The Microfoundations of Macroeconomics: A Critical Survey

By E. ROY WEINTRAUB

Duke University

I did appreciate, although I did not always follow, the oral and written comments on earlier drafts provided by Martin Bronfenbrenner, Robert Clower, Paul Davidson, Neil de Marchi, Miles Fleming, Jan Kregel, Hyman Minsky, and Don Patinkin. To Mark Perlman, and several anonymous referees, I extend my gratitude for exceptionally careful and sensitive editorial guidance.

THERE is little need to justify an interest in general equilibrium theory from the standpoint of resource allocation proper. The analysis, which begins with assumptions about individual behavior and given endowments, leads inexorably to propositions about equilibria, steady states, and efficient choice and thus provides a benchmark for both partial equilibrium analysis and empirical testing. This literature, often mislabelled "Walrasian," is large, is growing, and continues to be taught as the central core of what economists believe can be said about the allocation of scarce goods. Functionally, it does not enable one to assume, or conclude, that the world works like the Walrasian Bourse, but rather it forces economists to turn their attention to their implicit assumptions when they would assert, for instance, that depletable resources can be intertemporally allocated in an efficient manner. "This negative role of the Arrow-Debreu equilibrium I consider almost to be sufficient justification for it, since practical men and illtrained theorists everywhere in the world do not understand what they are claiming . . . when they claim a beneficient and coherent role for the invisible hand" [50, Hahn, 1973, pp. 14–15].

There is another face of general equilibrium theory that is less well-understood, although it has engaged the talents of many able economists. Students are taught (1) choice theory for given quantities of output as microeconomics, (2) aggregate supply and demand analysis to determine the level of output as macroeconomics, and (3) distribution theory, which partakes of both micro and macro as their linkage. It does not take long for students to become aware that general equilibrium theory is an integrative intellectual framework for all three theories. Indeed questions of multimarket interaction must be faced in each sub-discipline, and the formal structure of the inquiry appears the same in microeconomics and macroeconomics: equilibrium, stability, systematic linkages, subsystems, and feedback can be recognized at any level of aggregation.

So viewed, general equilibrium theory is coextensive with the theory of the mi-

crofoundations of macroeconomics. Despite this fact, the term "general equilibrium theory" is frequently used in a very restricted fashion in some macroeconomic studies. It is not my intention here to use the term as a synonym for any subset of "perfect competition," "perfect foresight," "static optimization exercise," "Pareto-optimal world," or "bourgeois capitalist apologetics." In what follows, general equilibrium will *not* be considered as bearing a necessary relationship to theories of Walras; *a general equilibrium model is simply some specification of states of the world and a set of rules that structure the manner in which those states change over time.*

From such a perspective one can speak of a single market model, a multimarket exchange system, and an aggregative Keynesian system as general equilibrium models. So much the better. It is easier to comprehend current research if we deny that general equilibrium theory equals timeless tâtonnements in a barter economy. Models of systematic interaction that attempt to analyze monetary institutions in an intertemporal context have as much claim to general equilibriumness as do models of Robinson Crusoe trading with Friday; their assumptions differ dramatically, but they share a concern for systematic analysis of general interactions.

I stress these points at the outset, not from any special obstinacy but rather from a belief that discussing "microfoundations of macroeconomics" and "general equilibrium" together may induce cognitive dissonances in some economists. "Surely," some argue, "the Arrow-Debreu world is based on a full-employment assumption, and this is *logically* inconsistent with unemployment in macromodels." The validity of this argument, however, ought not to preclude our search for perhaps more sophisticated Arrow-Debreu type systems that are consistent with unemployment. Consequently the reader should be aware of the author's biases on the subject, which can be reduced to the statement that a well-formed macroeconomic theory necessarily deals with production, money, and expectations about the future. Thus, if microeconomic theory provides a logical structure of economic decision-making, attempts to construct rich, flexible, and rigorous general equilibrium models help to provide a vision of the microfoundations of macroeconomics.

This bias does not entail the conclusion that any such general theory yet exists, nor does it require a belief that some day economists will possess a unified perfect theory. Instead it is a methodological caveat, which provides some guidance (at least to the author) on the potential fertility of certain research agendas; it encourages tolerance toward tentative solutions to difficult problems. Our knowledge of macroeconomics is not so secure that prejudgment can be attempted lightly. Economics is not theology, where the articles of faith must be supported to the end of time.

In *Part I,* then, there is a review of the development of "standard" macro-directed general equilibrium theory. Its nature is documented, and the synthesis, produced by Don Patinkin, is scrutinized. As both macroeconomics and general equilibrium theory have developed and become more complex, we shall find that this synthesis has been partially modified. *Part II* surveys some recent work in this area.

Part I: The Past is Prologue

> We have all of us become used to finding ourselves sometimes on the one side of the moon and sometimes on the other, without knowing what route or journey connects them, related, apparently, after the fashion of our waking and our dreaming lives. [66, Keynes, 1936, p. 292.]

Keynes felt that his *General Theory of Employment, Interest, and Money* reunited value theory and monetary theory

(chapter 21); the separate mental compartments of "classical" authors were, to Keynes, a mistake. Asserting a proposition does not make it so, and thus along side of the ofttimes strident Keynes-Classics debate arose an analytical method, general equilibrium theory, which held out some promise of establishing common ground in the controversy.

John R. Hicks's *Value and Capital* resuscitated the Lausanne School of Walras and Pareto, added elements of Wicksell, and, when it appeared in 1939, its author was able to say [56, 1939, p. 1]:

> I believe I have had the good fortune to come upon a method of [economic] analysis which is applicable to a wide variety of economic problems[:] . . . the method . . . is, perhaps, most illuminating when it is applied to the most complex problems (such as those of trade fluctuations).

A bit later Hicks added [56, 1939, p. 4]:

> . . . we shall [with this method] thus be able to see just why it is that Mr. Keynes reaches different results from earlier economists on crucial matters of social policy. . . .

It is not necessary here to review the Keynes-Classics controversy nor to document the early attempts to create some canonical model, which when turned one way yielded Keynes, when another the Classics. In any event, the construction articulated by Hicks was, essentially, carried to fruition by Lange and Patinkin. For Oscar Lange, writing in 1944,

> According to traditional economic doctrine, unemployment is entirely due to rigidity of factor prices. . . . Lord Keynes maintains that, under certain conditions, changes in money wage rates have no effect upon employment but influence only the level of product prices. . . . The diversity of opinion can be distangled only by considering the problem within the framework of the general theory of economic equilibrium. [69, 1944, p. 1.]

For Patinkin, in 1965 (revised from 1956):

> Of necessity, our viewpoint is that of general-equilibrium analysis. For since monetary changes are assumed to affect all markets of the economy, their effects can be fully appreciated only by a simultaneous study of all markets. . . . [86, 1965, p. xxiv.]

The conclusion of his study was stated simply:

> The propositions of the quantity theory of money hold under conditions much less restrictive than those usually considered necessary by its advocates and, *a fortiori*, its critics. Conversely, the propositions of Keynesian monetary theory are much less general than the *General Theory* and later expositions would lead us to believe. [86, 1965, p. xxv.]

For most purposes the hoary Keynes-Classics controversy was laid to rest. Following Hicks's formulation of the Walrasian system, Patinkin had introduced and integrated critical elements from monetary theory—the resulting scheme showed that a great deal of macroeconomic analysis could *in fact* be derived from a well-specified general equilibrium system. To those who had asked for a suitable microfoundation for macroeconomics the answer, "read *Money, Interest, and Prices,*" could be given enthusiastically.

The general equilibrium system used by Patinkin appeared well-established by the early 1960's. After Hicks, Paul Samuelson cleared up numerous ambiguities about properties of equilibrium states of dynamic systems [96, 1947]. In particular, the concept of stability was *formally* isolated, and henceforth study of models could proceed mechanically (albeit artfully) from existence proofs through uniqueness of equilibrium arguments to stability analysis of equilibrium states. With the conceptual underbrush cleared, normal science proceeded apace with rigorous proofs of existence of competitive equilibria provided by Kenneth Arrow and Gerard Debreu [4, 1954]; Lionel W. McKenzie [76, 1959]; David Gale [33, 1955]; Robert Dorfman, Paul Samuelson, and Robert M. Solow [23, 1958]; and others. The mathematical tool (a fixed-point

theorem) used in these proofs was unavailable to Walras and Pareto and, though established at the time Hicks wrote, was certainly unknown to him. In fact, the form in which some economists used the tool, the generalized Brouwer's fixed-point theorem, appeared after *Value and Capital* [64, Shizuo Kakutani, 1941].

Since most macroeconomic exercises involved comparative static propositions, more than existence proofs were needed to provide a general underpinning to macromodels. Samuelson again had lighted the way by showing that stability analysis was logically prior to comparative statics. It was not until the late 1950's however, (post-dating Patinkin's first edition) that this matter was settled in a series of papers by Arrow and Leonard Hurwicz [7, 1958]; Arrow, H. D. Block, and Hurwicz [3, 1959]; Frank H. Hahn [46, 1958]; Takashi Negishi [80, 1958]; McKenzie [76, 1959]; and others.

For stability theory, the major stumbling block was the absence of a *mathematical* method; the utilization by economists of A. Liapunov's indirect method of stability analysis lagged its application to physics and engineering by many years [74, 1907]. (It could, however, be argued that this method was available to *Pareto,* since Liapunov's work appeared in a French translation in 1907!)

In any event, by say 1960 the microfoundations problem appeared, on the surface, to be "settled." There existed a detailed model of a competitive private ownership economy for which a stable equilibrium was known to exist. Patinkin had shown that money could be introduced into that system in a "natural" way respecting the stability of the equilibrium. Upon aggregation of this multimarket system into a macroeconomic model, a number of traditional macroeconomic propositions could be inferred.

There were, however, some anomalies in this synthesis, but to examine their import it will be useful to review several aspects of the Walrasian model used by Patinkin in his static equilibrium analysis. In outline, (1) the system is firmly choice-theoretic, all agents being supposed to make simultaneous (but non-binding) decisions to optimize, taking prices as given; (2) an equilibrium is characterized by agents *not* modifying their decisions, so that the prices taken as parameters for each agent, who optimizes subject to them, are, in equilibrium, precisely those prices that *result* (in the market) from such optimizing behavior; (3) all transactions are, in consequence, co-terminal and subsequent to the decision process. Put briefly, the salient feature of the system is that it is timeless and, since stable, always in equilibrium.

From the way the model is set up, Walras' Law holds at each moment. That is, since the value of purchases equals the value of sales in all n markets, equilibrium in $n-1$ markets entails equilibrium in the nth market. Intuitively, then, a macroeconomic implication of this Walrasian model is that there cannot be disequilibrium in the labor market (unemployment) if goods and financial markets are clearing.

Such arguments led Patinkin to conclude that "restricting ourselves to static equilibrium analysis [means] that *involuntary* unemployment can, *by definition,* exist only if there are wage rigidities" [85, (1948) 1972, p. 30]. Since, however, the corpus of Keynesian analysis was unintelligible, or irrelevant, in a world of wage rigidities, economists had to look beyond the simple static general equilibrium model to explicate the workings of macroeconomic systems: for Patinkin, ". . . the real Keynesian message . . . must be read within a disequilibrium context" [52, Hahn and F. P. R. Brechling, 1965, p. 306].

The situation then, by the end of the 1950's, was not in fact settled but was

rather unsatisfactory. The sophisticated insights of macroeconomic theory could be reconciled with the then currrent general equilibrium analysis only by denying that the Keynesian revolution "mattered." Since Keynes's analysis seemed to require a disequilibrium theory, or a time-intrinsic general equilibrium structure, and since even static general equilibrium analysis was immensely difficult, there was no sound microeconomic system that, when aggregated, yielded Keynesian insights. There was only the negative but useful result that neoclassical value theory was inconsistent with Keynes's *General Theory.* Economists who accepted this set of propositions as definitive jumped to one of two injudicious conclusions: (1) Keynes had not advanced economic "theory" very much at all, since involuntary unemployment was inconsistent with the competitive market model; or (2) neoclassical analysis was sterile, since it was irreconcilable with the fruits of the Keynesian revolution. However, the two decades that have passed since 1957 make both positions somewhat anachronistic, as general equilibrium theory and macroeconomics have progressed and interacted upon each other.

Patinkin's early and exploratory insights into the microeconomic disequilibrium processes at work in the labor market were developed with the now classic paper by Robert W. Clower on "The Keynesian Counterrevolution" [16, 1965]. Focusing on Walras' Law, Clower asked how, in an on-going monetary economy, individuals could know for certain the value that sale of their labor services would bring during the period in which they would contract for purchase of goods and services. This was a critical wedge, for if individuals based their choice decision on expected (not given) income there was always the chance that they could not back up their demands with purchasing power earned by sale of factors services (see Albert G. Hines [59, 1971]).

In particular, if for some reason (loss of business confidence, say) firms cut back purchases of capital goods, the workers who would have produced those goods would lack the means of payment for the consumption goods they had demanded, and the fall-off in consumption expenditures would further exacerbate the decline. To Clower and to Axel Leijonhufvud [70, 1968; 71, 1969] following him, the Keynesian consumption function was a real-time construct, which fed disturbances back to the system in an amplified manner: the multiplier was aptly named. The genesis of the problem of unemployment (see Leijonhufvud [72, 1973]) was thus the failure of decentralized mechanisms to coordinate hiring and purchasing decisions in a monetary economy. (Note that in a barter economy the workers would *always* be in a position to effectively back up their demands for goods with means of payment—they trade their labor services to sellers of consumer goods directly.) For Clower the synthesis via the static general equilibrium model had failed to account for the crucial role that money plays in real economies—the synthesis characterized barter only [17, 1967]. Hahn studied this point from the microeconomic perspecitve [47, 1965]. Examining proofs of the existence of competitive equilibrium in monetized economies, he observed that assumptions used ensured that there was a positive demand for money at all positive values of money —this was tantamount to assuming what one was to prove, and Hahn concluded that the existence of equilibrium in such an economy was still an open issue.

From a more macroeconomic perspective, there was from the late 1950's a growing literature that had at its core the view that Keynes's contribution was essentially non-Keynesian; that is, there was

a logical incompatibility between the standard *IS-LM* realization of Keynes and Keynes's own writings on the interrelationship of money wages, money prices, and monetary institutions. In its most useful form, this argument was developed by Sidney Weintraub [109, 1957; 110, 1958], who attempted to show that income-expenditure models suppressed Keynes's distribution analysis, and by Leijonhufvud [70, 1968], who demonstrated how much of Keynes's monetary theory was cut out of Keynesian economics.

The Phillips curve literature also weakened a number of established truths. The explanations for the presence of trade-offs between wage rate changes and unemployment changes focused detailed attention on the labor market, specifically on market failures; imperfect information and decisions made "out of equilibrium" resulted in a lack of coordination of economic activity strongly reminiscent of the issues initially raised by Clower [88, E. S. Phelps, 1970]. In short, it began to appear that a number of real macroeconomic issues could *not* be phrased in timeless, perfect-information, maintained equilibrium models.

The changing world itself added to the difficulty economists had accepting the amalgam of static Walrasian theory with income-expenditure analysis as *the* micro-macro synthesis. The presence of simultaneous unemployment and inflation created a mood in which economists were more likely to be receptive to a reconsideration of the synthesis. But while the burden of creating new analysis lay more heavily on macroeconomists who found fault with neoclassical (static) value theory, general equilibrium theorists were examining the competitive equilibrium structure and, in the normal course of science, identifying its limitations.

It would be comforting to suggest that mathematical economists had simply begun work on the research program outlined by Patinkin's observation that it is [86, 1965, p. 323]:

> . . . not that involuntary unemployment can be defined away, but that it can have no meaning within the confines of static equilibrium analysis. . . . Thus our first task in studying involuntary unemployment is to free ourselves of the mental habit . . . of seeing only the points *on* the demand or supply curve.

In fact, however, general equilibrium theorists merely had been following the internal logic of the subdiscipline: models were created, criticized, and reformulated in a natural process. These exercises were not of the sort that could be easily popularized; they were not on the order of "the models assume perfect competition, the world isn't that way, thus the models are useless." Rather the models were put through more detailed and rigorous tests.

Problems involving expectations and uncertainty in multimarket models were examined early. Papers by Arrow and Alain C. Enthoven [5, 1956] and Arrow and Marc Nerlove [8, 1958] indicated that the inclusion of expected future prices, and reasonable mechanisms by which expectations could be modified, hardly perturbed the standard results. The individual primarily identified with such "uncertainty" questions, Roy Radner, was able to determine the precise point at which the Arrow-Debreu model would *fail* to provide a mechanism to allocate resources efficiently under uncertainty. He showed that [90, 1968, p. 57]:

> . . . if economic decision makers are uncertain about the environment, and if their information is about the environment, then even if they have different information, a once-and-for-all futures market in conditional contracts can achieve an optimum allocation of resources, relative to the given structure of information.

Put negatively, without a complete set of futures markets, the standard model may not have a competitive equilibrium. Further, if agents are uncertain about other

agents' behavior, so that strategic reasoning intrudes, no equilibrium may exist.

Another line of inquiry was directed to the robustness of the dynamic stability of the equilibrium. A number of authors were able to demonstrate that stability depended on properties of the model, which precluded a rich variety of institutional detail from appearing: the stability-condition that the Jacobian of the excess demand functions with respect to prices have a dominant negative diagonal suggested that little more was explicable by moving from a single market to a multimarket setting [77, McKenzie, 1960].

To be sure, not all work in general equilibrium theory had easy macroeconomic interpretations. More work was done to extend the Arrow-Debreu (see Debreu [19, 1959]) framework to imperfectly competitive markets, to markets with monopoly, to public goods, to externalities than was done with the purpose of linking up microeconomics to macroeconomics.

As evidence for this observation it may be noted that, with the papers by Martin Shubik [101, 1959], Debreu and Herbert Scarf [20, 1963], and Robert J. Aumann [9, 1964], general equilibrium redirected itself away from the Walrasian framework. With the focus on the exchange process, and the "core" as an economic equilibrium concept in a world in which individuals were free to contract and recontract, a new kind of general equilibrium theory began to emerge with a few ties to Walrasian mechanisms. These analyses were primarily directed to a reformulation of general equilibrium analysis: questions about efficient allocations, the role of competition, public goods, *etc.* could be handled naturally in this framework. Applications to macroeconomics with questions about "foundations" and the role of money were not the original reason for the development of the theory.

Before examining the new varieties of general equilibrium analysis that have been shaped by macroeconomic concerns, it may be useful to identify an alternative vision of the microfoundations problem. Specifically, there is an argument, developed most forcefully by economists whom J. A. Kregel [67, 1976] calls "post-Keynesians," that the microfoundations of macroeconomics cannot be formulated in general equilibrium terms. For such economists, macroeconomics deals essentially with aggregate categories; the functional distribution of income and problems of growth are agenda items for explication, and knowledge is not easily gained by econometric forecasting.

From such a perspective there is an implicit denial that theories of individual choice can provide explanations of the historical behavior of macroeconomic aggregates. The post-Keynesians prefer, for example, to let macroeconomics determine the microeconomic pricing mechanism: the long-run relationship between the price level and unit labor costs shapes their view of the microeconomics of price. This survey cannot attempt an evaluation of the post-Keynesian point of view. For such economists who believe that explanations for macroeconomic phenomena must be simple, historical, institutional, and based on the behavior of "representative" agents, general equilibrium analysis in any form simply misses the point. For many post-Keynesians general equilibrium theory is locially inconsistent with their concept of "explanation" (see Joan Robinson [94, 1971] and Paul Davidson [18, 1972]).

It is sometimes suggested that this view had its genesis in Marshall's antipathy to Walras and that Keynes, schooled in Marshallian thought, is best understood in terms of period analysis and "representative" firms (see Leijonhufvud [73, 1974]). Consequently the research agenda adumbrated by the Marshallian approach appears somewhat different from that which

follows from a more self-consciously disaggregated multimarket vision. Emphasis on market experiments leads to explicit sectoral analysis with considerable institutional detail present *ab initio*. This may take the form of attention to the role of finance in monetary theory (see Davidson [18, 1972] and Hyman Minsky [79, 1975]) as it impinges on the firm's decision calculus, it may focus on the institutional barriers to full-portfolio choice on the part of wage earners, or it may examine the role of inventories (see Hicks [57, 1974]) in the dynamic quantity adjustment of the firm. It certainly will pay explicit attention to the way the unknown future is "tamed" in greater or lesser degree by entrepreneurial decisions (see G. L. S. Shackle [99, 1972; 100, 1974]).

A Marshallian approach to the foundations of macroeconomics is not, however, of much help in phrasing questions about either the interrelationships of disaggregated markets or the linkage between questions of optimal allocation of given outputs and the determination of the level of those outputs. Neither is it of much help in suggesting why particular institutional configurations are likely to arise in the first place. Economists' understanding of allocative efficiency has deepened considerably since the 1930's; general equilibrium analysis has facilitated discussion and suggested modification of a number of established "truths" of partial equilibrium theory.

Such observations entail that we require a general equilibrium analysis sufficiently rich and flexible to phrase, and suggest answers to, questions that can also be well-posed using a Marshallian logic. It is to such models that we now turn.

Part II: Current Themes and Issues

> I might have written Walrasian general equilibrium but there is only one general equilibrium, whatever its name. [97, Samuelson, 1967, p. 113.]

In this part attention will be directed to the various ways in which the older general equilibrium theory has been modified to provide a conceptual base for the formulation of macroeconomic concerns. A taxonomic scheme will "place" recent advances.

We shall see two major approaches to the analysis, identified here as Walrasian and Edgeworthian, which depend on whether the theory focuses on interdependent optimization for the former, or exchange (transactions) mechanisms for the latter. A further bifurication will be between Equilibrium and Disequilibrium, or whether the analysis is directed to the possibility of prereconciled choice, or to the attainment of that equilibrium in real time. There are thus four "pigeonholes" in which to place recent work: Walrasian Equilibrium, Walrasian Disequilibrium, Edgeworth Equilibrium, and Edgeworth Disequilibrium, which will be taken up seriatim in the following sections.

Walrasian Equilibrium Models

It may be useful to recall the outlines of the Arrow-Debreu general equilibrium model, since this can be regarded as the starting point for subsequent work.

(1) There is a class of agents, called consumers, who have preferences over different bundles of final goods.

(2) The consumer preferences are sufficiently regular so that preferences can be represented by utility indicators.

(3) Consumers' income comes from sale of factor services and distributed profits of firms.

(4) Members of another class of agents, called firms, have preferences over output configurations, which lead to profits.

(5) Consumers, taking product and factor prices as given, attempt to maximize utility subject to their income constraint.

(6) Firms, taking product and factor prices as given, attempt to maximize profits subject to a technology constraint.

Under a variety of economic restrictions it can be shown that there exists a set of factor prices and product prices such that, if consumers and firms were to simultaneously optimize *at those prices,* the output and purchase of goods that would result entails those same prices. That is, there exists a set of prices (*a competitive equilibrium*) that could logically reconcile the potentially conflicting choices of all the economic agents. (The allocation of goods that corresponds to the competitive equilibrium is called the *competitive allocation.*)

This basic construction is far from concerns about speculative demands for money, real versus nominal interest rates, and flexible versus naive accelerators. Consequently, it becomes important to add on assumptions potentially more germane to macroeconomic issues to see what sorts of conclusions emerge. For example, Patinkin's work cited earlier had as a theme the appropriate sort of manner by which money could be introduced to this system in an essential fashion. His solution was based on the idea that agents derived current services from wealth, and thus real money balances constrained the choices that economic agents made. The resulting competitive equilibrium could then be examined for its comparative static implications, and those implications (like monetary neutrality) were essentially macroeconomic.

But as pointed out in *Part I,* macroeconomic theory requires a much more detailed equilibrium concept to discuss expectations, portfolio choice, and financing investment, for example. Consequently there has developed a literature, based quite securely on the Arrow-Debreu model, which attempts to develop some of these concerns.

The recent treatise by Arrow and Hahn [6, 1971] provides a convenient starting point; early on they introduce the notion of a "temporary equilibrium," which they attribute to Hicks [1939]. (See also Jean-Michel Grandmont [38, 1976].)

Suppose that one has an Arrow-Debreu model *without* a full array of futures markets for the allocations of goods in periods subsequent to the first. Certainly this is a *prima facie* approximation to a production economy in which money would very likely have some role, not just as a means of carrying cash balances forward but as a hedge against uncertainty. In a two period Arrow-Debreu framework one can introduce bonds sold in period one and redeemed in period two, ownership shares in firms (and an equity share market), and price expectations held by both households and firms. Since the second period can be "dragged back" to the first by discounting, "equilibrium occurs only on current markets, [and] the only relevant prices are those for current commodities and bonds" [6, Arrow and Hahn, 1971, p. 146].

This model excludes debts in the initial period, uncertainty (even in the limited sense of different subjective probability distributions of bond prices), and problems of speculation, which arise in a three-period setting.

There is a natural extension to many periods. Radner considered a temporal sequence of markets (sequence economies) such that "no market at any one date is complete in the Arrow-Debreu sense . . ." [91, Radner, 1970, p. 458]. For such models "equilibrium" may involve a sequence of momentary equilibria; as the agents revise their expectations through information the market provides over time, a maintained state might arise, which would also merit the title "equilibrium." Further, one could "investigate the possibility of consistency among the expectations and plans of the various agents," and define equilibrium to mean "a set of prices on the current market, a set of common expectations for the future, and a consistent set of individual plans,

one for each agent, such that, given the current prices and price expectations, each individual agent's plan is optimal for him, subject to the appropriate sequence of budget constraints" [91, Radner, 1970, pp. 458–59].

The concept of sequence economies leads naturally to the investigation, at a micro-level, of some established macro-theory concerns. Specifically, the institutional arrangements under which transactions occur in a real economy are often considered by monetary theorists. If it can be shown that an efficient equilibrium in sequence economies necessitates a money that mediates in exchange and/or serves as a store of value (in an uncertainty context), one will have gone some distance to link monetary theory with allocation theory.

In a series of papers Hahn [49, 1971; 51, 1973], Mordecai Kurz [68, 1974], and David Starrett [105, 1973] examined modifications of the basic sequence economy model to include a transactions technology, which consists of rules about permissible transactions (*e.g.,* costless spot transactions and costly forward transactions). In general, the resulting equilibrium will be inefficient, although certain assets can be introduced that entail efficiency (relative to the cost of the institutions that "run" the asset); such structures go some way to examining, as an economic question, the existence or nonexistence of markets. This was the concern of Jerry R. Green [43, 1973], who further identified particular efficiency-promoting institutions, like the collateral-loan market, which seem *inefficient* in the context of standard Arrow-Debreu models with a sufficient number of futures markets.

Other analyses along parallel lines has been pursued by Grandmont and Yves Younes [41, 1972; 42, 1973]. Looking at the sequence of momentary equilibria in sequence economies, they showed that, permitting only spot transactions, and allowing (fiat) money to be the only store of value, equilibria exist if among other conditions the elasticity of traders' price expectations with regard to current prices is small. Further, the "maintained state" equilibrium cannot exist if money plays no roles as an exchange medium; when it does mediate in the transactions process, the stationary equilibrium will obtain "only if the traders are willing to hold as an asset (in the long run) the existing stock of money" [41, Grandmont and Younes, 1972, p. 356]. They also investigated (and established with this model) the proposition that a stationary market equilibrium is in general inefficient because stationary real cash balances are too low. However, an extension of their analysis, by Grandmont and Guy Laroque, showed that the result was false in the more reasonable case where people live for a finite number of periods and where total population is constant [39, 1973]. Other work along these lines has been done by Grandmont [37, 1971] and Dieter Sonderman [103, 1973]. O. D. Hart showed that the results of general equilibrium theory do not generalize easily when markets for future contracts do not exist and are replaced by various securities markets [54, 1974].

Another series of papers has argued that the content of the Keynesian concept of involuntary unemployment can only be explained in general equilibrium models that emphasize ". . . the intertemporal character of production activities, and thus, the importance of producer's expectations regarding future effective demand in the determination of current wages and employment" [40, Grandmont and Laroque, 1976, p. 54]. These models, which rely on certain markets adjusting by price, and others (like labor) by quantity rationing, have also been considered by Jacques H. Drèze [25, 1975], Jean-Pascal Benassy [12, 1975], and Volker Boehm and P. Lévine [14, 1976]. Although all these works emphasize the peculiar features of the

equilibrium concept, called a Keynesian Equilibrium, Boehm and Lévine note correctly that the "equilibrium concept corresponds to a best response strategy equilibrium of each individual agent, exhibiting a Nash property in desired net trades" [14, 1976, p. 4].

Such an equilibrium, of the noncooperative sort, is quite different from the usual competitive equilibrium, which embodies cooperative inter-agent behavior. This phenomenon led Shubik to reject the Walrasian approach as irrelevent to macroeconomics *because* cooperative equilibria placed information requirements on agents and markets that far exceeded the information processing capacity of that institution-free model [102, 1975].

In a positive vein, then, the Arrow-Debreu model has been extended in a variety of directions to account for the "real" absence (1) of futures markets for commodities (under certainty) and (2) contingent commodities (under uncertainty). The analysis has "fit-together" Arrow-Debreu markets at different dates and examined not only the variety of equilibrium notions that arise naturally (see Michael Allingham [1, 1973]), but also the way these markets are linked through transactions structures, expectations, information requirements, and types of financial assets. This context appears to hold some promise of providing "natural" linkages between the standard theories of resource allocation and those aggregative structures that explicitly analyze the role of, say, financial institutions in a production-time-money world.

More pessimistically, it should also be clear that equilibrium notions are beginning to proliferate, and the simple stories of general competitive analysis must be recast drastically in order to model the concerns of macrotheorists. As Arrow and Hahn [6, 1971, p. 369] note:

> From all this . . . we conclude that the Keynesian revolution cannot be understood if proper account is not taken of the powerful influence exerted by the future and past on the present and by the large modifications that must be introduced . . . if the requisite futures markets are missing. . . . [Keynes] was certainly right in arguing that the theoretical evidence to be adduced from constructions in which these problems did not arise is not relevant.

Walrasian Disequilibrium

Although temporary equilibrium in sequence economies appears to have a dynamic character, it is still a static construction, since the concern is to establish that a particular configuration of state variables (*e.g.*, prices, expectations, *etc.*) would, if present, mediate the possibly conflicting choices of the various agents.

The behavior of a system when it is not in equilibrium is a rather more complicated matter, for, while equilibrium states are few, disequilibrium is the totality of all other states and as such is difficult to characterize. Stability analysis usually begins from an arbitrary state and, given a system dynamic, examines the trajectory or time path of the state variables: if they approach equilibrium the system is stable (in some sense). The standard Walrasian system, with market prices the state variables, can have a wide range of dynamic specifications. Historically, and from the perspective of analytic convenience, the "tâtonnement" mechanism holds pride of place (see Negishi [82, 1962]).

The rule that price in the i^{th} market moves in the direction (and proportional to the magnitude) of excess demand in that market defines equations of motion for market prices in such a manner that equilibrium will be attained provided the exchange (or production) system satisfies various requirements. Specifically, joined with assumptions that assure existence of an equilibrium state, gross substitutability (of excess demand) might be required. The tâtonnement model needs the additional assumptions (1) that no trades be made until equilibrium is achieved and (2)

that an "auctioneer" exists who makes the market by centrally receiving and disseminating the price information.

As noted in *Part I,* dynamic analysis of tâtonnement systems was well-established by 1960, and although the stability proofs represented a logical triumph, theorists began to see that it was an analytic necessity to specify the excess demand functions with extreme narrowness [98, Scarf, 1960]. This is unwelcome because the dynamic adjustment is of prices at a level of markets, and market excess demands cannot thus be based on the behavior of individuals who are in disequilibrium positions. In other words, although most interesting macro-oriented problems are related to the behavior of individual agents faced with disequilibrium problems of expectations, unemployment, speculation, *etc.*, the tâtonnement theory provides no specification of individual adjústments, only market movements.

As a consequence, theorists began to examine the behavior of disaggregated economic units and to specify with some rigor the precise manner in which these agents might adjust to the disequilibrium signals. Although the term "nontâtonnement" is not descriptive, economists began investigating alternative mechanisms that did not, for example, preclude trade-out-of-equilibrium. The literature that developed with papers by Negishi [81, 1962] and Hahn and Negishi [53, 1962] identified what has come to be called the Hahn-process: an exchange model that permits trading at all prices subject to the proviso "that two individuals exchange if and only if neither suffers a utility loss by so doing and one gains" [48, Hahn, 1970, p. 2].

The tâtonnement process precludes trade-out-of-equilibrium because income effects (distribution shifts) are present if one permits trading; such effects must be removed to insure stability. For the Hahn process, however, it is production that causes the trouble, since firms that profit-maximize at disequilibrium price ratios will not in general be increasing their utility through exchange over the price trajectory. "If we were further to allow for the embodiment of production decisions in some durable concrete objects, the path of the system will at any time be strewn with the remnants of past mistakes . . ." [48, Hahn, 1970, p. 3].

Assuming the Clower distinction that in a monetary economy *only* money can purchase goods, it is clear that the element of speculation may prevent steady increase of achieved utility via the trading process,

> For if a household is constrained to use a medium of exchange, it may be willing to exchange one good for money on the supposition that the money so acquired will be used in exchange for some other good. But should the second leg of the transaction fail to materialize, . . . [a] speculative element is introduced. . . . [48, Hahn, 1970, p. 3.]

Such analysis suggests that neither simple tâtonnement processes nor any utility-increasing process alone can provide a link to theories of aggregative behavior in which production takes time and money serves to link the past and present with the future. Indeed, Arrow and Hahn [6, 1971, p. 347] observed that perhaps

> . . . Keynes was more concerned with demonstrating a 'failure' of the price [adjustment] mechanism than [with] arguing that there exist no prices that make equilibrium possible. Considering the amount of attention he gave to matters such as expectations and speculation, this is a very plausible interpretation.

It is important to recognize the emergent problem: does the non-tâtonnement analysis suggest that economists will eventually find it possible to tell a satisfactory adjustment story, or does it merely illustrate the futility of continuing to work with tâtonnement models in a micro-foundations context? Notice that even the non-tâtonnement approach precludes a variety of detail that is necessary to discuss

monetized production economies and the possible ways decentralized markets can fail to coordinate economic activity. Consequently, one problem that has been brought into sharp focus in recent years has been the "auctioneer" construct itself, for it serves to coordinate behavior for both the tâtonnement and Hahn processes. Without the auctioneer, "we are faced with the necessity of specifying precisely the forces which shape the producers' demand for goods, and in particular how this demand reacts to these signs" [48, Hahn, 1970, p. 11].

What can replace the auctioneer? How do prices change in real markets? These questions are seen to be critical for specifying a general equilibrium model that can contribute to the formulation of macroeconomic issues. We may notice that these questions also arose in a partial equilibrium setting in the foundations-of-the-Phillips-Curve literature (see Phelps [88, 1970]) where it was necessary to specify mechanisms of wage changes in a more realistic fashion than could be provided by a labor market tâtonnement-*cum*-auctioneer. Recent work on price adjustment without the auctioneer thus has two parents: Hahn processes with the Clower view of actual *vs.* notional constraints and the information-search models of labor market behavior. Since a number of issues related to this latter theme have been admirably surveyed by Michael Rothschild [95, 1973], it will suffice to sketch some recent developments in the multimarket framework.

The economist primarily responsible for this redirection is Franklin M. Fisher. Beginning with a "preliminary paper" in 1970, he has worked with a variety of assumptions about how consumers and producers "searched" the market and "reset" their bids and offers in response to market prices that prevailed at the time they received information [31, 1972; 32, 1973]. Questions about "buy-now-versus-look-somemore," revision of expectations, informational efficiency and decentralization, and the role of money play a crucial role. More explicit treatment of the uncertainty theme in such analysis was presented by Peter A. Diamond [21, 1971] and, later, J. D. Hey [55, 1974]. A somewhat more complete characterization of the decisions facing the firm was presented by Katsuhito Iwai [62, 1974] in the context of monopolistic competition, building on Robert J. Barro's analysis of a monopolistic firm's price adjustment [10, 1972]. A short note by Herschel I. Grossman [45, 1969] identified the blend of Hahn-Clower-Patinkin that characterizes such an approach to the microfoundations problem, while Barro and Grossman [11, 1971] have examined these issues from an explicitly macroeconomic perspective, focusing on implications of the adjustment processes for such phenomena as the multiplier, accelerator, and unemployment. This work links up with aggregative analysis derived from Patinkin.

Interplay between individual and market forces places a burden on the mathematics used to model the adjustment dynamics. There are difficulties, for example, with using continuous market excess demand functions in either tâtonnement or nontâtonnement mechanisms if those functions result from the partial adjustment behavior of all the individual agents. The mathematics of such models is extremely delicate and may not be able to support the kind of interrelated individual-*cum*-market theory of adjustment, which emerges from the Walrasian approach. Further, there is a little that is known about such systems (see P. Champseur, J. Drèze, and C. Henry [15, 1974]).

In his 1975 survey of monetary theory, Stanley Fischer commented on these developments saying [29, 1975, p. 161]:

> While disequilibrium analysis has succeeded in presenting models in which many Keynesian notions—particularly that of effective demand

—are clarified, it remains to be seen whether the same analytical structure will prove useful when applied to situations in which price determination is endogeneous.

It is easy to agree with this call for methodological caution. It is not so easy, however, to continue telling macroeconomic stories that rely on a theory of general equilibrium dynamics abandoned over a decade ago by most serious investigators. The tâtonnement cannot be considered a harmless "as if" assumption if it is *logically* inconsistent with other assumptions in the models we use.

Edgeworth Equilibrium Models

The last decade has seen a reformulation of general equilibrium theory in which "markets" are pushed into the background as the act of individual exchange is brought into sharp focus. This game-theoretic approach to microeconomics, whose progenitor was Edgeworth not Walras, is likewise important for the light it sheds on microfoundations problems. Although less well-developed than the Walrasian approach, it too formulates at the microeconomic level a number of intrinsically macroeconomic issues. To see this, however, it is necessary to develop some of the preliminary conceptual framework.

The development, and rudiments, of the Edgeworth approach to market analysis are presented by Arrow and Hahn [6, 1971], although less rigorous surveys of the theory can be found in Vivian C. Walsh [106, 1970] and E. R. Weintraub [107, 1974; 108, 1975]. In outline, one begins with preferences over goods bundles by individual traders and the idea of "domination": a bundle x dominates a bundle y if for some coalition (subset) of traders, all prefer x to y. An *allocation* is a bundle of goods that a coalition can realize, by themselves, by redistribution. The *core* is the set of all allocations ("feasible" bundles) that are undominated by any coalition.

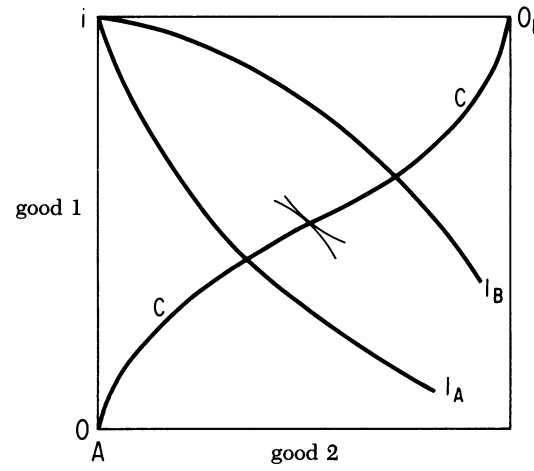

Figure 1

For those unfamilar with these terms, it may be advantageous to recall the two-person, two-commodity exchange problem represented by an Edgeworth-Bowley box diagram. If we locate the initial endowment point at the northwest corner as in *Figure* 1, with origins for traders A and B at O_A and O_B, then we measure good 1 vertically and good 2 horizontally. The indifference curves for A and B, which pass through the initial endowment i, are labelled I_A and I_B, and the tangencies between the indifference maps trace out the contract curve, C. First, note that every point in the box diagram is an allocation, since all are attainable by redistributions. Second, note that the curve C is the set of Pareto-efficient allocations. Finally, it should be clear that the portion of C which does not lie below I_A or above I_B is the core, since it consists of those allocations that no coalition (the coalitions are A, B, and (A,B)) finds more desirable (and can, in fact, effect).

Using this language it is clear that (1) the core is a subset of the set of Pareto-efficient allocations; (2) the allocation that gives equal utility share to A and B is in

the core; and (3) for any price system, the competitive allocation with respect to those prices is contained in the core. It should also be clear that with more commodities the same results are true. Further, it turns out that with more traders, similar arguments are valid. But such a model, with n traders and m commodities, is in reality a general equilibrium system.

In this context of multi-trader multi-commodity exchange, the general equilibrium problem is isomorphic with an interesting type of N-person game, dubbed by Shubik [101, 1959] "the Edgeworth market game," and hence a number of game-theoretic propositions may be applied to exchange analysis. The two main results of this theory are that (1) "equal" allocations are always in core, and (2) as the number of traders increases, the core shrinks. Since the competitive allocation is in the core (for any number of traders), it can be shown (see Debreu and Scarf [20, 1963] and Werner Hildenbrand [58, 1970]) that in the limit as the number of traders increases, the core converges to the competitive equilibrium. Alternatively, beginning with a continuum (uncountably infinite set) of traders, core allocations and competitive equilibria coincide [9, Aumann, 1964]. (A continuum is best thought of as corresponding to all points, say, between 0 and 1. There are of course more of these than there are positive integers: although they are both infinite numbers, the former is intrinsically bigger. Consequently each such point has, truly, no "size" relative to the totality of all the others, and this may be taken to model the influence of a single competitor in a competitive market.)

Since the Edgeworth model replicates the Walrasian exchange equilibrium, it is an obviously useful tool for analyzing resource allocation questions. It provides, first, an approach to efficiency that does not require agents to "take price as given," but instead permits them to decide, given their preferences for goods, to engage in mutually beneficial transactions. Further, it suggests that the freedom to contract (and recontract) is the essence of competition, since it is just such a mechanism that results in core allocations which, for many individually insignificant traders, is the competitive equilibrium.

Such advantages are only incidentally our concern here. Even if it is granted that Edgeworth systems are comparable to Walrasian systems in a general equilibrium of barter sense, in what way can they be considered to provide a foundation for macroeconomic theorizing?

Firstly, macroeconomics has not been a part of the research agenda for most "core" theorists. Their program has been primarily one of generalization and extension of the exchange model to economies permitting production, public goods, externalities, monopoly, and oligopoly (see Volker Boehm [13, 1974] and Sonderman [104, 1974]). In short, work has concentrated on basic microeconomics: the analysis has tended to show satisfying unities in the deep structure of economic theory (*e.g.*, Arrow's Impossibility Theorem, external diseconomies, and public goods problems can all be linked to the failure of some structurally similar games to possess a core (see William H. Riker and Peter C. Ordeshook [93, 1973] and Robert Wilson [114, 1972]). Since core allocations are produced by the Invisible Hand, their nonexistence and "market failures" are inextricably linked.

It is to the area of model selection, and model structure, that we must turn in order to assay the usefulness of Edgeworth equilibrium models of the desiderata of macroeconomics. We must be careful, here, to keep statics and dynamics separate. The core is an equilibrium concept, since it is an allocation that, once reached, will not be modified; any modification requires a trading coalition to form and improve the given allocation. The core thus seems to embody a process dynamic, the

costless recontracting mechanism run either by a benevolent auctioneer or a diety who forms trading coalitions. *There is not, however, any notion of time involved in this process;* it is not even the economic quick-time of a Walrasian tâtonnement, since there is no explicit market experiment being performed.

How the core allocation is achieved is secondary (in a research agenda sense) to the assumptions that insure its existence, and it is here that we may see some fragments of the foundations puzzle beginning to be assembled in a coherent manner. The question of what is needed to construct the recontract argument in the Edgeworth system has been admirably surveyed by Jerry R. Green [44, 1974], who showed that one could "realize" the process as a series of trading proposals and counterproposals; necessary for this construction is some assumption about the information exchange between "potential" members of coalitions, and with this present the core can be attained. In terms of our earlier discussions the role of information in the marketplace is crucial to the existence of core solutions. The analogy to Clower's distinction between what is expected as income, and what is received, should be clear.

Alan M. Feldman [28, 1974] has elaborated on this problem; he showed that the crucial role of information is to preclude outcomes that are inefficient given the resources *potentially* available to the traders. The unrestricted process by which *one* potential coalition improves its position does not necessarily lead, in the limit, to an unimprovable allocation. In macroeconomic terms, the existence of resources being used inefficiently (unemployment) may not generate attempts, in a decentralized economy, to make more efficient use of those resources. With costly recontracting, it is logically possible for the economy to get "stuck" at an allocation that is not in the core.

Since the core provides, for many models, an alternative characterization of the competitive equilibrium, assumptions that guarantee existence of a core simultaneously establish equilibrium in the related Walrasian system. Put negatively, factors that inhibit coalition formation and cooperative inter-agent behavior may preclude the existence of a core; consequently the related Walrasian system might not exhibit coherent and coordinated outcomes. To the extent that macroeconomics is concerned with coordination failures [72, Leijonhufvud, 1973], there is value in the study of microeconomic systems that direct attention to behaviors and institutions that may produce those failures.

Studying the manner in which the Walrasian system might fail to produce coherent market outcomes provides few clues to the individual behaviors that generate the difficulties, since the Walrasian structure coordinates activity at the level of markets. The Edgeworth structure, however, gives prominence to inter-agent behavior; problems involving imperfect information, uncertainty, unrealized expectations, and transactions constraints can be posed naturally in the model. Further, since it is this set of problems that restrict coalition behavior (and can entail the non-existence of core allocations), coordination failures can be linked directly to Keynesian concerns about uncertainty and expectations.

Edgeworth Disequilibrium Models

There is an analogue, for Edgeworth models, to disequilibrium analysis in Walrasian models. Instead of examining the market price adjustment mechanism, one could examine the patterns of exchange that individual traders create and face when required to complete transactions out of equilibrium. If the Walrasian framework is a model of how the institutions of a competitive market serve to organize

and stabilize economic activity, the Edgeworth system, which abstracts from the price mechanism, may appear as neoinstitutionalism.

There are two distinct themes to this literature: (1) it can be directed at problems of coordination, of resource allocation proper, in systems without competitive markets or (2) it can be directed toward problems of monetary theory in the sense that it can pose conundrums about the role of money in a dynamic exchange setting. Of course both themes come together for a neoclassical theory in which money mitigates barter inefficiency.

The modeling of auctioneerless non-Walrasian systems has been critically surveyed by Hurwicz, who suggested that "[t]he new mechanisms [for resource allocation] are somewhat like synthetic chemicals; even if not usable for practial purposes, they can be studied in a pure form and so contribute to our understanding of the difficulties and potentialities of design" [60, 1973, p. 27].

An extensive analysis of one family of such processes was presented by Hurwicz, Radner, and Stanley Reiter [61, 1975]. They considered a decentralized mechanism, called a *B* (bidding) process, which required traders to meet, evaluate information, bid, and trade in an iterative fashion. They note [61, 1975, p. 189] that

> at equilibrium in the *B*-process there may be different proposals [for trade] still coming in, but these proposals cannot overcome the standing agreements. . . . [Processes,] like the *B* process, continue searching for a "better" solution indefinitely, but when in equilibrium keep "printing out" the answer already found.

A comparable mechanism was called by Feldman [27, 1973] a "Random Paretian Reallocative Process": at each iteration a trader selects randomly from the set of Pareto-superior trades. Feldman showed that very weak assumptions about traders' preferences insured convergence to Pareto-allocations with probability one and hence ". . . a random sequence of Pareto moves which does *not* carry an economy to an efficient allocation is indeed perverse" [27, 1973].

A similar reallocative process, based more explicitly on the "core" interpretation of Edgeworth, was studied by Daniel A. Graham and E. R. Weintraub [36, 1975]. Permitting coalitions to form and trade at Pareto inefficient allocations led to a Pareto efficient outcome again with probability one; however, the assumptions of costless information entered at a critical juncture, for information and coalition formation are really twin concepts. The role of fixed transactions costs can also be highlighted with such Edgeworth processes [34, Graham, Jacobson, and Weintraub, 1972].

Models in which one can study transactions chains leading to Pareto-allocations are well-suited to the study of barter inefficiency. In particular, both Trout Rader [89, 1968] and Feldman [26, 1973] have examined special situations in which the transactions chain could be "realized" by bilateral exchange. The question itself is of some importance, for if a Pareto allocation could arise only in a sequence of large coalitions (or trading groups), and coalition formation was costly in proportion to coalition size, then efficient allocations would be unlikely without some institutional contrivance.

To establish efficient outcomes of bilateral trading processes, Rader required a broker who dealt in all commodities, while Feldman assumed the existence of a "partial" money, a good desired and possessed in positive quantities by all traders. These results have been given an interesting twist by Paul J. Madden [75, 1975] and Graham *et al.* [35, 1976]. Madden showed that, without a broker but with preferences coarser than assumed by Feldman, efficient allocations would arise even if coalitions were restricted to size $m =$ the

number of commodities, while Graham *et al.* established that without any continuity of preferences, broker, or partial money, only coalitions of size m or less need be used in a sequence that realized the Pareto allocation. The implication of this, of course, is that the information requirements for decentralized trading might be quite weak; one may have less of a *prima facie* case for explaining the use of money by exchange mediation only, although it should be noted that such sequences necessarily preclude speculative behavior whereby a coalition might form to achieve a Pareto inferior allocation in the hope of achieving a Pareto "very" superior allocation on the next iteration. It is plausible that money would play an important role in forcing such sequences to efficient outcomes.

Related work, more from the monetary theory perspective, has been done by Joseph M. Ostroy [83, 1973], and Ostroy and Ross M. Starr [84, 1974]. In the former paper, a sequence of bilateral exchanges may lead to outcomes inefficient when compared to outcomes that would arise from the introduction of money into the process; monetization facilitates the traders' desire to arrange (by allowing unbalanced budgets in some iterations) efficient sequences, which terminate more quickly than they would have in the barter case. This is strongly reminiscent of Clower's hypothesis, of course. Using a similar framework, Ostroy and Starr further suggest that "the function of a common medium of exchange is to allow decentralization of the trading process" [84, 1974, p. 1094].

A Concluding Note

Stanley Fischer noted, in his 1975 survey involving monetary disequilibrium analysis, that [29, 1975, p. 159]:

> This work is obviously both difficult and only a beginning. It is not clear where, if anywhere, it will lead. It will no doubt provide more convincing and carefully worked out explanations for the use of a medium of exchange than we now have, but it appears that those explanations will not be fundamentally different from the traditional verbal explanations, and that they will not have any major consequences for the way in which macromodels are built.

Such an assessment of the work surveyed in the preceding pages seems unduly pessimistic. At a minimum, general equilibrium theorists have demonstrated quite convincingly that Keynesian macroeconomics cannot be derived from any simple Walrasian microsystem. This in itself is of some consequence. It is difficult, today, for serious macrotheorists to argue against income policies on the grounds that they distort the price signals that enable a (Walrasian) multimarket system to function efficiently. That is not to say that incomes policies are "good things," but rather that they cannot be assessed from a Walrasian perspective, since a Walrasian equilibrium model generates uninteresting macrosystems.

The more important lessons are probably methodological. As Edward O. Wilson [113, 1975, p. 28] remarked, in another discipline:

> In sociobiology, it is still considered respectable to use what might be called the advocacy method of developing science. Author X proposes a hypothesis to account for a certain phenomenon, selecting and arranging his evidence in the most persuasive manner possible. Author Y then rebuts X in part or in whole. . . . [A]uthor Z appears as an *amicus curiae* . . . and so forth seriatim through many journals and over years of time. Often the advocacy method muddles through to the answer. But at its worst it leads to "schools" of thought that encapsulate logic for a full generation.

Matters are not quite so grim in economics, where postulational-deductive model building is well-established. The danger that Wilson notes, however, will be present for macroeconomics to the extent that the general equilibrium microfoundations of the subject are ignored.

The preceeding pages have suggested that the question of *appropriate* microeconomic foundations for macroeconomic theory is still an open one. General equilibrium analysis has, for a number of years now, gone far beyond Walrasian typologies to a consideration of many issues, like transactions structures, information costs, speculation, imperfect adjustment, and search behavior, which are nearer to traditional macroeconomic concerns. There should be little argument about the proposition that some sort of revivified, reconstituted general equilibrium theory is the only logically possible general link between microeconomics and macroeconomics. Those who argue that the analysis at present prejudges the issue fail to appreciate the variety of modern general equilibrium theory. Those who argue that the current theory is unrealistic fail to appreciate the attention being paid to real adjustment processes in real time. And yet the subject, being so current, is not susceptible to neat packages of integrated results. Although one may guess that eclecticism will be the rule in the near future, it is apparent that many issues are being faced. If answers are emerging only slowly, it is because the problems are difficult and not because general equilibrium theorists have failed to ask hard questions.

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