discovered would set off a continual acceleration of growth, while any shortfall would set off deceleration. He wrote to Keynes of this discovery on 7 September 1938:

If in static theory producers produce too little, they will be well satisfied with the price they get and feel happy; but this is not taken to be the *right* amount of output; they will be stimulated to produce more. The equilibrium output is taken to be that which *just* satisfies them and induces them to go on as before. Similarly the warranted rate [of growth] is that which just satisfies them and leaves them going on as before. The difference between the warranted rate and the old equilibrium (i.e. the difference between dynamic and static theory) is, on my view, that if they produce above the warranted rate, they will be more than satisfied and be stimulated, and conversely, while in the case of equilibrium in static conditions the opposite happens. The 'field' round the [static] equilibrium contains centripetal, that round the warranted centrifugal forces.

It took Keynes time to absorb Harrod's startling discovery. On September 19th he proposed a counterexample in which  $C$ , was merely one-tenth, while  $s$  was also one-tenth. With this counterexample, a deviation of output by a small amount from the warranted path, say by  $\delta x$ , which would raise planned investment above the level at which it would otherwise be by  $C, \delta x$  would merely raise this by  $0.10 \delta x$ , which would equal the rise in planned saving of  $s \delta x$ , which would also come to  $0.10 \delta x$ , so there would be no tendency towards an explosive growth in effective demand. This would grow explosively if  $C$ , was one-ninth (in which case planned investment would rise by

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0.11  $\delta x$  and saving by only 0.10  $\delta x$ ) but the further growth of output would be damped if  $C_s$  was merely one-eleventh, so, Keynes insisted, 'neutral, stable or unstable equilibrium' are equally likely.

Harrod protested on 22 September, 'it is absurd to suppose extra capital required [ $C_s$ ] only  $\frac{1}{10}$  of annual output, when the capital required in association with the pre-existent level of incomes in England today is 4 or 5 times annual output.' The probability that  $C_s$  would exceed  $s$  so that ex-ante investment would rise by more than ex-ante saving in order to produce instability was therefore overwhelming.

But several qualifications emerged. In comparing the increase in ex-ante investment to the increase in ex-ante saving following a small deviation of output from the warranted rate: the relevant marginal capital coefficient ( $C_s$ ) which determines how much planned investment will rise is the net new requirement of induced investment. In so far as investment decisions are autonomous of short-term fluctuations in output, the relevant  $C_s$  will be lower than the economy's overall capital output ratio.

(1) The relevant coefficient which determines the increase in planned saving is the *marginal* and not the average propensity to save. Planned saving will rise more where output deviates upward from the warranted rate, the greater is the marginal propensity to save in relation to the average propensity. The circumstances that could produce a stable upward deviation of growth from the warranted rate and the avoidance of Harrod's knife-edge are therefore a very high marginal propensity to save in combination with a situation where most investment is autonomous so that the induced investment coefficient,  $C_s$ , is considerably less than 1. In 'An Essay in Dynamic Theory', Harrod covered this possibility with the caveat, 'when long-range capital outlay is taken into account ... the attainment of a neutral or stable equilibrium of advance may not be altogether improbable in certain phases of the cycle.' The possibility he had in mind here is that in the early stages of a cyclical recovery there may be so much excess industrial capacity that  $C_s$  will be quite low for a time, and therefore quite possibly lower than the marginal propensity to save. But in general any deviation of growth from the warranted line of advance would raise ex-ante investment by a greater margin than ex-ante saving with the result that the rate of growth would deviate further.

In addition to establishing the existence of the warranted line of advance and its instability, Harrod had to define the equilibrium investment behaviour by businesses which would actually lead to expansion at the requisite rate. In his 1939 article he omitted to offer any behavioural rule but simply asserted that the warranted rate was, 'that rate of growth which, if it occurs, will leave all parties satisfied that they have produced neither more nor less than the right amount'. That is no more than a description of equilibrium growth, and much the same can be said of his definition of the warranted rate in *Towards a Dynamic Economics* (1948) as, 'that over-all rate of advance which, if executed, will leave entrepreneurs in a state of mind in which they are prepared to carry on a similar advance'. It was only in the article, 'Supplement on Dynamic Theory' (1952) that Harrod arrived at a behavioural assumption that matched his algebraic formulation of the warranted rate:

Let the representative entrepreneur on each occasion of giving an order repeat the amount contained in his order for the last equivalent period, adding thereto an order for an amount by which he judges his existing stock to be deficient, if he judges it to be deficient, or subtracting

therefrom the amount by which he judges his stock to be redundant, if he does so judge it.

With that assumption an economy which once achieves growth at the warranted rate will sustain it, while any upward or downward deviations will lead to still greater deviations wherever  $C_s$  exceeds the marginal propensity to save.

But it emerged by 1964 when Harrod published, 'Are Monetary and Fiscal Policies Enough?', that even that assumption fails to define growth at the warranted rate, for it must also be assumed that the representative entrepreneur will expand at a rate of precisely  $s/C_s$  when he judges his capital to be neither deficient nor redundant. This requires an expectation by the representative entrepreneur that his market will grow at a rate of precisely  $s/C_s$ . Hence the full requirement for growth along Harrod's warranted equilibrium path is that entrepreneurs expect growth at this rate and expand and continue to expand at that rate so long as their capital stock continues to grow in line with their market so that it is neither deficient nor redundant. They will of course increase their rate of expansion if their capital should prove deficient, and curtail it if part of their stock becomes redundant.

The warranted rate of growth and its instability were Harrod's great innovations. From 1939 onwards he contrasted this equilibrium rate with the natural rate of growth, 'the rate of advance which the increase of population and technological improvements allow', which was entirely independent of the warranted rate. Harrod defined the rate of technical progress more precisely in 1948 as the increase in labour productivity 'which, at a constant rate of interest, does not disturb the value of the capital coefficient'. This then entered the language of economics as Harrod-neutral technical progress, which, together with growth in the labour force, determines the natural rate of growth, that is the rate at which output can actually be increased in the long run. This raised few theoretical problems in 1939, and there was nothing novel in the proposition that long-term growth must depend on the rate of increase of the labour force and technical progress. Keynes himself had said as much several years earlier in, 'Economic Possibilities for our Grandchildren' (1930). But the contrast between this natural rate, and Harrod's innovatory warranted rate offered entirely new insights.

If the warranted rate exceeds the feasible natural rate, the achievement of equilibrium growth must be impractical because the economy cannot continue to grow faster than the natural rate. It must deviate downwards from the warranted rate towards the natural rate far more than it deviates upwards with the result that 'we must expect the economy to be prevailingly depressed'. If the natural rate is greater, output will tend to deviate upwards towards the natural rate with the result that the economy should enjoy 'a recurrent tendency towards boom conditions'.

Keynes's own reaction to the dichotomy between the warranted and natural rates was characteristically (his letter to Harrod on 26 September 1938) that the warranted rate always exceeded the natural:

In actual conditions ... I suspect the difficulty is, not that a rate in excess of the warranted is unstable, but that the warranted rate itself is so high that with private risk-taking no one dares to attain it ...

I doubt if, in fact, the warranted rate - let alone an unstable excess beyond the warranted - has ever been reached in USA and UK since the war, except perhaps in 1920 in UK and 1928 in USA. With a stationary population, peace and unequal incomes, the warranted rate

sets a pace which a private risk-taking economy cannot normally reach and can never maintain.

That is characteristic Keynes, but Harrod had persuaded him to express his familiar analysis in the language of his new theory of growth. In the immediate postwar decades when full employment and creeping inflation prevailed, it was widely argued that the natural rate had come to exceed the warranted. The richness of Harrod's model is demonstrated by its ability to illuminate both kinds of situation.

Evsey Domar's growth model which has a good deal in common with Harrod's was published seven years after 'An Essay in Dynamic Theory', and a considerable literature emerged in the next fifteen years on the stability conditions and other important features of what came to be known as the Harrod-Domar growth model. This is elegantly summarized by Frank Hahn and Robin Matthews in their celebrated 1964 survey article.

The development of neoclassical growth theory in the 1950s led to an increasing realization that the warranted and natural growth rates could be equated by an appropriate rate of interest. If the warranted rate was excessive so that oversaving led to slump conditions, a lower interest rate which raised  $C_r$  sufficiently would bring it down to the natural rate. Conversely the inflationary pressures that resulted from an insufficient warranted rate would be eliminated if higher interest rates reduced  $C_r$  sufficiently. If the real rate of interest and  $C_r$  responded in this helpful way,  $s/C_r$ , the warranted rate could always be brought into equality with the natural rate.

Harrod's response included his 'Second Essay in Dynamic Theory' (1960), a title which underlines its significance. He proposed that there was an optimum real rate of interest  $r_n$  which would maximize utility, with a value of  $G_p/e$ ,  $G_p$  being the economy's long-term rate of growth of labour productivity and  $e$  the elasticity of the total utility derived from real per capita incomes with respect to increases in these. If a 1 per cent increase in real per capita incomes raises per capita utility  $\frac{1}{2}$  per cent,  $e$  will be 0.5, and  $r_n$  the optimum rate of interest which maximizes utility will be  $G_p/0.5$ , viz. twice the rate of growth of labour productivity. If the marginal utility of growth does not fall at all as real per capita incomes rise, per capita utility will grow 1 per cent when incomes rise 1 per cent so that  $e$  is unity, and  $r_n$  equals  $G_p$ . The more steeply the marginal utility of incomes fall, the more  $e$  will fall below unity, and the more the optimum real rate of interest,  $G_p/e$ , will exceed the rate of growth of labour productivity.

If a society actually seeks to establish the optimum rate of interest determined in this kind of way, the value of  $C_r$  will depend upon this optimum rate of interest, so it will not also be possible to use the rate of interest to equate the natural and warranted rates of growth in the manner the neoclassical growth models of, for instance, Robert Solow (1956) and Trevor Swan (1956) propose. There will therefore still be difficulties because the warranted rate of growth with real interest rates at their optimum level will not in general be equal to the natural rate. Therefore as Harrod suggested in the final articles he published in 1960 and 1964, governments will have to run persistent budget deficits or surpluses if they are to avoid the difficulties inherent in discrepancies between the natural and the warranted rates of growth.

So Harrod remained a convinced Keynesian who continued to believe that a long-term imbalance between saving, the main determinant of the warranted rate, and investment opportunity would call for persistent government intervention. When that approach to economic policy again becomes fashionable, economists may learn a good deal from Harrod's later articles

which have not yet received the same attention from the economics profession as his seminal work in the 1930s and the 1940s.

WALTER ELTIS

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**Harrod-Domar growth model.** The Keynesian revolution led Roy Harrod (1939) and Evsey Domar (1946 and 1947) to work out the implications of permanent full employment. In *The General Theory of Employment, Interest and Money* (1936) Keynes himself showed how full employment could be reached, but he made no attempt to work out the long-term conditions which must be satisfied before an economy can continue to produce at that level. Harrod's and Domar's analyses of this problem show that long-term full employment requires that two fundamental conditions be satisfied.

First, the economy must invest full employment saving every year. If saving is  $s_f$  per cent of the full employment national income, and investment falls short of this, then as Keynes showed, effective demand is bound to be insufficient for full employment.

Second, for continuous full employment, the rate of growth of output must equal the growth of the physical labour force, plus the rate of increase in labour productivity. If there are  $n$  per cent more workers every year, and each produces  $a$  per cent more output, then continuous full employment requires that production grow  $(n+a)$  per cent a year. There will be no need to make use of  $n$  per cent more workers if output grows less than this, so all the extra workers who wish to join the labour force will not find employment.

Harrod and Domar both discovered a truism which allows formulae for  $g$ , the rate of growth, to be derived from these fundamental conditions.  $g$  can be defined as  $\delta Y/Y$ , where  $\delta Y$  is 'increase in output' and  $Y$  the level of output.  $\delta Y/Y$  is identically equal to  $\delta K/Y$  divided by  $\delta K/\delta Y$ , where  $\delta K/Y$  is 'increase in capital/output', that is, 'investment/output', while  $\delta K/\delta Y$  is 'increase in capital/increase in output' or the marginal capital-output ratio. There is therefore the truism that:

$$g \equiv \text{Investment/output } (I/Y) \div \text{the capital-output ratio } (C).$$

This can be combined with two basic full employment conditions. The result is presented first in the manner suggested by Harrod (whose model was published seven years prior to Domar's).

The condition that for full employment the share of investment must equal the full employment savings ratio,  $s_f$ , means that in the above formula, it is necessary that:

$$g = s_f \text{ (which has to equal } I/Y \text{) divided by } C.$$

There will be one particular level of  $C$ , the marginal capital-output ratio, which profit maximizing entrepreneurs consider ideal, for which Harrod used the symbol,  $C_r$ , and when this is substituted for  $C$  in the above expression, one necessary condition for continuous equilibrium growth at full employment is arrived at:

$$g = s_f/C_r$$

A second condition which needs to be satisfied if there is to be continuous full employment is that the economy's rate of growth must equal  $(n+a)$ , the rate of growth of the physical labour force plus labour productivity. Hence, if there is to be continuous full employment growth, it is necessary that:

$$g = s_f/C_r = n + a$$

So growth has to equal both  $s_f/C_r$  and  $(n+a)$ . Harrod called the first of these the 'warranted' rate of growth for which he used the symbol  $g_w$  and the second the 'natural' rate for which he wrote  $g_n$ . An economy will only be able to achieve continuous full employment if its rate of growth is equal to both  $g_w$  and  $g_n$ . Since in Harrod's account,  $s_f$  and  $C_r$  which determine the 'warranted' rate, and  $(n+a)$  which determines the natural rate, are exogenously given and independent,  $g_w$  and  $g_n$  will only be equal by chance. It follows that actual economies will find it virtually impossible to achieve continuous full employment, a Keynesian result which follows naturally from Harrod's Keynesian assumptions.

In the version Domar published in 1946 and 1947 which he sent to the printers before he was aware of Harrod's 1939 article, 'the rate of growth required for a full employment equilibrium' (Harrod's  $g_w$ ) is described as  $r$ , the economy's long-term saving ratio ( $s_f$ ) is  $\alpha$ , and the annual output produced by a unit of capital in the long term ( $1/C_r$ ) is  $\sigma$ . Domar's equivalent to Harrod's condition for long term full employment equilibrium that  $g_n$  must equal  $s_f/C_r$  is (Harrod, 1959) the identical proposition that  $r$  must equal  $\alpha\sigma$ . Harrod's symbols are more often used than Domar's because  $g$ ,  $s$ , and  $C$  are more readily thought of as the growth rate, the savings ratio and the capital-output ratio than,  $r$ ,  $\alpha$  and  $1/\sigma$ .

Harrod and Domar were both then unaware of the work of Fel'dman, who had produced a growth model quite similar to theirs in the Soviet Union in 1928. Domar published an account of Fel'dman's model, 'A Soviet Model of Growth', in his *Essays in the Theory of Economic Growth* (1957), a collection of papers in which his own model of growth and its implications for public policy are fully developed.

The consequences of the all but inevitable failure to achieve Harrod's and Domar's conditions provide illuminating insights into the long term development of real economies which often fail to achieve full employment over considerable periods. Harrod's first condition is that  $g$ , the economy's actual rate of growth must equal the 'warranted' rate,  $s_f/C_r$ . The meaning of this condition is that equilibrium growth entails that full employment saving be continuously invested, as in table 1, where a full employment savings ratio ( $s_f$ ) of 12 per cent, and a required capital-output ratio ( $C_r$ ) of 4 are assumed, so that the warranted rate is exactly 3 per cent. The real national income is 100 in the first year, and the initial capital stock is exactly the one required, namely four times this or 400.

TABLE 1. A Table to Illustrate Growth at the Warranted Rate  
 $s_r = 12$  and  $C_r = 4$ 

Year	Capital Stock $K = K_{-1} + I_{-1}$	National Income $Y$	Desired Capital $C_r \cdot Y$	Investment $I = s_r \cdot Y$
1	400.00	100.00	400.00	12.00
2	412.00	103.00	412.00	12.36
3	424.36	106.09	424.36	12.73

Investment which is always 12 per cent of the national income is added to the capital stock of the previous year, and the national income (which grows at exactly the warranted rate of 3 per cent) is always exactly one-quarter the capital stock, so the 'desired capital stock' (which is  $C_r$  times the national income) is always in line with the actual stock. This means that if the economy grows at precisely the 'warranted' rate (3 per cent), entrepreneurs will be satisfied that they have undertaken the commercially correct rate of investment. In 1939 Harrod defined the 'warranted' rate of growth as 'that rate of growth which, if it occurs, will leave all parties satisfied that they have produced neither more nor less than the right amount', which is precisely the situation in the table where the actual capital stock always equals the desired stock.

Table 2 illustrates what goes wrong when  $g$ , the actual rate of growth is less than  $g_w$ . It is assumed that  $g$  is only 2 per cent, while with  $s_r$  12 per cent and  $C_r$  4 as before,  $g_w$  is still 3 per cent.

TABLE 2. Growth where the Actual Rate ( $g$ ) is 1 per cent less than the Warranted Rate ( $g_w$ )

Year	Capital Stock $K = K_{-1} + I_{-1}$	National Income $Y$	Desired Capital $C_r \cdot Y$	Investment $I = s_r \cdot Y$
1	400.00	100.00	400.00	12.00
2	412.24	104.04	416.16	12.48
3	424.72	106.12	424.48	12.73

Here, where the rate of growth is slightly less than the warranted rate, the capital stock actually increases *faster* than the one entrepreneurs consider ideal. This margin of excess capital grows continuously, year after year, so the time is bound to come where entrepreneurs will respond by cutting investment. According to Harrod (1952) the rate at which firms invest to expand will be determined as follows:

Let the representative entrepreneur on each occasion of giving an order repeat the amount contained in his order for the last equivalent period, adding thereto an order for an amount by which he judges his existing stock to be deficient, if he judges it to be deficient, or subtracting therefrom the amount by which he judges his stock to be redundant, if he does so judge it (p. 284).

In the conditions set out in Table 2 where  $g_w$  exceeds  $g$ , part of the capital stock of the representative entrepreneur gradually becomes redundant, so investment and therefore effective demand and growth will begin to fall. Thus Harrod arrived at the extremely uncomfortable conclusion that if actual growth is less than the 'warranted' rate, it will come to fall still further below this. It can be shown similarly that if  $g$  exceeds  $g_w$ , for any reason, the economy will become increasingly short of capital with the result that  $g$  will rise further and further above  $g_w$ .

There are propositions in microeconomic theory which claim to demonstrate that if there is a surplus of any particular commodity, then the rate at which it is supplied will fall off with the result that market forces respond in the direction required to remove the surplus. The economy is therefore expected to respond to a shortage or surplus of an individual commodity in the manner required to remove it; but according to Harrod's instability theorem, at the macroeconomic level, any chance deviation of actual growth below the warranted rate will lead to excess capacity, and as this grows, investment and hence effective demand will be curtailed, which will lead to the creation of still more excess capacity. The response of the macro-economy to excess capital will therefore be the opposite of that required to remove the excess, with the result that economies are inherently unstable at the macro level.

Domar arrived at a similar result by directly contrasting the rate of growth of effective demand to the growth of productive capacity. In his formulation (but using Harrod's symbols) the growth in demand equals the increase in investment ( $\delta I$ ) times the multiplier ( $1/s$ ) while the growth of productive capacity equals total investment ( $I$ ) divided by the long term capital-output ratio ( $C_r$ ), with the result that where the growth of demand equals the growth of capacity:

$$\delta I/I = s/C_r$$

A slight upward deviation of investment from this critical rate of growth (which corresponds to Harrod's 'warranted' rate) will raise  $\delta I/I$  (which equals the growth of demand) relative to  $s/C_r$ , the growth of capacity, and this can be expected to lead to further increases in investment. Thus as in Harrod's argument, any chance deviation in the rate of growth of investment from the critical  $s/C_r$  growth rate of productive capacity can be expected to lead to further deviations in the same direction.

The difficulties capitalist economies must overcome to achieve continuous expansion at full employment are still greater because in order to grow all the time at the 'warranted' rate and so escape the instability inherent in any departure of  $g$  from  $s_r/C_r$ , the 'warranted' rate itself must equal the natural rate, but there is no reason why  $s_r/C_r$  should equal  $(n+a)$ .

Suppose the conditions assumed in the above tables ( $s_r = 12$  per cent and  $C_r = 4$  so that  $g_w = 3$  per cent) but that the labour force grows at only 0.5 per cent and productivity at 1.5 per cent so that  $g_n$  is just 2 per cent. Then the economy's full employment output can grow no more than 2 per cent a year, so it will be possible for the economy to achieve the 3 per cent growth rate required to prevent the emergence of continual excess capacity for a few years at most. Its actual long term growth rate is likely to approximate to the 2 per cent 'natural' rate with the result that  $g$ , the actual rate will fall short of  $g_w$  most of the time. Then years with excess capacity leading to economic depression will predominate over periods of expansion. The continual tendency towards depression will reduce average actual saving ( $s$ ) below full employment saving ( $s_r$ ). Then via unemployment and underproduction, the economy's actual long term savings ratio will come into line with the lower investment ratio ( $C_r$  times  $g_n$ ) which physical conditions actually allow the economy to sustain.

Conversely, where  $g_n$  exceeds  $g_w$ , market forces will all the time attempt to push actual growth above the 'warranted' rate, with the result that conditions where capital is scarce and saving inadequate will be predominant. In the first instance this will lead to excess demand for capital and therefore to a predominance of inflation over deflation which is what Harrod emphasized in 1948: 'we may have plenty of booms and a frequent tendency to approach full employment, the high

employment will be of an inflationary and therefore unhealthy character' (p. 88). However, if investment of less than  $C_r(n+a)$  causes the rate of growth of productive capacity to fall short of  $(n+a)$ , then there will be insufficient growth of the real capital stock to provide enough physical capital equipment to raise employment at the rate at which the physical labour force is growing ( $n$ ), with the result that the economy will suffer from growing structural unemployment.

Harrod's theory therefore predicts that incompatibilities between long term saving and investment opportunity are all but certain to cause prolonged unemployment (which will be structural where  $g_n$  exceeds  $g_w$  and demand deficient where  $g_w$  exceeds  $g_n$ ) with persistent inflation in addition wherever long term saving is inadequate for the natural rate of growth. This raises fundamental problems for public policy, and Harrod argued in 1939 that 'the difficulties may be too great to be dealt with by a mere anti-cycle policy'. He suggested that where an economy suffers from a long term tendency to over saving with the result that the 'warranted' rate exceeds the 'natural' rate, then a generous attitude to public investment is appropriate so that more will be undertaken than commercial and social considerations call for. Conversely governments should seek to generate more long term saving and to curtail long range and social investment where the 'natural' rate exceeds the 'warranted' rate.

By the later 1950s the United States and several West European economies were achieving full employment and negligible inflation which led a number of distinguished economists to develop models of economic growth which were less prone to predict secular unemployment or inflation. Robert Solow (1956) and Trevor Swan (1956) produced neoclassical growth models where market forces adjust the equilibrium capital-output ratio ( $C_r$ ) so that this automatically equates  $g_w$  to  $g_n$  (which is achieved when  $C_r = (n+a)/s$ ). Nicholas Kaldor (1955-6 and 1957) evolved a Keynesian model of growth and income distribution where shifts between wages and profits will adjust the savings ratio until this becomes the one required ( $C_r(n+a)$ ) to equate  $g_w$  and  $g_n$ . A few years earlier, Alexander (1950) had questioned the inevitability of Harrod's knife-edge which sent an economy soaring upwards or downwards wherever  $g$  diverged from  $g_w$ .

The unemployment and stagflation of the 1970s and the 1980s has surprisingly failed to restore some of the former prestige of the Harrod-Domar model. In the 20th century in the leading Western economies there have been prolonged periods when more saving would have been beneficial, and others with every appearance of inadequate effective demand. The Harrod-Domar growth model is one of the few which actually predicts this, so it still deserves serious attention.

WALTER ELTIS

See also AGGREGATE DEMAND AND SUPPLY ANALYSIS; NATURAL AND WARRANTED RATES OF GROWTH.

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Hart, Albert Gailord (born 1909). Born in Oak Park, Illinois, Hart received his BA from Harvard in 1930 and his PhD from the University of Chicago in 1936. Most of his career - from 1946 until his retirement in 1979 - was spent as Professor of Economics at Columbia University. Much of his noteworthy work concerned the implications of uncertainty for policy makers, but he should also be remembered as having worked with Kaldor and Tinbergen (1964) to produce an ingenious proposal for a commodity reserve currency: this would serve to improve international liquidity simultaneously with providing a means of protecting incomes of primary producers against shrinkage in times of depression.

Hart's work on uncertainty included a monograph (1940), one notable feature of which was an attempt to analyse how decision makers can judge their success or failure, and thence reformulate their expectations, in the light of partial knowledge of performance distributions. From 1936 onwards, he emphasized the rationality, in situations of uncertainty, of choosing flexible production technologies which, though they might not be perfectly adapted to any specific output rate, would not be disastrously expensive to run over a range of outputs. This idea, which was also promoted by his Chicago contemporary Stigler (1939), led Hart to be critical of much writing on decision theory. He felt it misleading to theorize as if firms assign probabilities to rival hypothetical outputs, aggregate these weighted values and then build their plans around the weighted average of probable output rates (1942). Hart was also irritated by Keynes's tendency to speak of expectations in terms of certainty equivalents, and he warned that, 'generally speaking, the business policy appropriate to a complex of uncertain anticipations is different in kind from that appropriate for any set of certain expectations' (1947, p. 422).

Hart carried this theme into work critical of deterministic macroeconomic model-building and fiscal policy formulation (1945), and into a distinctive approach to monetary theory (1948, especially part II). In the latter, he introduced the 'margin of safety' motive for holding liquid assets, arguing that the structure of economic affairs is such that risks are usually linked: a single disappointment is prone to cause many other things to go wrong in consequence. Hart's concern with surprise, flexibility, and structural linkages in many ways foreshadows themes that emerged in the 1980s in the business policy literature on scenario planning and strategic choices. However, he is not usually credited as the pioneer of this kind of thinking: having been largely ignored by mainstream writers, his ideas were sufficiently poorly known to end up being reinvented.

PETER EARL

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of papers in 1908-9 that we can now recognize as containing the germ of a proof of the asymptotic efficiency of maximum likelihood estimates. In a contentious 1935 meeting of the Royal Statistical Society this work was pointed out to R.A. Fisher by Bowley as an unacknowledged predecessor, although it seems doubtful that it had any influence on Fisher (see Pratt, 1976). Of more importance was Edgeworth's work on index numbers and on the theory of banking. While his work on index numbers is more properly treated with his economic work, it is worth noting here that he was a pioneer in the application of probability to the analysis and choice of index numbers. In regard to banking, based upon statistical considerations, he promulgated in 1888 the rule that the reserves of a bank need only be proportional to the square root of its liabilities (Edgeworth, 1888).

In all Edgeworth's work one is constantly coming upon minor, often paradoxical observations (see for example, Stigler, 1980) that reveal the depth of his understanding, the subtlety of his thoughts, and a grasp of mathematics that seems quite at odds with his lack of formal training in the subject. Edgeworth was an independent thinker upon statistical matters, though he was perhaps the earliest to appreciate and follow up on Galton's innovative concepts of regression and correlation. Edgeworth's most important influence was upon Karl Pearson, though Pearson was chary in his recognition of this influence. Taken together, Galton, Edgeworth and Pearson shaped modern statistics to a greater degree than any other individual or group before R.A. Fisher. Edgeworth's works on statistics number at least 75, and it is rare to find one that is self-contained. Bowley (1928) made an attempt to summarize all of Edgeworth's statistical work, and he gave a bibliography of most of it. Stigler (1978, 1986) gives a more recent assessment, and comments upon different aspects of Edgeworth's work can be found in papers by Kendall (1968, 1969) and Pratt (1976).

STEPHEN M. STIGLER

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Edgeworth, Maria (1767-1849). Born in England of an Irish land-owning family, Maria Edgeworth began her career as amanuensis and co-author to her father Richard Lovell Edgeworth, the educator and amateur inventor. Her first publications were a series of moral tales for children (*The Parents' Assistant*, 1796, and *Early Lessons*, 1802) which aimed to instil the virtues she saw as essential to a 'good' individual and so a 'good' society: honesty, frugality and hard work. These characteristics match rather precisely those of Adam Smith's 'prudent man' in the *Wealth of Nations*. Her tales teach the value of a work ethic, sharply contrasting the evils of sloth and idleness with the pleasures of diligence and achievement. Indeed, her attitude towards this aspect of labour did not exclude her own privileged class of landowners, who, as she witnessed in her own country, frequently abused the landlord-tenant contract.

In 1800 she published the work which is, perhaps, of most interest to economists, *Castle Rackrent*. Through the character of Thady Quirk, an ancient retainer of the Rackrent family, she recounts the history of three generations of absentee landlords, of their tenants and of the depths to which the Rackrent fortunes had fallen through successive generations of dissolute lifestyle. The book not only influenced prominent literary figures of the time (for example, Turgenev and Walter Scott) but also established a literary precedent for the development of fictional characters within the context of a realistic historical, social and economic setting - an approach which, in England, could be said to reach its peak with George Eliot's *Middlemarch*. In the 19th century the name Rackrent came to stand for the embodiment of the vices of the landed aristocracy and was freely used as such by writers like Carlyle and, later, her nephew F.Y. Edgeworth.

Maria Edgeworth continued her critical examination of the landlord-tenant relationship in novels like *The Absentee* (1812) and *Ennui* (1825) where she addressed issues such as leases, population and economic progress and the impact of manufacture on a traditional agricultural economy. Her letters to David Ricardo confirm her interest in the poverty and distress among the Irish agricultural peasantry. She initiated and engaged in a vigorous correspondence with Ricardo over the potato question and the effects of famines in the 1820s. On this subject she differed with both Ricardo and Malthus arguing that the essential cause of the difficulty lay in mismanagement. She rather amusingly suggested that instead of theorizing from afar, Ricardo should travel to Ireland and see for himself.

J.P. CROSHAW

education, economics of. See HUMAN CAPITAL.

effective demand. This is the term used by Keynes in his *General Theory* (1936) to represent the forces determining changes in the scale of output and employment as a whole.

Keynes attributed the first discussions of the determinants of the supply and demand for output as a whole to the classical economists, in particular the debate between Ricardo and Malthus concerning the possibility of 'general gluts' of commodities, or what has come to be known as Say's Law of Markets. Indeed, Keynes's theory was intended to replace Say's Law, although the emergence of effective demand from his *Treatise on Money* (1930) critique of the quantity theory of money, and his insistence on its application in what he originally called a 'monetary production economy', suggests that it should also be seen in antithesis to classical monetary theory. For Adam Smith (1776, p. 285), 'A man must be perfectly crazy who ... does not employ all the stock which he commands, whether it be his own or other peoples' on consumption or investment. As long as there was what Smith called 'tolerable security', economic rationality implied that it was impossible for demand for output as a whole to diverge from aggregate supply. Although Smith (p. 73) did call the demand 'sufficient to effectuate the bringing of the commodity to the market', the 'effectual demand' 'of those who are willing to pay the natural price' of the commodity, the idea referred to divergence of market from natural price of particular commodities and the process of gravitation of prices to their natural values. J.B. Say's discussion of the problem of the 'disposal of commodities' adopted Smith's position. Against those who held that 'products would always be abundant, if there were but a ready demand, or market for them,' Say's 'law of markets' argued 'that it is production which opens a demand for products' (1855, pp. 132-3); if production determined ability to buy, then demand could not be deficient. While excesses in particular markets were admitted, they would always be offset by deficiencies in others. Ricardo used similar arguments against Malthus, who responded by suggesting that:

from the want of a proper distribution of the actual produce, adequate motives are not furnished to continued production, ... the grand question is whether it [actual produce] is distributed in such a manner between the different parties concerned as to occasion the most effective demand for future produce ... (Malthus, 1821).

Malthus argues that the composition of output affects its quantity by producing doubts in the minds of Smith's rational entrepreneurs concerning the 'security' of their future profit.

The final word in the classical debate was J.S. Mill's 'On the Influence of Consumption on Production', which sought exceptions to the proposition that 'All of which is produced is already consumed, either for the purpose of reproduction or enjoyment' so that 'There will never, therefore, be a greater quantity produced, of commodities in general, than there are customers for' (1874, pp. 48-9). Mill accused those who argued that demand limits output of a fallacy of composition, for the individual shopkeeper's failure to sell is due to a disproportion of demand which cancels out for the nation as a whole. Mill also notes that the argument that every purchaser must be a seller presumes barter, for money enables exchange 'to be divided into two separate acts' so one 'need not buy at the same moment when he sells' (p. 70). To avoid this problem 'money must itself be considered as a commodity', for 'there cannot be an excess of all other commodities, and an excess of money at the same time' (p. 71). Mill admits that if money were 'collected in masses', there might be an excess of all commodities, but this would mean only a temporary fall in the value of all commodities relative to money. Similarly to Smith's 'tolerable security', Mill explains an excess of

commodities in general by 'a want of commercial confidence, which he denies may be caused by an overproduction of commodities' (p. 74).

Mill's defence of Say's Law highlights the importance of the classical quantity theory, which was originally formulated to oppose the undue emphasis given to precious metals as components of national wealth by the mercantilists. Hume noted that labour, not gold, produced the commodities which composed national wealth; that gold was only as good as the labour it commanded to produce output. Thus the classical position that the velocity of circulation of money was independent of its quantity was built on the view that money would only be held to be spent. Money could at best cause temporary general gluts; in the long term, 'rational' men would not choose to hold money rather than spend it.

On the eve of the marginal revolution, classical theory thus admitted the temporary occurrence of general gluts explained by cyclical disproportions in demand for money and commodities due to crises of confidence. It is paradoxical that while the marginal revolution was motivated by the failure of classical theory to give sufficient attention to the role of demand in value theory, it failed to extend its analysis of demand to output as a whole in either the long or the short period. Indeed, the emphasis on individual equilibrium produced by the subjective theory of value which replaced the classical theory, made separate discussion of aggregate supply and demand redundant. Thus Keynes's reference to 'the disappearance of the theory of demand and supply for output as a whole, that is the theory of employment after it has been for a quarter of a century the most discussed thing in economics' (Keynes, 1936c).

But it was discussion, not Say's Law, which disappeared from neoclassical economics. Thus Keynes classed economists from Smith and Ricardo to Marshall and Pigou as 'Classical', for despite antagonistic theories of value and distribution, they all held a similar theory of supply and demand for output as a whole.

Keynes suggests that this was due more to the failure of neoclassical economists to heed Mill's warning concerning the extension of the conditions faced by the individual to the economy as a whole, than to positive analysis. If consumers (producers) maximize utility (profit) subject to an income (cost) constraint, reaching the maximum by substituting in consumption (production) goods (inputs) which were cheaper per unit of utility (output), then excess supply of any good (resource) is due to its price exceeding its marginal utility (productivity). Market competition would lead to relative price adjustments which eliminate excess supply. Since it was impossible for any single good (resource) to be unsold (unemployed), it was natural to extend this analysis to the aggregate level to deny the possibility of general gluts without further analysis.

Any divergence from this position was explained, not by reference to hoarding money due to crises of confidence, but by temporary impediments to the automatic adjustment of relative prices in competitive markets. Thus, despite their new marginal theory of value, Keynes's contemporaries reached a similar result that divergence of employment from its full employment level would be determined by temporary non-persistent causes eliminated in the long run.

From 1921 to 1939 the unemployment rate in the United Kingdom never fell below 10 per cent, peaking in 1932 at 22 per cent (over 2.7 million). This exceeded the limits that most economists attributed to short-period frictions. The self-adjusting nature of the neoclassical version of Say's Law that Keynes chose to criticize was thus contradicted by reference



economic events as well as by Keynes's conception of effective demand.

Keynes was not concerned with impediments to the equality of the supply and demand, but with the

problem of the equilibrium of supply and demand for output as a whole, in short, of effective demand ... When one is trying to discover the volume of output and employment, it must be this point of equilibrium for which one is searching.

While the Classics solved the problem by assuming the identity of savings and expenditure on investment goods, neoclassical theory presumed Say's Law 'without giving the matter the slightest discussion' (1936b, p. 215).

Keynes's theory of effective demand thus had to replace Say's Law. To do this Keynes departed from the Classical position on two points. The first was to assume that wages exceed subsistence so that expenditure on consumption goods does not exhaust factor incomes. As expressed in Keynes's psychological law of consumption, this implied that as output increased, the gap between aggregate expenditure and factor costs increased, so that unless investment expenditure expanded to fill the gap, entrepreneurs would experience losses.

The second departure was from the assumption that rationality dictated that entrepreneurs' savings represented productive investment expenditure. If investment could produce losses, or changes in interest rates change capital values, then greater future enjoyment might be assured by not investing; holding money might be 'rational' in such conditions. Further, in a monetary economy, nothing guarantees that maximization of returns in money will maximize either productive capacity or the demand for labour.

In Keynes's theory the propensity to consume and the multiplier produce the proposition that it is the level of output which adjusts saving to investment, rather than the rate of interest, while the explanation of the decisions over the level of investment in a monetary economy requires an explanation of rates of interest in money terms. The two factors are closely related.

In a 1934 letter to Kahn, Keynes gives a 'precise definition of what is meant by effective demand' (1934a, p. 422). If  $O$  is the level of output,  $W$  the marginal prime cost of production for that output, and  $P$  the expected selling price, 'Then  $OP$  is effective demand'. The classical theory that 'supply creates its own demand' assumes that  $OP$  equals  $OW$ , irrespective of the value of  $O$ , 'so that effective demand is incapable of setting a limit to employment which consequently depends on the relation between marginal product in wage-goods industries and marginal disutility of employment'. Thus, what Keynes later called (1936a, ch. 2) the two 'classical' postulates limit  $O$  at full employment. In contrast,

On my theory  $OW \neq OP$  for all values of  $O$ , and entrepreneurs have to choose a value of  $O$  for which it is equal - otherwise the equality of price and marginal prime cost is infringed. This is the real starting point of everything.

The key point was thus the impact of different levels of  $O$  on the difference between costs and prices, that is on entrepreneurs' profits. Keynes took up this question, in an undated exchange with Sraffa of about the same time (1934b, pp. 157ff). Keynes notes that a non-unitary marginal propensity to consume implies  $OP \neq OW$  for any  $O$ , and generates

the general principle that any expansion of output gluts the market unless there is a *pari passu* increase of investment appropriate to the community's marginal propensity to consume; and any contraction leads to windfall profits to producers unless there is an appropriate *pari passu* contraction of investment.

The level of  $O$  at which  $OP=OW$  will be determined by the level of investment and the propensity to consume. Changes in the rate of investment, based on entrepreneurs' expectations of their future profits, will determine  $O$ .

In an early draft of the *General Theory* Keynes put it this way:

Effective demand is made up of the sum of two factors based respectively on the expectation of what is going to be consumed and on the expectation of what is going to be invested (1973a, p. 439).

Thus the theory of effective demand required, in addition to explanation of consumption based on the propensity to consume, an explanation of variations in the level of investment. Since neoclassical theory resolved this problem by presuming that investment was brought into balance with full employment saving by means of the rate of interest, Keynes located the 'flaw being largely due to the failure of the Classical doctrine to develop a satisfactory theory of the rate of interest' (1934c, p. 489).

Keynes concentrated his efforts to produce a theory of interest compatible within this theory of effective demand within what he called a monetary production economy. The *Treatise on Money* (1930) had explained changes in prices in terms of households' consumption decisions relative to entrepreneurs' production decisions. If these decisions were incompatible, investment diverged from saving and prices of consumption goods adjusted producing windfall profits or losses. The prices of investment goods were determined separately from this process, by means of the interaction of the bearishness of the public reflecting their decisions to hold bank deposits or securities on the one hand, and the monetary policy of the banking system on the other.

Investment goods are held because their present costs or supply prices are lower than the present value of their anticipated future earnings or demand prices; the larger this difference, the higher the expected rate of return. Since any change in the price of a durable capital asset will influence its rate of return, a theory that explains the price of capital assets also explains rates of return (which Keynes called marginal efficiency). With the demand price of an asset based on the value of expected future earnings discounted by the rate of interest, it is clear why a satisfactory theory of interest is crucial to the explanation of effective demand.

But money was a durable asset like any other, and as such it has a spot or demand price and a supply price or forward price, which determine the money rate of interest. Keynes thus transformed his concept of bearishness into liquidity preference which, together with banking policy, would determine the rate of interest. For Keynes, 'the money rate of interest ... is nothing more than the percentage excess of a sum of money contracted for forward delivery ... over what we may call the "spot" or cash price of the sum thus contracted for forward delivery' (1936a, p. 222), it is:

the premium obtainable on current cash over deferred cash ... No one would pay this premium unless the possession of cash served some purpose, that is had some efficiency. Thus we may conveniently say that interest on money measures the marginal efficiency of money measured in terms of itself as a unit (1937a, p. 101).

Since both money and capital assets had marginal efficiencies representing their rates of return, profit-maximizing individuals in a monetary economy would demand money and capital assets in proportions which equated their respective returns. The equilibrium level of output chosen by entrepreneurs would then be represented by equality of the marginal efficiency of capital and the rate of interest (the marginal efficiency of money). The question of the effect of an increase in output on profit raised by a propensity to consume less than unity can now be seen as the effect of an increase in investment on the marginal efficiency of money relative to the marginal efficiencies of capital assets. Since these marginal efficiencies reflect pairs of spot and forward asset prices, the question can also be put as the effect of an increase in investment on relative money prices. Thus Keynes's independent variables, the propensity to consume, the efficiency of capital and liquidity preference, given expectations and monetary policy, interact to determine effective demand.

Since this equilibrium could be described by  $S=I$ , or equality between the rate of interest and the marginal efficiency of capital, the level of output which equates aggregate demand and supply also equates marginal efficiency with the rate of interest. To complete his theory of effective demand, Keynes faced the question first raised by Wicksell of the causal relation between the natural and the money rate of interest. Just as Keynes rejected the determination of the level of  $O$  at which  $OP=OW$  by the equality of the marginal productivity and disutility of labour, he rejected marginal productivity as the determinant of marginal efficiency and the real rate of interest determining the money rate because it was based on 'circular reasoning' (1937b, p. 212).

Keynes argues instead that it is the marginal efficiency of capital assets which adapts to the money rate of interest rather than vice versa. These two points of departure are discussed in chapters 16 and 17 of the *General Theory*, where Keynes points out that the money rate of return to be expected from a capital asset depends on the relation of anticipated money receipts relative to expected money costs, and that there is no reason to believe that these will be related in any predictable way to the asset's physical productivity. Wicksell's natural rate, derived from physical relations of production and exchange, has no application in a monetary economy; Keynes thus substitutes the concept of marginal efficiency.

Keynes also notes that increased investment in particular capital assets increases supply prices and reduces demand prices, causing a decline in marginal efficiencies; an increase in output thus leads to investment in assets with lower rates of return. At some point the marginal efficiency of money will make investment in money as profitable as the purchase of capital assets. At this point the rate of interest equals the marginal efficiency of capital, and any further increase in output would confirm Keynes's 'general principle' that any further expansion in output gluts the market, for increased income is not spent but held in the form of money which becomes a 'generalised sink for purchasing power'.

The question that distinguishes Keynes's theory is thus why money's liquidity premium does not fall as output expands, for this is what prevents investment from rising by just the amount to fill the gap created by the propensity to consume being less than one. To describe these 'essential properties of interest and money', Keynes departs from Mill's position that money is just another commodity. When money is the debt of the banking system its price and quantity behaviour will differ from physical commodities, for it has no real costs of production nor real substitutes. Thus an asset which has a negligible elasticity of production and substitution with respect

to a change in effective demand, will have a rate of return which responds less rapidly to an expansion in demand. As long as the rate of interest falls less rapidly than the marginal efficiencies of capital assets, its rate will be the one which sets the point at which further expansion creates losses.

Thus the propensity to consume shows that investment will have to increase by the amount of the gap between income and expenditures as incomes rise if entrepreneurs are not to make losses, while the marginal efficiency of capital and liquidity preference in a monetary production economy explain why the behaviour of the rate of interest relative to the marginal efficiency of capital makes it unlikely that the rate of investment should adjust by just that amount. Since entrepreneurs maximize monetary returns, not employment or physical output, there is no reason why their investment decisions should lead to an equilibrium at full employment. Keynes's explanation of the limit to the level of employment permits any level as a stable equilibrium, including full employment; it is thus more general than the classical Say's Law position, in which the only stable equilibrium was the limit set by full employment as given in the labour market.

J.A. KREGEL

See also SAY'S LAW.

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**effective protection.** The effective rate of protection is the rate of protection provided to the value added in the production of

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undertaker. See ENTREPRENEUR.

unemployment. Unemployment can be divided into different types according to the reasons for its occurrence. Some types are relatively uncontroversial from a theoretical point of view. For example, there is frictional unemployment which arises when a person is temporarily unemployed between jobs. Similarly, there is structural unemployment when people find their skills are not employable because they have become technologically redundant or there is no demand for them in the particular part of the country where they live. These sorts of unemployment will be discussed later. By comparison, there is an enduring controversy associated with the attempts to unravel what, if any, are the differences between Classical and Keynesian unemployment. It is this controversy and the policy debate that flows from it which occupies most of the immediate discussion.

The macroeconomists' use of the term Classical, and the designation New Classical for contemporary theorists in this tradition, is somewhat idiosyncratic. This is not the economics of Smith, Ricardo and Marx. Indeed, Neoclassical would be a much more appropriate label. The intuition behind their analysis of unemployment comes from the standard apparatus of supply and demand curves: and the conclusion is drawn that if the labour market does not equilibrate, it must be because the price, in this case the real wage, is set at an inappropriate level.

The demand for labour emanates from the profit maximizing decisions of firms. Under competitive conditions, this leads firms to equate the real wage with the marginal physical product of labour. Hence the demand for labour schedule is a direct reflection of the marginal physical product of labour function. With a well-behaved aggregate production function, the marginal physical product of labour will be a decreasing function of the level of employment, and so the demand for labour varies inversely with the real wage. Consequently, if the supply of labour exceeds the demand and there is a problem of unemployment, then the solution lies with a fall in the real wage as this will prime the quantity of labour demanded and close the unemployment gap.

There are two conceptually separate reasons why the real wage may fail to adjust to the competitive equilibrium value as far as the New Classical Macroeconomics is concerned. Firstly, the institutions of the economy may not correspond to those of a competitive economy: information may be costly, there may be traces of monopoly, etc. Within this institutional context, markets are assumed to clear and the associated level

of unemployment is termed the 'natural' rate of unemployment.

The 'natural rate of unemployment'... is the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, costs of gathering information ... and so on (Friedman, 1968, p. 8).

Consequently, one way that unemployment might be tackled is through policies which attempt to lower the 'natural' rate by removing market imperfections. The policy discussion here does not differ significantly from the Classical analysis of what to do about unemployment. These policies will be considered later in more detail when the topics of frictional and structural unemployment are taken up.

By comparison, the second source of an inappropriate real wage is more distinctively New Classical Macroeconomic. The real wage may deviate from its equilibrium value because workers hold incorrect expectations with respect to the rate of inflation. The point here is that workers bargain over the money wage and hence they will settle for a real wage which unintentionally deviates from the equilibrium value whenever inflation is not accurately anticipated. Unanticipated inflation of this sort forces a wedge between unemployment and its 'natural' level. The policy implications of this analysis revolve around the conduct of demand management policies, and can best be appreciated once Keynes's analysis and policy prescriptions have been introduced.

In the *General Theory*, Keynes disputed the Classical analysis of unemployment and the associated policy prescriptions. He distinguished another category of 'involuntary' unemployment that had something to do with inadequate demand in final commodity markets and which could be remedied with the management of demand by fiscal and possibly monetary policy.

Keynes's *General Theory* is a masterful book, but it is sufficiently ambiguous at crucial points to admit several interpretations of this claim. The dominant view, at least until the late 1960s, is sometimes referred to as the neoclassical-synthetic interpretation and focuses on the role of nominal wage inflexibility in the *General Theory*. As the title might suggest, according to this interpretation, once the *General Theory* is stripped of its rhetoric, it turns out that unemployment results from an inflexible money wage which prevents the real wage from adjusting downwards to prime the demand for labour. In other words, hidden amongst the claims to be providing a *General Theory* of which Classical theory is a special case, is a piece of theoretical analysis that looks suspiciously like the Classical and New Classical Macroeconomic diagnosis of unemployment as a problem flowing from an inappropriate real wage.

To appreciate this conjecture, consider what would happen in Keynes's model if money wages were allowed to fall in response to unemployment. Initially, with unchanged final commodity prices, this would lead to a fall in the real wage which would increase employment and the output supplied. But, given the initial level of aggregate demand, this increase in aggregate supply will put downward pressure on final commodity prices. As prices fall aggregate demand starts to increase and aggregate supply begins to shrink back because the real wage is creeping up again. Eventually, the economy equilibrates at a lower real wage with higher output and aggregate demand. It is the initial excessive fall in the real

wage that creates the excess supply which is necessary if final prices are to fall and prime the increase in aggregate demand to sustain a higher equilibrium level of output. The only circumstances in which this adjustment process would lead the economy back to the same level of employment is if aggregate demand is insensitive to changes in the general level of prices. Here, the increase in aggregate supply which put pressure on final commodity prices would only be removed when final commodity prices have fallen in line with the drop of the money wage to restore the original real wage. Since aggregate demand does not increase as prices fall, the only way the market can re-equilibrate here is through supply reverting to its original value and this will happen once prices have fallen sufficiently to recreate the original real wage.

There was some dispute over the possibility of aggregate demand being insensitive to changes in the general level of prices. But, even within Keynes's model of aggregate demand it is difficult to hold the idea of insensitivity, especially once the real balance effect is acknowledged. From this vantage point, though, granted there is not much new theory in Keynes, it is still possible to see merit in Keynes's policy prescription. An increase in aggregate demand may well be an altogether simpler and quicker way of producing the necessary reduction in the real wage by increasing the general level of prices with a constant money wage, rather than waiting on falls in the money wage to do the trick.

However, even this restricted claim for Keynes is disputed by the New Classical Macroeconomics. After the experience of rapid wage and price changes in the 1970s, it is not very plausible to assume the kind of money illusion which is implicit in the neoclassical-synthetic story of constant money wages. Instead, the New Classical Macroeconomics argues that money wages will be set, given a particular expectation of the rate of inflation, to achieve an equilibrium real wage. Consequently, as noted above, the real wage will only deviate from its equilibrium value when there is unanticipated inflation. The twist to the policy argument comes when a particular version of Rational Expectations is introduced to help analyse the circumstances in which there is unanticipated inflation.

The rational agents of New Classical Macroeconomics use available information to generate expectations which do not suffer from systematic errors. Agents in this world will realise it is demand management policies that influence the rate of inflation; and so it is only unanticipated changes in policy which will create unanticipated inflation. But, any systematic policy rule of the sort advocated by Keynes (i.e. expand/contract demand when unemployment is above/below the target unemployment level) cannot remain unanticipated for long. Rational agents will learn the rule through experience and once learnt the effects of the policy become anticipated. When the policy is anticipated in this fashion it no longer affects output and employment because it does not cause unanticipated inflation. This is the famous policy impotence proposition of Sargent and Wallace (1975). The only kind of policy that would affect unemployment in these circumstances is a completely random one, because only a truly random policy cannot be anticipated. However, it is not at all clear what advantages a government could see in pursuing a random demand policy of this sort since it would only generate random perturbations in unemployment about the 'natural' rate. Ironically, the New Classical Macroeconomics might say, it was the inflation produced by Keynesian inspired expansionary demand policies that undermined the money illusion upon which the efficacy of those policies depended.

The neoclassical-synthetic interpretation of Keynes was

always controversial with those like Joan Robinson who had been influential in the development of the *General Theory*. She dubbed it 'bastard Keynesianism'. However, it was not until the late 1960s that an alternative reading of Keynes, sharing many of the insights of Joan Robinson and others from that critical tradition, gained a wide currency. It is perhaps conceding a little too much to the sociology of knowledge to suggest that the success of this reappraisal of Keynes owed much to the fact that it was firmly located in the tradition of neoclassical general equilibrium theory. Nevertheless, whatever its origins and relation to earlier ideas, the reappraisal of Keynes establishes a firm theoretical base for answering the New Classical Macroeconomic argument and restoring a role for Keynesian-type demand management policies.

There are two substantive parts to the reappraisal. Firstly, that Keynes was arguing it is extremely likely an economy will go to work with a non-Walrasian equilibrium price vector. The reasons for this are much more general than the ad hoc suggestion that the money wage is inflexible. They revolve around the congenital problem of all economies located in historical time, the existence of uncertainty. Uncertainty is a keyword in the Robinson approach. But, in neoclassical hands the concept of uncertainty is usually cashed in with the idea that the informational base of the economy is imperfect: there is inadequate information, misinformation, impacted information, asymmetric information, etc. Informational disorders of this sort can then be used to explain the existence of wage stickiness; in the sense not of a constant money wage but of a failure of wages to move to clear the market. It is poor information which prevents agents in the labour market from pursuing the mutually beneficial exchanges which could be realized through setting an equilibrium wage. However, once the point about information problems is recognized, it tends to shift the focus of attention away from the labour market to financial markets because it is intertemporal decisions which are liable to suffer particularly from these informational difficulties. Put it this way: uncertainty is bound to attach with force to those decisions like investment which depend on expectations with respect to a distant future; and this can greatly complicate the business of coordinating savings and investment in financial markets.

Leijonhufvud (1968) and Minsky (1975) provide two accounts in this tradition of how it is the complex intervention of uncertainty which prevents the interest rate from adjusting to equilibrate savings and investment. The failure of financial markets in this regard throws the burden of adjustment on to goods markets, where uncertainty again in the form of initial price stickiness will produce quantity adjustments. This takes the story on to the second part of the reappraisal. Before taking up that part explicitly, it is perhaps worth noting that, aside from the specific role of uncertainty in this account, there is a general point here which any general equilibrium theorist should appreciate. Namely, that in the context of a general equilibrium system it makes no sense to locate the source of market failure in the market in which it happens to occur. In a general equilibrium system, everything depends on everything else that is happening in the economy, and consequently it need not be the agents in the labour market who are responsible for the failure to generate the Walrasian equilibrium price vector. To paraphrase a famous comment by Lerner, the fault may well lie in the market for peanuts.

The second part of the reappraisal suggests Keynes was introducing a new set of dynamics for an economy which trades with such a vector of false prices. A variety of non-Walrasian equilibrium states, where markets do not clear in the accepted sense, can arise from this process of false

trading. In general, the insights of Walrasian equilibrium analysis do not carry over to these other states: and in particular a fall in the real wage may not, but an increase in aggregate demand could, prime employment. The analysis of trading at false prices here turns on a distinction between 'notional' and 'effective' demands and supplies.

Patinkin (1956) is now credited with first making this distinction explicit in the labour market. The 'notional' demand for labour is the old demand for labour which is to be found in the classical model where competitive firms equate the real wage with the marginal physical product of labour. However, this is only the effective demand for labour if firms are able to sell all the output which would be produced at each level of employment. When firms are constrained in final commodity markets by a particular level of demand, then even though the real wage may fall the effective demand for labour need not increase because although it would be notionally profitable to hire more workers and sell more output at the lower wage, the constraint of final demand undercuts this calculation: no more goods can be sold in the market and so it makes no sense to hire additional labour.

Clower (1965) plots the reverse influence of how the constraint workers encounter in the labour market produces a wedge between the notional and effective demands for final commodities. Thereby providing an alternative explanation of why a quantity variable appears in the Keynesian consumption function. Barro and Grossman (1971) put the two together, assume that trades take place on the short side of the market, and derive Keynes's multiplier adjustment process. So when economies trade with a vector of false prices and adjustment occurs with quantities on the short side of the market, the famous deviation amplifying Keynesian dynamics can be derived.

Once the two parts of the reappraisal are put together, it is easy to see how the reappraisal lends support to Keynes's claim to have offered a more general theory, of which Classical economics was a special case. Uncertainty means you typically operate with a vector of false prices, false trading ensues with its deviation-amplifying dynamics until a non-Walrasian equilibrium state is reached, and where this state is characterized by unemployment it may be remedied through expansionary aggregate demand policies. Only in the special case where informational difficulties are not important would the economy operate with the Walrasian equilibrium price vector, with the resulting trades producing a Walrasian equilibrium, thus obviating the need for Keynesian activist demand policies.

The position of the New Classical Macroeconomics and its dispute with Keynesian type policy recommendations also becomes clearer with the benefit of the reappraisal. In effect, the New Classical Macroeconomics has defined away the informational problems which are central to Keynes with the twin assumptions of market clearing prices and rational expectations. Indeed, once information difficulties are introduced in New Classical models in the form of gradual price adjustment, then rational expectations can still be maintained and there is a role for Keynesian-like policies (see Butier, 1980). Equally, if the information difficulties only apply to the formation of rational expectations, say because of non-convergence in the learning process, then even with market clearing prices there remains a place for demand management.

At this stage it may be tempting to declare the rout of Classical and New Classical Macroeconomic analysis of unemployment. After all, it seems impossible to doubt there are significant information problems in the real world. We do not have crystal balls, and learning to remove systematic

errors in expectations is no simple matter when our ignorance affects the data set from which we are trying to discover the true relationships between variables. The point being that expectations influence behaviour and so misinformed expectations produce economic outcomes that deviate from those which would be observed in a rational expectations equilibrium and so there is no guarantee that those outcomes will provide any clue to the rational expectations equilibrium relationship between variables. Furthermore, the New Classical Macroeconomics' random errors explanation of unemployment movements appears to come up against a brute empirical fact, the business cycle: unemployment movements are far from random, they exhibit a strong pattern of serial correlation.

Some caution is in order, however, before the declaration of a Keynesian celebration. Firstly, several ingenious explanations of the business cycle have been mounted within the New Classical Macroeconomic framework. Some revolve around cyclical changes in the 'natural' rate itself, occasioned by intertemporal substitutions of labour for leisure or deviations from the trend growth in the capital stock which take place in response to random variations in demand. Others rationalize persistence when there are random oscillations of demand by introducing inventories which spread the adjustment to a disturbance over several time periods (see Lucas, 1981).

Secondly, there are two non-Walrasian equilibrium states in Barro and Grossman's (1971) model that are characterized by unemployment. One exhibits all the Keynesian properties, the demand for labour is invariant to the real wage and employment can only be increased if aggregate demand rises in final commodity markets. The other has all the classical properties, increasing aggregate demand per se will not help unemployment, what is required is a fall in the real wage. Which non-Walrasian state the economy finds itself in depends on the precise vector of false prices with which the economy has gone to work. So, just because an economy suffers from unemployment, it cannot be presumed that it is Keynesian in origin and will respond to expansionary demand policies. In addition, even if the Keynesian non-Walrasian regime obtains rather than the classical one, the effective demand for labour could still depend in more general models on the real wage. Changes in the real wage could have effects on the level of aggregate demand, via for example redistribution effects; or the fall in the real wage could arise from a depreciation in the exchange rate which alters international demand for domestic goods, thus influencing the effective demand for labour. The direction of influence is, of course, ambiguous and it remains the case that the full Walrasian equilibrium could not be achieved by changes in the real wage alone.

In other words, even if information difficulties are acknowledged and trades occur at false prices, it does not follow that all unemployment deviations from the 'natural' rate can be remedied through Keynesian demand manipulations. Real wage adjustments may be required. In this way, the insights of Classical and New Classical Macroeconomics carry over to a world where there is uncertainty. What has become clear, however, is that Classical and New Classical Macroeconomics do not hold the monopoly on what happens in a world where there is uncertainty: Keynes's theoretical credentials have been restored.

In fact, it could be argued that the recent discussion of Keynes and the New Classical Macroeconomics, rather than proving decisive on one side of the dispute or the other, has revealed a deep underlying consensus on the theory of unemployment. The rational expectations component of the New Classical Macroeconomics, particularly its critique of

arbitrary expectation assumptions, is pushing economic analysis in exactly the same direction as the reappraisal. Even, if it comes at the issue from a slightly different direction, the issue is very definitely information and its processing. In short, there is perhaps a surprising level of agreement that the informational base of an economy is crucial in determining its functioning and the appropriate role for policy. From this position, the disagreement only surfaces over the diagnosis of the degree of imperfection in the informational bases of economies in the real world.

Before concluding the discussion on this aspect of unemployment, it is worth developing briefly the Kaleckian tradition which explicitly draws on Robinson's emphasis on uncertainty arising from economies operating in historical time. Typically, uncertainty and history license a different set of microfoundations in this tradition. This is not the place to elaborate these foundations. But, what is interesting is that they yield surprisingly similar implications for the analysis of unemployment (see Rowthorn, 1980). Unemployment is still influenced by aggregate demand, but it now also regulates class conflict. Both the real wage and profit expectations of workers and firms are affected by the level of unemployment. A 'natural' rate of unemployment now emerges in the same sense that it is the level of unemployment where inflation is anticipated. The only difference, albeit one with important normative implications, is that this rate no longer corresponds to the adjusted Walrasian market clearing value. It is for this reason that the less normatively charged term, NAIRU (the non accelerating inflation rate of unemployment) is often preferred to the title 'natural' to describe this level of unemployment. Indeed, it would be pure serendipity if this level coincided with what would otherwise be called the full employment level of unemployment in the Walrasian world. Instead, it is the level of unemployment where the otherwise conflicting real wage and profit expectations of workers and firms are reconciled. At other levels of unemployment these aspirations are inconsistent and a reconciliation is achieved through unanticipated inflation which frustrates one set of the claims on output. Again, though, how long unemployment can persist at such a non-'natural' level will depend on the degree of price stickiness and the expectation generating mechanisms.

To summarize, there is widespread agreement in macroeconomics that when there are informational inadequacies leading to sticky prices and difficulties forming expectations, unemployment can deviate from its 'natural' level. In such circumstances, there may be a part for Keynesian demand management policies to play in influencing unemployment. Where there is disagreement is over the normative properties of the 'natural' rate and over the likelihood of these information disorders being important in the economies of the real world.

Of course, unemployment can also be influenced by policies directed at the 'natural' rate itself. These are sometimes referred to as supply side policies to distinguish them from the demand manipulations designed to alter unemployment through changing its relation to the 'natural' rate.

Two sorts of unemployment which pop up in both the orthodox market clearing and Kaleckian accounts of the 'natural' rate are frictional and structural unemployment. Search theoretic explanations of frictional unemployment typically isolate the level of unemployment benefits as important in determining the length of search since this affects the calculation of costs versus expected benefits of search. Similarly, any measure which improves the flow of information about job vacancies in the labour market is likely to lower frictional unemployment. In addition, the age and sex

composition of the labour force is probably important. It is a feature of the gender stratification of most economies that women enter and re-enter the labour force more frequently than men and because each re-entry is often accompanied by a period of frictional unemployment, an increase in the share of women in the labour force tends to increase the economy-wide proportion of frictional unemployment. Likewise young people tend to chop and change jobs more often than older people and so an increase in their share raises the overall level of frictional unemployment. It is not obvious how policy can alter the age-sex composition itself, but it could be directed at this aspect of gender stratification.

The geographic dimension of structural unemployment could be ameliorated with encouragements to mobility. The skill aspect depends on whether the evolution of the skills of the labour force keep pace with the changing requirements associated with technological advance. There is a rather obvious role for policy here in the provision of educational, training and re-training facilities.

The extent of monopoly in product and factor markets will also influence the 'natural' rate. From the market clearing perspective trades unions are the obvious market imperfection which produces an equilibrium real wage above the competitive value with a corresponding lower level of employment. By contrast, it is monopoly in product markets which attracts the Kaleckian attention. The degree of monopoly influences the profit expectations of firms positively and consequently produces a direct relationship with the 'natural' rate. The difference here is really only a matter of emphasis: which type of monopoly excites immediate interest. Where the Kaleckians depart decisively in their analysis of the 'natural' rate is on what determines the wage expectations of workers.

For Kaleckians, the wage expectations of workers depend on the historical and social circumstances of the time. This may seem a bit woolly, but it has its uses. For example, it enables a careful politico-historical explanation of the surge in wage militancy which is thought to have occurred in many European countries in the late 1960s. More generally, it locates the distribution of income, which is central to their view of the 'natural' rate, strongly in the political arena and this makes the 'natural' rate susceptible to a range of policies from social contracts, national economic assessments, to incomes policies to industrial policies: in fact, anything that might directly or indirectly bear on questions of distribution.

One of the more intriguing possibilities, which gives a twist to the earlier policy debate, is that the government's demand policies may themselves influence the 'natural' rate. Friedman (1977) acknowledges such a possibility. He argues that the variability of inflation is directly related to the level of inflation. So, more noise enters into price signals at higher rates of inflation, with the result that the 'natural' rate rises with the rate of inflation. This provides the ammunition to extend the argument against Keynesian demand activism into one where steady demand growth is targeted for low rates of inflation.

Tobin (1980) envisages a different connection:

It is hard to resist or refute the suspicion that the operational NAIRU gravitates towards the average rate of unemployment actually experienced. Among the mechanisms which produce that result are improvements in unemployment compensation and other benefits enacted in response to higher unemployment, loss of on-the-job training and employability by the unemployed, defections to the informal and illegal economy, and a slowdown in

capital formation as business firms lower their estimates of needed capacity (p. 60).

If such hysteresis effects are accepted, then an expansionary demand policy which lowers unemployment 'temporarily' below the 'natural' rate will have a permanent influence because it contributes to reducing the 'natural' rate itself. In the most recent world recession, there is no evidence of unemployment compensation changing in this way. There is some evidence that the loss of on-the-job training has contributed to a rise in the numbers structurally unemployed: this effect can be most easily seen in the growth of long term unemployment. And, overall, it is clear in a number of countries that the 'natural' rate has risen during the course of the world recession of the early 1980s. Consequently, there is some basis for accepting this idea of cumulative causation applied to the 'natural' rate itself; and this provides a contrary presumption to that of Friedman in favour of expansionary demand policies.

One way of appreciating this policy implication and summarizing the whole discussion, is through the language of Phillips curves. The original Phillips curve suggested there was a trade-off between inflation and unemployment which could be exploited by governments with their manipulation of aggregate demand. Friedman (1968) interpreted this curve as a short run reflection of the aggregate supply function arising only when inflation was unanticipated: in the long run when inflation is anticipated there is no trade-off, the Phillips curve is vertical and unemployment does not deviate from its 'natural' rate. The New Classical Macroeconomics collapsed the long run here into the short run with the addition of their version of rational expectations. There is no scope for systematic Keynesian demand manipulations to influence unemployment in the short or long run: any systematic manipulation will become anticipated and once anticipated it ceases to have an effect on output and employment.

The reappraisal of Keynes has made clear that the conditions where this conclusion holds are rather special. If an economy suffers from informational problems producing either sticky prices or difficulties with the formation of rational expectations, then the operative Phillips curve is one of the so-called short run versions and there is a role for demand management. Acknowledging hysteresis effects tends to reinforce this conclusion by providing grounds for the belief that the 'long' run of the inflation anticipated Phillips curve is not vertical: rather it too exhibits a trade-off between the 'natural' rate and the fully anticipated rate of inflation. Friedman's (1977) contrary argument that the 'natural' rate rises with the rate of inflation, of course, points policy in the opposite direction.

To conclude, the theoretical and policy debate over unemployment turns on two sets of issues. The first concerns the pervasiveness and influence of uncertainty (or informational problems) as this affects the potential for demand policies to manage the relation between unemployment and the 'natural' rate. Secondly, there are disputes over the determinants of the 'natural' rate and this generates a controversy over the appropriate supply side policies. The two issues are connected. The hysteresis argument links demand policies to the determination of the 'natural' rate. But, more generally, it is the perception of uncertainty as endemic that contributes to the alternative Kaleckian micro foundations which are at the root of the dispute over supply side policies for the 'natural' rate. In short, all macroeconomists might agree with Angelica in Congreve's *Love For Love*, 'Uncertainty and expectation are the joys of life': or at least, they are the joys of macroeconomic theorizing on employment.

SHAUN HARGREAVES-HEAP

See also INVOLUNTARY UNEMPLOYMENT, NATURAL RATE OF UNEMPLOYMENT.

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unemployment benefit. See SOCIAL SECURITY.

unequal exchange. Marxists have long attempted to explain the uneven development of 'productive forces' (labour productivity) and the resulting income differences in the world capitalist economy primarily by means of the 'surplus drain' hypothesis (see Emmanuel, 1972; Andersson, 1976). Adopting Prebisch's division of the world capitalist economy into the 'centre' and 'periphery', Marxists have argued that surplus transfer has restrained the economic development of the periphery and exacerbated its income gap vis-à-vis the centre.

Before Emmanuel's work, the surplus transfer argument consisted of a loose intertwining of Prebisch's thesis over the secular deterioration of the terms of trade in the periphery, Marx's writings on 'the colonial question', and Lenin's theory of imperialism. Although presented inelegantly in terms of Marx's tableaux, Emmanuel introduced a coherent surplus drain theory utilizing Marx's transformation of values into production prices.

Emmanuel (1972) formulated his theory of surplus transfer through unequal exchange by comparing values with Marxian prices of production (see Okishio, 1963, pp. 296-8). Subsequently, Braun (1973) introduced unequal exchange utilizing Sraffa's framework (see Evans's, 1984, critical survey), Bacha (1978) introduced a neoclassical counterpart, and Shaikh (1979) suggested an alternative preserving Marx's theory of value.

Departing from recent reformulations, it is helpful to explain Emmanuel's unequal exchange theory within its original Marxist framework. The value ( $t$ ) of a product is the sum of constant capital ( $c$ ), variable capital ( $v$ ), and surplus value ( $s$ ), whereas its corresponding Marxian production price ( $p$ ) includes the average profit rate ( $r$ ):

$$t = c + v + s \tag{1}$$

$$p = (1 + r)(c + v) \tag{2}$$

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wage flexibility. The importance of wage flexibility arises from the fact that, in a wide range of economic models, there is an inverse relationship between wages and employment. Unemployment is thus associated with wages in excess of the full employment level, and the persistence of unemployment then depends on how quickly wages adjust in the face of unemployment. It is often argued that if wages were very flexible, unemployment would be eliminated quickly and automatically by wage cuts, and that consequently any persistence of unemployment must be ascribed to wage inflexibility.

While wage inflexibility plays a crucial role in explaining unemployment in both Classical and Keynesian models, the mechanism through which it does so is quite different in the two cases. Following Barro and Grossman (1971) and Malinvaud (1977) it is useful to distinguish 'Classical' from 'Keynesian' unemployment. Classical unemployment occurs where the real wage exceeds the marginal product of labour at full employment, so that it is not profitable for firms to employ the whole labour force. It can only be reduced by cuts in real wages which make it profitable for firms to take on more workers at the margin.

Keynesian unemployment is caused by a deficiency of aggregate demand, but in most standard presentations of the Keynesian model aggregate demand is determined, to a greater or lesser extent, in nominal terms so that a cut in money wages, and hence in prices, tends to raise real aggregate demand. Thus it is the inflexibility, or downward rigidity, of money wages which is the crucial assumption in explaining the persistence of unemployment in standard presentations of the Keynesian system. (For a very full documentation of this point see Leijonhufvud, 1968.)

Wage bargaining is generally conducted in money terms, and wage flexibility is thus generally interpreted in terms of the responsiveness of money wage settlements to changes in economic conditions. But the effectiveness of money wage flexibility in reducing unemployment depends on the interaction of wage-setting and price-setting behaviour. As Keynes stressed in the *General Theory* (1936, chs 2 and 19), if a change in money wages leads to an equi-proportionate change in prices, as the standard economic theory of competitive markets might lead one to expect, it will leave the real wage unchanged. Thus, in the Keynesian system, the wage bargain has no direct effect on the real wage. At the other extreme, in their general disequilibrium model, Barro and Grossman (1971) take the price level as fixed. In their model a fall in money wages will reduce real wages but, because there is no fall in prices, there is no stimulus to aggregate demand, and hence a fall in money wages will not help remove Keynesian unemployment.

Price-setting behaviour is important for a second reason. While wage bargains are generally conducted in money terms, it is now generally accepted that what is at issue is the real wage. There is much empirical support for the theoretical proposition that workers do not suffer from 'money illusion'

(especially in countries which have had some experience of inflation), and the money wage claim is best regarded in terms of some desired real wage to be attained in the wage bargain.

The desired outcome of the wage bargain may thus be written

$$w^* = p + q - \alpha_1(u - \bar{u}), \quad \alpha_1 > 0 \quad (1)$$

where all variables are measured in logarithms,  $w^*$  is the desired money wage,  $p$  the price level,  $q$  labour productivity,  $u$  the unemployment rate and  $\bar{u}$  a measure of 'equilibrium' unemployment in a sense to be defined below.

Equation (1) is sufficiently general to be consistent with a number of models of wage determination. Under perfect competition, it describes the equilibrium wage, given the size of the labour force, in which case  $\bar{u}$  represents frictional and voluntary unemployment, determined by search behaviour, work-leisure preferences and the like. In models in which wages are not necessarily set to clear the market, the impact of trade union bargaining power or other non-competitive influences which shift the wage equation can be captured in  $\bar{u}$ .

In general, wages do not adjust instantaneously to the desired level, in part because perceptions, or expectations, of the relevant variables may be slow to adjust (Friedman, 1968) and in part because of rigidities in the adjustment process itself, associated for example with the existence of wage contracts (Fischer, 1977; Taylor, 1980). In a simplified representation, actual wages might be determined according to

$$w = \beta_1 w^* + (1 - \beta_1)w_{-1}, \quad 0 < \beta_1 < 1 \quad (1')$$

where  $w$  is the actual, and  $w_{-1}$  the one period lagged, money wage.

The price equation may be written

$$p^* = w - q - \alpha_2(u - \bar{u}), \quad \alpha_2 > 0 \quad (2)$$

where  $p^*$  is the firm's desired price,  $(w - q)$  is a measure of unit cost and  $\alpha_2$  measures the impact of the level of economic activity on the price mark-up. (The constant term in the equation is suppressed, but changes in, e.g., material prices can be represented by a change in  $q$ .) Equation (2) is consistent with price-setting behaviour by firms operating in competitive or non-competitive markets (with a given degree of monopoly power).

Product prices may not adjust instantaneously due to slow adjustment of perceptions (or expectations), transactions costs

$$p = \beta_2 p^* + (1 - \beta_2)p_{-1}, \quad 0 < \beta_2 < 1. \quad (2')$$



These equations define the adjustment behaviour of wages and prices

$$\Delta w = \frac{\beta_1}{1 - \beta_1} [p + q - w - \alpha_1(u - \bar{u})] \quad (3)$$

$$\Delta p = \frac{\beta_2}{1 - \beta_2} [w - q - p - \alpha_2(u - \bar{u})]. \quad (3')$$

For equilibrium ( $\Delta w = \Delta p = 0$ ) we evidently require

$$\left. \begin{aligned} w &= p + q \\ u &= \bar{u} \end{aligned} \right\} \quad (4)$$

with unemployment at the equilibrium rate and real wages equal to labour productivity.

To examine the response of the system to a change in aggregate demand, we assume for simplicity that nominal aggregate demand ( $m$ ) is determined exogenously and that unemployment responds to real aggregate demand according to

$$u = \bar{u} - \frac{1}{\gamma} (m - p), \quad \gamma > 0 \quad (5)$$

Substituting (5) into (3) and (3') allows the wage-price system to be converted to a representation of the economy in terms of money wages and unemployment.

$$\Delta w = \frac{\beta_1}{1 - \beta_1} [m + q - w + (\gamma - \alpha_1)(u - \bar{u})] \quad (6)$$

$$\begin{aligned} \Delta u &= \frac{\beta_2}{\gamma(1 - \beta_2)} [w - q - m - (\gamma + \alpha_2)(u - \bar{u})] \\ &+ \Delta \bar{u} - \frac{1}{\gamma} \Delta m \end{aligned} \quad (6')$$

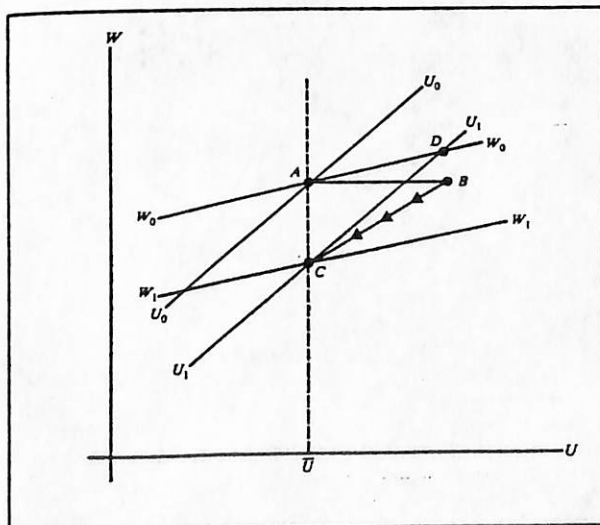


Figure 1 Wage and unemployment dynamics

new equilibrium loci  $w_1, u_1$  relating to the reduced level of nominal demand,  $m_1$ .

The equilibrium of this system is given by equation (4), as before, together with  $m = p$ . Its dynamic behaviour is depicted in Figure 1. The equilibrium loci  $\Delta w = 0$  and  $\Delta u = 0$  are depicted, at some given level of demand  $m_0$ , by the lines  $w_0, u_0$  and  $u_0, u_0$  respectively with the equilibrium of the system at point A. (The  $wu$  locus is drawn upward sloping since empirically one would expect  $\gamma$  to be greater than  $\alpha_1$ .) If demand is now reduced to some lower level ( $m_1$ ) initially, with given wages and prices, unemployment will rise and the system will move to point B. The higher unemployment will cause wages and prices to fall and the economy will move along the path BC, the final equilibrium position C being defined by the intersection of the

The crucial issue is the speed at which the economy progresses along the path BC. This speed is jointly determined by the parameters of equations (6) and (6') and hence on the flexibility of prices ( $\beta_2$ ) as much as of wages ( $\beta_1$ ). The algebraic solution to equations (6) and (6') is standard, and while there is no simple analytical expression for the speed of adjustment it can be confirmed that adjustment is quicker the larger the values of the demand effects on wages and prices ( $\alpha_1$  and  $\alpha_2$ ) and the greater the flexibility of wage and price adjustment ( $\beta_1$  and  $\beta_2$ ).

The response of the economy to a real shock, such as a change in productivity, the terms of trade or the burden of taxation, can be represented by a change in the variable  $q$ . It is clear from equations (6) and (6') that the response of money wages and unemployment to a change in  $q$ , if it enters the two equations symmetrically, will be the same as the response to a demand shock,  $m$ . There has, however, been much discussion in the literature (e.g., Bruno and Sachs, 1985; Grubb, Jackman and Layard, 1983) of the idea that real shocks affect firms' pricing decisions but do not alter desired real wages in the wage bargain. Thus, for example, an adverse productivity or terms-of-trade shock might shift the equilibrium unemployment locus from  $u_0, u_0$  to  $u_1, u_1$  in Figure 1, while leaving the equilibrium wage locus unchanged at  $w_0, w_0$ . The economy would then move to a new equilibrium at point D, with the unemployment rate given by

$$u = \bar{u} - \frac{\Delta q}{\alpha_1 + \alpha_2} \quad (7)$$

where  $\Delta q$  is the change in productivity. It will be noted from the figure that a fall in productivity may in these circumstances raise money wages. The reason is that a fall in  $q$  raises costs and hence prices, and increased prices will tend to raise money wages. Money wages will rise as long as the price effect outweighs the wage-depressing effect of higher unemployment.

The 1970s were characterized by particularly severe adverse supply shocks, in particular the oil price increases of 1973 and 1979 and slowdown of productivity growth throughout the industrialized world. The above analysis suggests that the capacity of an economy to adjust to such shocks will depend above all on the extent to which wage claims are moderated. Empirically there appears much support for the view that the more 'corporatist' the structure of wage bargaining in the economy (i.e., the more centralized the wage bargain) the more quickly are such supply shocks reflected in wage settlements (Bruno and Sachs, 1985, ch. 11). Austria and Sweden are cited

is examples of countries where the wage bargain is struck at the national level, involving centralized unions covering the bulk of the labour force, employers' associations and government. Corporatism is seen as helpful to the rapid assimilation of productivity changes and the like into the wage bargain both because it focuses attention on macroeconomic performance and because it avoids inter-union rivalry. In a decentralized system, individual wage bargainers may know about their individual sector but not about general macroeconomic developments, and may therefore be slow to adjust to macroeconomic shocks. Each group is reluctant to change its own wage if it is uncertain whether others will follow, because of concern over relative wages (Taylor, 1980). Wage flexibility thus suffers from the 'paradox of isolation': each group might like to adjust its wage if it could be sure that similar adjustments would be made throughout the economy, but in a decentralized system there is no coordinating mechanism.

Finally, it may be noted that a rigidity of nominal wage rates, although it raises the unemployment costs of demand deflation, reduces the short-run costs of supply shocks. In Figure 1, the progress of the economy from point A to point D is made slower if money wages are inflexible, the increase in unemployment takes longer to emerge. A supply shock will raise prices and, if money wages are inflexible, the increase in prices will reduce real wages and thereby maintain employment. In this sense, real wage flexibility may be seen as the opposite of nominal wage flexibility (Sachs, 1979). A number of authors (Bruno and Sachs, 1985) have attributed the relatively strong performance of the United States economy since 1973 to a combination of a very high degree of nominal wage inflexibility (resulting in part from long-term wage contracts) and, over much of the period, demand expansionary policies. By contrast, in economies with more flexible money wages, meeting supply contraction by demand expansion would simply add faster inflation to higher unemployment.

RICHARD JACKMAN

See also TRADE CYCLE; WAGES, REAL AND MONEY.

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wage fund doctrine. A central part of classical analysis and closely related to the advances theory of capital, this doctrine lost support in the 1870s because of its association with unacceptable ideas on wages and trade unions. This loss was reinforced by J.S. Mill's authoritative 'recantation'. However, the doctrine was reaffirmed by Jevons and Böhm-Bawerk and survived at a high level of abstraction in neoclassical capital and production theory. This essay starts with the classical statement of J.S. Mill (1848), notices the recantation in 1869, and then looks both backwards to the 18th-century origins of the theory, and forwards to its post-classical developments.

Capital, says Mill, is a stock, previously accumulated, of the products of former labour. Because production takes time between the employment of labour and natural agents and the availability of their product, capital provides the shelter, protection, tools and materials which the work requires, and feeds and otherwise maintains the labourers during the process.

Wages, then, depend mainly upon the demand and supply of labour; or as it is often expressed, on the proportion between population and capital. By population is here meant the number only of the labouring class, or rather of those who work for hire; and by capital only circulating capital, and not even the whole of that, but the part which is expended in the direct purchase of labour. To this, however, must be added all funds which, without forming a part of capital, are paid in exchange of labour, such as the wages of soldiers, domestic servants, and all other unproductive labourers. There is unfortunately no mode of expressing by one familiar term, the aggregate of what has been called the wages-fund of a country: and as the wages of productive labour form nearly the whole of that fund, it is usual to overlook the smaller and less important part, and to say that wages depend on population and capital. It will be convenient to employ this expression, remembering, however, to consider it as elliptical, and not as a literal statement of the entire truth.

With these limitations of the terms, wages not only depend upon the relative amount of capital and population, but cannot, under the rule of competition, be affected by anything else. Wages (meaning, of course, the general rate) cannot rise, but by an increase of the aggregate funds employed in hiring labourers, or a diminution in the number of the competitors for hire; nor fall, except either by a diminution of the funds devoted paying labour, or by an increase in the number of labourers to be paid (Mill [1848], 1965, pp. 337-8).

This statement of the doctrine, agreeing in essentials with the views of Mill's contemporaries, for example, McCulloch and Senior, is followed by the conclusion that high wages require restraints on population growth.

In the recantation contained in his 1869 *Fortnightly Review* article on his friend Thornton's book, *On Labour*, Mill repeats the doctrine (Mill [1869], 1967, pp. 643-4) only to reject it immediately as a 'true representation of the matter of fact'. His grounds are simply that at any time the limit to the fund available to pay wages is not in practice fixed, because it includes 'the aggregate means of the employing classes'. The limit to the rise in wages is set by how much would drive the employer out of business. In the first six editions of his *Principles* Mill had said that if combinations of workmen 'aimed at obtaining actually higher wages than the rate fixed by supply and demand - the rate which distributes the whole circulating capital of the country among the entire working population - this could only be accomplished by keeping a

SELECTED TOPICS IN POLITICAL ECONOMY

MARX, KEYNES AND KALECKI

Economics 210S  
Fall 1993

Prof. Anwar Shaikh

Reading List

I. Persistent Unemployment as a Theoretical Problem

1. Overviews

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- Shaikh, A. 1988. Notes on Goodwin's Model of Accumulation and the Reserve Army of Labor, unpublished.
- [Optional: Goodwin, R. 1986. Swinging Along the Autostrada, in **Competition, Instability and Nonlinear Cycles**, W. Semmler (ed.) New York/Heidelberg]

#### II. Money, Finance, Credit and the Significance of Budget "Restraints"

1. Walras's Law
2. Marx's Treatment of Reproduction
3. The Critical Role of Credit in Keynesian and Kaleckian Theory
4. Budget Restraints and the Labor Market.