THE MACROFOUNDATIONS OF MICRO

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In the opening chapter of his pathbreaking textbook, Paul Samuelson reproduced a picture from N. R. Hanson's *Patterns of Discovery* [1961].[1] From one perspective, it looked like a picture of antelopes; from another perspective, it looked like a picture of birds. The point of the example was that the same reality can look fundamentally different depending on one's perspective and that revolutions in a discipline occur through these changes in perspective.

Perspective is fundamental to understanding theories, because, ultimately, any theory is built on a vision — a way of putting reality together. That vision guides one in choosing assumptions and in interpreting results. Vision allows one to make the leap of faith necessary to believe that one's "theory" is more than a jumble of meaningless tautological equations. It was Keynes's vision that made Keynesian economics "spread like a disease among South Sea Islanders" [Samuelson, 1964], and it was Lucas's vision that made New Classical economics spread like the flu virus in a university. (In both cases economists over fifty were immune.)

This paper argues that such a change in perspective is currently underway in macro and that the new emerging perspective can be called a "macrofoundations of micro" perspective. This new perspective changes the nature of the macroeconomic debate and provides a theoretical foundation for a Keynesian macroeconomic revival, in which the Classical model is seen as a special case of the more general Keynesian model, rather than the way things are currently — the Keynesian model being seen as a special case of the Classical model, in which nominal wage inflexibility is assumed.

This perspective is arrived at by carrying Lucas's critique of macro models to its logical conclusion. Not only does policy change the structural characteristics of the model, so do individuals' expectations; without making *ad hoc* assumptions, it is impossible to distinguish structural and non-structural changes.

The first Keynesian revolution set off by the publication of *The General Theory* initially involved such a change in perspective, and it is not surprising that Samuelson's book, which translated the Keynesian revolution into a textbook model that students could follow, should have included the bird/antelope picture. The change in perspective that the first Keynesian revolution brought about completely separated macro from micro. They were different approaches: macroeconomics looked at the aggregate economy from one perspective, micro from another. The new macro perspective allowed one to talk about interrelationships among aggregates without specifying the underlying individual choice theoretic framework, while the micro perspective retained the traditional individual choice theoretic perspective in which individuals maximized utility over the entire set of choices.[2]

THE NEOKEYNESIAN EVOLUTION AND THE MICROFOUNDATIONS OF MACRO

This dual perspective was problematic, since most individuals agreed that micro and macro are related and should be unified. Much work in what came to be called neoKeynesian economics involved relating the macro analysis to microeconomic choice theoretic notions. That work began a shift in perspective away from a macro- and toward a micro-perspective, a shift in perspective that would ultimately lead to the New Classical revolution. The reason is that the neoKeynesian integration of micro and macro was done from a micro perspective. As the work became known, a slow and subtle change from a macro- to a micro-perspective took place in researchers' minds. The evolving neoKeynesian perspective differed from the old Keynesian perspective, and as the evolution proceeded, those antelopes kept looking more and more like birds.

The neoKeynesian work was not the only work being done that focused on microfoundations. As the neoKeynesian developments were occurring, simultaneously much work in micro was relating individual choice to aggregate general equilibrium results over infinite horizons. These two sets of work started to come together in the late 1960s and early 1970s as the microfoundations-of-macro literature developed. That microfoundations-of-macro work attempted to connect macro results with microfoundations directly, in a much more fundamental way than previous neoKeynesian attempts. The basic premise of the microfoundations-of-macro literature was that if an aggregate model were to assume any individual behavior, such as is implied by wage or price inflexibility, that behavior had to come out of a microeconomic choice theoretic framework. This work extended the shift in perspective that the neoKeynesian evolution had begun; the picture was looking more like birds all the time. All those old Keynesians who insisted that they kept seeing antelopes were having illusions (money or otherwise).

This microfoundations-of-macro work was soon incorporated with work on rational expectations that originated with Muth [1961], but that did not become well known until it was picked up by Robert Lucas [1972] and other New Classical macroeconomists. What New Classical macroeconomics did was to bring macro expectations into the microeconomic choice theoretic framework and complete the change in perspective. In a New Classical perspective there was no question that the picture was one of birds. From an analytic viewpoint, the result was impressive because the rational expectations assumption allowed a broader integration of microeconomic individual choice theory with macro than had hitherto existed.

That combination was fruitful in the sense that it generated significant research by both Classicals and Keynesians. New Classicals, such as Robert Lucas [1975] and Thomas Sargent and Neil Wallace [1976] showed that, assuming competitive markets and a unique equilibrium, the macroeconomic problem disappeared when individuals had rational expectations.

This New Classical work led to Keynesian responses that offered a number of justifications for the Keynesian approach. Elsewhere, I have divided those responses into two categories: New Keynesian and New neoKeynesian [Colander, 1992a; 1992b]. The New neoKeynesian response, which includes the work of economists such as Gregory Mankiw and David Romer [1990], took a micro perspective and attempted to explain why individuals would rationally choose to override the Walrasian market. This New neoKeynesian work showed that with fixed money contracts, menu costs, or various types of imperfect information, Keynesian results could be coaxed out of the traditional microeconomic choice theoretic foundations.

This was not an easy thing to do; since this work was using a micro perspective, it was the equivalent of convincing people that Classical birds were really Keynesian antelopes, even though they looked, felt, and chirped like birds. If the people you were convincing were nearsighted enough, and wanted to believe, they could be convinced, but, from a micro perspective, with clear eyesight, a New neoKeynesian antelope looks like what it is, a Classical bird in antelope clothing.

A key element of this New neoKeynesian work is the representative agent approach. New neoKeynesian formal analysis is done at the partial equilibrium level, and then the results are intuitively extended to the aggregate economy using a representative agent analogy. No explicit consideration is given to the problems of that aggregate extension of the partial equilibrium analysis, and the resulting analysis is meshed into a unique-equilibrium Walrasian framework.

I classify that coaxing of Keynesian results out of a traditional choice theoretic framework as New neoKeynesian rather than simply New Keynesian to separate that work from another set of work that makes a much more substantive shift in response to the New Classical challenge. This work involves a fundamental change in perspective, and from that new perspective, the macro picture is clearly one of antelopes, and one can see birds in it only by the reverse mental gymnastics used by the New neoKeynesians.

This work starts from the premise that one cannot analyze the aggregate using a representative agent analogy because any analysis that does not deal with those interdependencies is conceptually flawed.

THE IMPORTANCE OF INTERDEPENDENCIES AND MULTIPLE EQUILIBRIA

This New Keynesian work changes the perspective by giving up the unique-equilibrium Walrasian competitive framework and replacing it with a multiple equilibrium framework in which disequilibrium adjustment paths can affect equilibrium outcomes and there is no unique connection between individual decisions and equilibrium outcomes. All decisions are conceived as fully interdependent with other decisions.

Any resulting formal macroeconomic model that follows from this vision is hopelessly complex from an analytic standpoint, but the problems it describes are intuitively obvious. Depending on the nature of the interdependencies assumed among individual decision makers, any aggregate outcome is possible. The resulting equilibria are sometimes called sunspot equilibria — because an equilibrium can be caused by seemingly irrelevant aspects of the economy; in other models they are called path-dependent equilibria, because the equilibria arrived at are dependent on the disequilibrium adjustment paths that led to those equilibria. But the key element of these models is that almost any result is possible, depending on where one begins.

The existing formal New Keynesian models and discussion are embryonic. No New Keynesian claims that their models are any more than suggestive of the dynamic interdependencies that exist. What distinguishes them is their unwillingness to make the leap of faith that allows them to brush aside the problems of interdependencies and to assume a unique aggregate equilibrium.

Giving up that micro framework changes the perspective and the nature of the questions asked. From this multiple-equilibrium perspective the New neoKeynesian response, which tries to justify the Keynesian view within a unique-equilibrium framework, is viewed as a slight modification to Classical economics. It is tangential to the main Keynesian analysis since from a multiple-equilibria macro perspective there is no need to justify fixed nominal wages and prices as a reason for output fluctuation. An output fluctuation is simply a movement from one equilibrium to another and is to be expected. It does not need explanation. What needs explanation is why the real-world aggregate economy is as stable as it is — why output does not fluctuate more than it does.

The stability of output in the real world economy is often used as implicit justification for the unique-equilibrium assumption. New Keynesians do not accept that; they believe the stability is caused by conventions and institutional constraints on individual behavior and that to understand the general stability and periods of instability in the economy requires a far more complicated analysis than can be captured in a model assuming a unique aggregate equilibrium.

Work on this new analytic approach, for the most part, has been highly theoretical and abstract; some of it, such as Michael Woodford [1986; 1990] begins in a game theoretic context and analytically shows that multiple equilibria are a likely outcome. Other work [Rosser, 1991] has considered systems with nonlinear dynamics in which sudden shifts from one path to another can occur. Still other work [Diamond, 1982; Howitt, 1985] has considered the macroeconomy from a search theoretic framework and has argued that even with full price flexibility, additional market trading has positive externalities and therefore can change the aggregate equilibrium. These New Keynesian economists have shown in these highly abstract analyses that multiple equilibria are the norm and that unless one rules out interdependencies by assumption, no unique equilibrium exists.

The absence of a unique equilibrium poses serious questions for the New Classical resolution to the macro/micro integration, since many alternative choices may be individually rational, each consistent with a different aggregate equilibrium. Even using all information available to them through the market, individuals, acting alone, will have no way of knowing which equilibrium to expect. One arrives at a unique equilibrium only by making strong *ad hoc* assumptions. From a New Keynesian perspective, it is Classical, not Keynesian, economics that is guilty of "adhocery".

From the New Keynesian multiple-equilibria perspective, talking about a microfoundation of macro, independent of institutional context, is meaningless. In specific, traditional individual choice theory, in which aggregate results correspond to non-contextually determined representative agent decisions, is irrelevant to the microfoundations to macro. The New Keynesian perspective maintains that before there is any hope of undertaking meaningful micro analysis, *one must first determine the macro context within which that micro decision is made*. It is that macro context that lets individuals choose among likely multiple equilibria and makes the choice theoretic foundation contextually relevant. In doing so, however, the macro context imposes institutional constraints on individual decision makers, and these constraints must be considered in deriving any microfoundations to macro. Thus establishing appropriate macrofoundations of micro must logically be done before one establishes any microfoundations of macro, and any micro analysis independent of a macrofoundation is irrelevant game-playing.[3]

Now one could argue that Walrasian perfectly competitive markets provide an appropriate macrofoundation. Elsewhere I have argued that they do not for three reasons. The first is that they are institutionally unstable [Colander, forthcoming], by which I mean that some individuals will have an incentive to monopolize and change the perfectly competitive institutions to monopolistic ones and that at the margin no one will have an incentive to oppose them. Thus, Walrasian markets do not meet the minimum logical requirement of local stability. Any institutional structure used as a macrofoundation should be, at least locally, stable.

The second reason is that the traditional Walrasian general equilibrium structure requires more rationality than individuals have. It requires them to make billions of rational calculations every moment of every day. As Leijonhufvud [1993] nicely points out, doing so is the equivalent of assuming that because a person can jump off the ground — can make a contextual rational decision — that the person can fly like a bird — make noncontextual rational decisions. It is far more reasonable to picture individuals, like ourselves, with limited brainpower, able to exhibit some rationality, but relying on inertia and rules of thumb to make many decisions. If individuals are rational, their rationality is a bounded rationality within an institutional and expectational context. The macrofoundations of micro must specify that context.

The third reason is related to the second and concerns the absence of money in the Walrasian general equilibrium system. Money is a social convention that makes the aggregate economy operate more efficiently. It affects the coordination of the entire system and reduces the number of calculations an individual must make. Money has *no role* if individuals are super-rational and there is a perfectly competitive system. But it does have a role in our real-world economy and hence in any real-world relevant macrofoundations of micro. But money enters the economy not as a component of individual utility, or even aggregate production, functions; instead, it is part of the macrofoundational structure of the economic system and must be modeled as such.[4] Questions about money illusion and whether there is a dichotomy between the real and nominal sectors are non-questions since, in the macro institutional structure, the real and nominal decisions are so entwined that illusion and reality blend into one. Thus, in the macrofoundations-of-micro literature, the entire attempt to integrate money into the Walrasian general equilibrium system is a needless waste of time. It must be integrated in the macrofoundations of micro, and its integration is incompatible with a Walrasian general equilibrium system.

The analytic basis of this macrofoundations-of-micro approach goes back to Herbert Simon's work on bounded rationality [1959]. Simon argues that deciding over an entire range of possible choices exceeds the processing capacity of economic decision making units. Because it does, the decision making process has meaning only with a macro context. There is no one-to-one mapping between aggregate results and individual decisions. Put another way, the aggregate economy acquires a life of its own.

This view of the aggregate economy suggested by the macrofoundations-of-micro approach is, in many ways, Austrian, since the information processing achieved by the economic system is not directly related to the information processing of individuals. Many Austrians, however, make an additional normative assumption that the existing institutional structure should be seen within a broader evolutionary context that makes the existing institutional structure efficient, or at least beyond the society's ability to improve upon it. In Simon's approach, that assumption is inappropriate. All one can say is that the existing institutional structure exists. That difference is important because it opens up the possibility of studying alternative institutional structures and potentially finding a preferable one.

Ironically, it was a project extending Simon's research program examining how to integrate process into microeconomic analysis, in which Muth [1961] was a participant, that led to rational expectations. Struggling with the problem, Muth proposed to cut the Gordian Knot and eliminate process entirely [Simon, 1978; 1979]. Forget process: assume in the model expectations consistent with the equilibrium of that model. He called those model-consistent expectations "rational expectations." The New Keynesian macrofoundations-of-micro approach is a reversion back to Simon's work. It assumes that process is fundamentally important and that Muth's solution presumed far too much information processing capability of individuals.

In the macrofoundations-of-micro perspective one cannot escape process, and one cannot meaningfully relate noncontextual individual choice theory with macro analysis until one has first determined the relevant macro context within which a micro decision is made. Thus, whereas the microfoundations-of-macro work forged an integration of micro and macro from a unique Walrasian general equilibrium perspective, the New Keynesian macrofoundations-of-micro perspective is attempting to forge an integration from a macro perspective and to devise a micro perspective to fit into macro, rather than the other way around.

HOW CAN ONE DETERMINE AN APPROPRIATE MACROFOUNDATION?

To say that before one starts developing a microfoundation to macro one needs a macrofoundation to micro is not to argue that what we currently view as Keynesian macrofoundations is the right approach. The mechanistic multiplier and the modified IS/LM model are naïve and misleading. They involve as much a denial of the importance of institutional structure as does the microfoundations literature.

Exactly how to go about determining an appropriate analytic macrofoundation for micro is not clear. The work of Barkley Rosser [1991], Michael Woodford [1986, 1990], Andrei Schleifer [1986], John Bryant [1983], and others, which elsewhere I have classified as New Keynesian, is attempting to arrive at an analytic solution to the problem. While these researchers have been successful in demonstrating analytically the possibility of multiple equilibria and in showing how, once one takes seriously the possibility of non-linear dynamics, jumps from one equilibrium to another can occur, they have not been very successful in providing much assistance in determining a meaningful macrofoundation. The main value of their analytic work has been to demonstrate the need for, and the difficulty of determining, a macrofoundation.

I suspect that if an analytic approach is going to provide a macrofoundation of micro, a multi-step analytic approach must replace the one-step analytic approach currently being used. The first step would be what might be called a "deductive institutional approach" in which one analyzes the rational choice of economic institutions along the lines suggested by Buchanan's constitutional analysis [Colander, forthcoming]. Those deductively-derived institutions then become the macrofoundation for microeconomic theorizing. This means that the constraints those institutions impose on individuals must be built into the micro theorizing. Thus New Keynesian economics might have a representative agent but it would be a fundamentally different representative agent than used by New neoKeynesians or New Classicals. In its conception the macrofoundations representative-agent would incorporate macro-institutional constraints on its behavior. More likely, it will have a number of representative agents interacting along the lines described by Allan Kirman [1992].

An analytic approach is not the only way to arrive at a macrofoundation. Two alternative approaches are a simulation approach and the institutional approach. Axel Leijonhufvud is a strong advocate of the simulation approach, and he is involved with the Center for Computation Economics at U. C. L. A., where most work along this line is taking place. In "Towards a Not-Too-Rational Macroeconomics" Leijonhufvud [1993] makes arguments similar to those in this paper about the unsatisfactory nature of the unique-equilibrium Walrasian approach and the failure of analytic methods of arriving at what I call the macrofoundations of micro. He then argues that in other sciences when analytic solutions are not forthcoming, scientists use computer simulations to arrive at a solution, and that it would make sense for macroeconomists to do likewise. In Leijonhufvud's approach, the macrofoundations of micro would be determined by simulation. Micro decisions would be analyzed contingent on the simulation-determined institutional structure.

Another approach to macrofoundations is what I call the institutional or Post Keynesian approach. In this approach, as opposed to computer simulation, one uses the real-world economy to simulate the reduced-form relationships. Since these aggregate real-world individual decisions are made contingent on the existing institutional structure, empirical observation is the only way to determine the macro-constrained micro choice. The work on wage contours and price ratchets falls within this framework. (A modification of this approach is to supplement empirical observation with institutionally-constrained micro-analytics in which the perceived reality determines the institutional constraints, but one still conducts analytic choice theoretic exercises within that observationally-determined environment.)

THE MACROFOUNDATIONS OF MICRO AND THE CANONICAL MODEL

Once one views the macroeconomic problem through the macrofoundation-of-micro perspective, many of the issues that had previously been in debate are simply non-issues. Price inflexibility does not need a unique-equilibrium Walrasian microfoundation; the search for reasons for price inflexibility as a justification for fluctuations in aggregate output are irrelevant exercises, at least at this stage of inquiry. Menu cost analysis and implicit contract theorizing become, perhaps, fun analytic exercises, but unnecessary for establishing a basis for Keynesian macroeconomics.

Since these issues become so clear in the macrofoundations-of-micro perspective, I have been perplexed to explain why they have received so little attention in the literature. Keynes made it quite clear that he believed that his was the general theory and the Classical theory was the special case, assuming full employment. From a macro perspective, Keynes is correct; from a micro perspective it is the Classical theory that is the general theory and the neoKeynesian model that is the special case, the Classical model modified by fixed wages and prices.

I have come to the conclusion that one of the prime reasons why Keynesian, or macro, insights have been lost is that a unique Walrasian general-equilibrium perspective has been embedded in the canonical aggregate model used by both neoKeynesians and Classicals. The micro perspective inherent in that model directed all formal analysis to a micro perspective.

Specifically, the canonical model's use of an aggregate production function that assumes a one-to-one mapping between inputs and aggregate output eliminated the possibility of multiple equilibria, and the assumption of a linear dynamics eliminates the possibility both of sudden jumps from one equilibrium to another and of path dependency. Since all previous attempts to provide a microfoundation for macro have been based on that unique-equilibrium aggregate production function with linear dynamics, it is not surprising that any time a microfoundation was formalized, the logical outcome was a micro perspective. Formal modeling of the macrofoundations-of-micro perspective must start with the proposition that the standard aggregate production function is inconsistent with multiple aggregate-equilibria and hence with a perspective that identical inputs of capital and labor can be associated with different levels of output. Garretsen [1991] and van Ees [1991] make arguments along these lines.

To incorporate the macro perspective into the model, one must specify an aggregate production function that can have different properties than the individual firm production function. It must be a function that has no one marginal productivity of inputs, but, instead, has many, depending on at which of the multiple equilibria

the economy arrives. In the macrofoundations-of-micro perspective, the individual decisions can only be specified, given one of those macro equilibria.

A MORE LIMITED REALM FOR THEORY

To point out that this alternative macrofoundations perspective exists is only a very limited first step in the analysis. It is also the easiest one. It disparages much of the existing work without replacing it and suggests that the understanding of macro questions lies in taking seriously the complexity of those questions, not assuming away complexity for analytic convenience. It is a step that, once taken, is nihilistic: much existing macro theory and even the possibility of doing tractable macro theory is obliterated.

It is, I suspect, these nihilistic implications of the macrofoundations approach that have led macro theorists to avoid them. If the macro economy is almost infinitely complex, any tractable model will at best be suggestive. At best, what we might hope to achieve from macro theorizing are suggestive results of directional implications of observed shocks. Global normative statements fall by the wayside and are replaced by statements about potential tendencies to deviate from a dynamic path.

The macro perspective will also fundamentally change the way we do macroeconometrics. Macroeconometric models built up from micro relationships specified independently of institutional context will also fall by the wayside and will be replaced with models with far fewer theoretically-imposed structural limitations on the models. Robert Basmann's [1972] and Christopher Sims's [1980] attacks on macroeconometrics fit in nicely with the macrofoundations-of-micro perspective. Once one accepts that macro theory can lead to almost any result, forecasters will have to turn elsewhere — to pure statisticians who can extract maximum information from statistics independent of theory.

CONCLUSION

The fact that the perspective one takes determines the conclusion one arrives at is not surprising. What is surprising is that the importance of perspective has been so little discussed in the literature. Recent developments in the macrofoundations of micro bring the debate back to a debate about perspective and for that reason are a welcome advance — one likely to bring significant gains to our understanding of the aggregate economy, or at least to our understanding of what we do not know about that macro economy. Ultimately, any research program will be based on a leap of faith. Developing meaningful dialogue about faith is difficult; justifying faith with analytics is impossible. Ultimately, any researcher must answer the question: What simplifications will my faith allow me to make in the name of analytic tractability? Those simplifications define the perspective, and are what ultimately will differentiate macro models.

The change in perspective that an alternative leap of faith involves is not only for macro. Ironically, the changes will be more major for micro than for macro, since from a macro perspective much of what we currently teach as micro is out if its macro context and hence inappropriate. Exactly where the macrofoundations of micro might lead is unclear. Changes in perspectives are the most difficult to predict and — who knows? — maybe when the work is complete, Hanson's picture described at the beginning of this article will be of neither birds nor antelopes. Some economist may well pull a rabbit out of it.

NOTES

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1. The earliest edition to which I had access, the 6th edition, had this diagram in it. I do not know whether it was in earlier editions.
2. There are, of course, different branches of microeconomics, and, as discussed in Landreth and Colander [1994], it was the Neo-Walrasian tradition that dominated the profession. Thus, when I refer to a micro perspective, I refer to the new Neo-Walrasian perspective. This Neo-Walrasian perspective saw macro issues from a micro perspective. The Marshallian tradition was somewhat different; it did not accept that one could build up from individual to general. The Marshallian approach was not followed up, except for the work of Post Keynesians, Leijonhufvud and Clower. The macrofoundation of micro approach follows in this Marshallian tradition, and could be called Marshallian Macro.
3. The term macrofoundations, I suspect, has been around for a long time. Tracing the term is a paper in itself. Axel Leijonhufvud remembered using it in Leijonhufvud [1981]. I was told that Roman Frydman and Edmund Phelps [1983] used the term and that Hyman Minsky had an unpublished paper from the 1970s with that title; Minsky remembered it, but doubted he could find it and told me that he used the term in a slightly different context. I was also told by Christof Ruhle that a German economist, Karl Zinn, wrote a paper with that title for a *Festschrift* in 1988, but that it has not been translated into English. I suspect the term has been used many more times because it is such an obvious counterpoint to the microfoundations of macro, and hence to the New Classical call for microfoundations. While he does not use the term explicitly, Bruce Littleboy [1990], in work that relates fundamentalist Keynesian ideas with Clower and Leijonhufvud's ideas, discusses many of the important issues raised here.
4. In a recent paper, Clower and Howitt [1993] extend Clower's earlier arguments and discuss the issue of the use of money in the economy, arguing that it must be analyzed as part of the structure of the economy, not as another good.

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