A Macro Economy as an Emergent Ecology of Plans

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Abstract

Orthodox macro theories theorize about a controlled economy where all phenomena are simple and visible, with aggregate variables acting directly on one another. In this analytical framework, spontaneous order gives way to planning. In contrast, this paper explores how macro theory might be rendered consistent with recognition that societies are arenas of spontaneous ordering. Where orthodox macro reduces macro phenomena of choice, the alternative formulation explored here treats them as emergent phenomena. Only in the presence of emergent phenomena can spontaneous ordering come into play. Orthodox macro theories proceed by a choice-theoretic reduction of macro to micro. In contrast, in the emergent-theoretic formulation explored here macro supervenes on micro. The macro-micro relation is one of supervention and not one of reduction. Hence, a macro economy is treated as a complex ecology of plans that constitute a non-equilibrium process of spontaneous ordering.

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In a session on emergence in economics, it is probably useful to clarify what an author means by emergence because the term is used in different ways. It is often used to describe the end of some process, as in asserting that the champion of an athletic league will “emerge” at the end of the season. While temporality is necessary for a theory to reflect emergence, it is not sufficient. Sufficiency requires more than simple temporality. It requires interaction among entities, and with that interaction generating phenomena that are distinct from the observed actions of those entities, and yet those phenomena owe their existence to those entities and their interaction. In this manner, emergence incorporates both seen and unseen, both planned action and spontaneous ordering. To theorize in this manner, moreover, requires a theorist to theorize in terms of distinct levels of phenomena, in contrast to orthodox macro theories where macro variables are presumed to act directly upon one another. This paper rests on a prior commitment to theorizing in terms of emergent and unseen phenomena, and explores what this commitment might imply for macro theory once supervention replaces reduction as the analytical framework by which macro relates to micro.

A Fork in the Theoretical Road

Where micro theory is mostly the domain of relationships among the entities that comprise an economy, macro theory is the domain of the economy as a whole. This, anyway, is how most economists treat the distinction. The

relationship between micro and macro is thus one of parts to whole. The relationship between parts and whole is the province of the micro foundations of macro theory (Janssen 1993). Here, theorists largely follow one of two paths, both of which I describe as orthodox paths in contrast to what I characterize as the alternative path in Table 1. One of those orthodox paths takes the suitable micro foundation to be the theory of perfect competition and its Pareto efficiency; this path leaves no space for macro policy to serve as a corrective tool: macro observations are of perfectly competitive equilibria, as illustrated by formulations of real business cycles wherein macro-level variability represents Pareto-efficient response to shocks to technology or preferences. The other orthodox path embraces a micro foundation of imperfect competition and its Pareto inefficiency. This path maps into claims that macro observations pertain to states of imperfect competition, and with that imperfection capable of taking various forms, including the presence of market power and weaknesses in the cognitive faculties of individuals. Regardless of the source of possible Pareto inefficiency, this path provides analytical space for macro policy as a corrective tool. What is particularly notable about either orthodox path is that macro is reduced to micro, either by constructing a representative agent or by, equivalently, seeking to explain averages.

A macro economy is reduced to an individual chooser who is assumed to be a miniature instance of the macro economy. This individual possesses both the capacities and the limitations that are thought to characterize the macro economy. These days there are two prime forms of macro theory in play. One

form embraces the strong rationality that dominated economic theory through most of the 20th century. The other form invokes a weaker version of rationality, and is a macro-level counterpart of the introduction of behavioral ideas into economic theory. The strong view of rationality maps into claims that macro observations are of perfectly competitive equilibria, as illustrated by formulations of real business cycles wherein macro-level variability represents Pareto-efficient responses to shocks to technology or preferences. The weak view maps into claims that macro observations pertain to states of imperfect competition, and with that imperfection capable of taking various forms, including the presence of market power and weaknesses in the cognitive faculties of individuals.

By reducing macro to micro, the theoretical framework of micro theory is carried forward to macro theory. Macro theory is thus predicated on the existence of direct relationships upon aggregate variables, where one such variable acts directly on another such variable. In contrast, this paper explores an alternative theoretical framework where aggregate variables do not act directly on other aggregate variables. This is not to deny the presence of statistical relationships that appear stable over some significant interval of time. It is rather to replace the presumption that macro can be reduced to micro with the presumption that macro supervenes on micro. This alternative micro foundation for macro is emergent theoretic and not choice theoretic.

I do not seek to adjudicate between these alternative orientations toward macro theory and the form of micro foundations on which they rest. Given my prior commitment to incorporating emergent phenomena into economic theory, I

necessarily must sketch an alternative path that rests upon a different approach to the relation between micro and macro phenomena. Table 1 provides a contrast between reductionist and emergent forms of macro theorizing. In both cases, the relation between micro and macro is one of parts to whole. But there are two divergent paths by which part and whole might be connected. Before continuing this comparison, however, it is useful to remember that the entity we describe as a macro economy is not something that we can observe directly. It is rather something we construct through some preceding theoretical effort. Any theoretical construction unavoidably will highlight some phenomena while neglecting other phenomena.

The contrast between the theoretical paths described in Table 1 is stark, and the remainder of this paper will plumb some facets of the emergent theoretical path toward the construction of macro-level theories. All reductionist theories rest upon a presumption that observations pertain to equilibrium states, and with those states capable of being evaluated differently according to Paretian criteria. This presumption makes it straightforward to reduce macro to micro, either directly though the construction of representative agents or indirectly through reasoning based on relationships among average values of variables. Society is thus treated as an organization that can be reduced to such a point-mass entity as a parade. Macro phenomena are thus equally simple as micro phenomena, for macro is just a scaled up version of micro. Reductionist macro theory also works with an equally simple sketch of the relationship between polity and economy within a system of political economy; economy and polity are both

reduced to point-mass entities, and with polity acting on economy much as one billiard ball would act upon another. Just as theorists differ with respect to the Pareto efficiency of market outcomes, they differ as to the implications of political action for Pareto efficiency. Those theorists, however, commonly embrace an analytical framework where a political entity acts upon an alternative entity denoted as a market economy.

The emergent theoretical framework explored here differs from the reductionist framework in all these respects. Societies are treated as networked ecologies of enterprises. There is no reduction of macro to macro; to the contrary, macro supervenes on micro. Macro and micro operate on different theoretical levels, which bring attention to the relationship between the levels. Society is an order of organizations (including individuals) and not an organization; it is analogous to a moving crowd of pedestrians and not to a parade, which is also an orderly group of people. Macro phenomena are thus inherently complex and not simple. The move from micro to macro is a move from simple to complex phenomena (Hayek 1967). Finally, neither polity nor economy is reasonably reducible to a point-mass entity; moreover, the relationship among those entities is entangled and not separated (Wagner 2007). The remainder of this paper shall proceed by sketching and exploring some of the differences that might arise for macro theory by pursing this alternative theoretical framework.

Two Images of Macro Coordination: Postulated and Emergent

The world appears to us as generally orderly. The reasonableness of that appearance is attested by our ability to pursue deliberate action in the world with reasonable success. Not complete success to be sure, but certainly with quite a bit of success. The world presents itself largely as a form of orderly turbulence. This perception of orderliness provides the point of departure for social theorizing; if there were no sense of orderliness, there would be no object to theorize about. That point of departure, however, presents an immediate fork in the theoretical road. One branch of that fork entails the postulation of orderliness as a systemic condition that is conveyed by models of equilibrium. Whether that equilibrium is thought to be perfect or imperfect in Paretian terms is a point of controversy among theorists, but behind this controversy resides acceptance of the presumption that the perception of orderliness is best carried forward analytically by models of systemic or general equilibrium.

Systemic equilibrium portends placidity and not turbulence. You can get to turbulence from equilibrium only by postulating exogenous shocks. Turbulence is brought in through a *deus ex machina* rather than being treated as an intelligible feature of the ecology of plans. In contrast, turbulence is a normal feature of most ecologies. To treat both orderliness and turbulence as properties of the life of the ecology of plans that constitutes a macro economy requires that we follow the other branch of that analytical fork, which seeks to explain the emergence or generation of orderliness out of some pre-coordinated point of departure. In a

related vein, Bruno Latour (2005) objects to forms of social theorizing that explain social phenomena in terms of other social phenomena; he argues instead that social phenomena should be explained as emerging out of interaction among non-social phenomena. In similar fashion, an emergent analytical framework would seek to explain macro coordination as something that arises through interaction among non-coordinated entities. Coordination would thus be a variable quality of societal processes and not a maintained hypothesis to guide theoretical effort, as illustrated, for instance, in the generative style of theorizing conveyed in Axtell and Epstein (1996) and in the essays collected in Epstein, ed. (2006).

Central to this generative orientation are theories that reflect emergent phenomena, which require theorizing in terms of levels of phenomena as against treating all phenomena as residing on the same theoretical plane. Mitchel Resnick's (1994) computational analysis of a traffic jam illustrates the analytical distinction nicely. Imagine that cars enter a highway and follow the simple rule of driving as fast as they can until they are three car lengths behind the car in front of them, at which time they maintain that distance. What results from this formulation is a steady state where the cars in the mainstream of traffic could be reduced to a point-mass equilibrium. Suppose the cars in the steady state are traveling at 80 MPH. Now suppose one car in that stream of traffic slows down momentarily. This will cause a traffic jam among the following cars as they slow down to try to maintain their distance from the car in front of them. The traffic jam would be recognized by the presence of cars that are traveling at less than 80

MPH. The traffic jam, however, is an object that is distinct from the cars that constitute the jam. If you were to take a sequence of photographs of the traffic jam, the jam will be moving backwards. Initially, the jam might have started at, say, mile marker 100 along the highway. Thirty minutes later the jam might start at the 90 mile mark, and it might start at the 80 mile mark 30 minutes after that. The starting position would move continually backward as cars left the jam and resumed their 80 MPH speed.

It would not be accurate to describe the traffic jam as a gigantic car, perhaps of ten-mile width, that is moving backward. No car ever moves backward; they move only forward, only at less than 80 MPH until they clear the jam. The traffic jam is a distinct object that emerges out of interaction among the cars that constitute the jam. It is this quality of emergence that must be brought into play in treating a macro economy as an ecology of plans. A central feature of that ecology, as any ecology, is the emergence of non-linearity through interaction among participants within the ecology.

For instance, the ecology around a grove of 100 oak trees will differ from the 100 ecologies beneath 100 individually isolated oak trees. A grove with 100 trees cannot be reasonably reduced to a single tree because doing so would eliminate significant phenomena that arise through interaction. Among other things, patterns of shade differ within the grove than would characterize isolated trees, leading to different the shapes and sizes of the trees. Moreover, amounts of moisture and rates of evaporation will differ when the 100 trees comprise a grove than when each tree stands in isolation. The effects of wind will likewise

differ when some of the trees in the grove shelter other trees. Furthermore, the grove will attract different animals and plants than would a set of isolated trees, due in part to differences in shade and moisture.

This distinction between theories based on postulated order and on emergent order can be conveyed by an illustration I have invoked before (Wagner 2010). Parades and crowds of pedestrians leaving a stadium are both orderly social formations, though a parade would surely be judged by an impartial spectator as more orderly than a pedestrian crowd, perhaps perfectly orderly in contrast to the imperfect order of the pedestrian crowd. The pedestrian crowd reflects an ecology of plans, but a parade reflects only a single plan. The parade is an organization whose orderliness resides in the plan of a parade marshal. The pedestrian crowd is an order of organizations: some of those organizations will be individuals and some of them will be small clusters of individuals who are traveling together. The orderliness of the parade resides in the plan of the parade marshal, along with the musical and marching skills of the members of the parade. The orderliness of the pedestrian crowd resides in the rules and principles that govern interaction among the participants. It would be ontologically mistaken to treat the pedestrian as an imperfect parade that potentially could be perfected through policy, even though it is conceivable that the orderliness of the crowd could be improved along the lines illustrated in Schelling (1978).

A parade is appropriately reducible to a point-mass entity; this reduction fits the nature of a parade. A pedestrian crowd is not appropriately reducible to a point-mass entity that can be represented by a field. It is rather a form of

spontaneously ordered network. For a parade, you can tell where it is going by looking at any single participant: the parade is reducible to a point mass entity. The pedestrian crowd as an aggregate of people is not going anywhere. Its members are going in different directions to many different places. Following one member gives you little to no useful information about where the other members are going. It is a pedestrian crowd and not a parade that is an appropriate analogy to the orderly social configuration that I denote as an ecology of plans.

Contrasting Formulations of Macro Outcomes

Orthodox macro theories based on stipulations of equilibrium entail reductions of both economy and polity to point-mass entity. Economy is reduced to point-mass entity by the assumption of equilibrium; polity is reduced to point-mass entity that acts on economy to shift its location. While a large menu of macro models can be found in use today, they are unified in their reduction of an economy to some point-mass entity even if they differ regarding some of the properties of that mass. A widely used macro formulation is an expectations-augmented version of the Philips relationship between inflation and unemployment, as conveyed by

$$O_t = O^* + \lambda(P_t - E(P_t) \quad [\lambda > 0].$$

In this analytical framework, aggregate output has two components: what is considered a natural or normal volume of output, O^*, and a deviation from that output due to monetary shocks that produce a gap between actual and expected prices. This analytical framework posits direct theoretical relationships among

such aggregate variables as output, prices, and money. These formulations map into some Phillips formulation at the aggregate level. It is easy enough to work with these formulations. They are the stuff of macro theory, though, of course, to different effect among different theorists. My interest here, however, is not any adjudication among macro theories but rather resides in exploring an emergent ecology of plans and how this articulation leads to a treatment of macro observations as supervening on micro interactions.

Before doing that, I should like to consider an alternative ways of bringing polity to act on economy within various lines of orthodox formulation. Figure 1 presents an abstract rendition of the conceptual options when polity and economy are treated as point-mass entities. Polity and economy are both reduced to point-mass entities. What is called policy, moreover, is denoted by the action of polity on economy. This abstract formulation leaves plenty of room for controversy about both polity and economy. Figure 1 portrays a polity that acts on economy to shift economy from E to E*. It is here where controversy arises, and in two broad forms. One concerns whether economy is plausibly Pareto efficient without state action. Even if Pareto inefficiency is presumed in the absence of corrective action, it does not follow that the move from E to E* will represent improvement.

There is a line of literature, which will be explored below in terms of an ecology of plans, which suggests that policy might worsen rather than improve matters through the effort to use policy measures to enhance electoral support. Figure 2 illustrates this idea within a standard Phillips formulation. Starting with

Nordhaus's (1975) Keynesianesque formulation, a substantial literature on political business cycles subsequently emerged, much of which is surveyed in Wagner (2001). The central idea behind this literature is that whether political processes promote variability or stability depends on the relative payoffs from different policies to those who conduct the affairs of state. The initial literature largely developed under the presumption that states have the competence to promote stability, but might choose instead to promote variability because doing so offers political gain. The starting point for such PBC theorizing was the presumption that an incumbent's electoral success is influenced by macro-economic conditions as measured by rates of inflation, unemployment, and growth prior to an election.

Figure 2 can be used to illustrate the various threads of argument of PBC models. There are two components to Figure 2, and these correspond to preferences and opportunities within a framework of constrained optimization. Preferences are expressed by votes or, alternatively, by measures of popularity. The quite reasonable presumption is that politicians would rather win an election than loose it. The PBC literature presumes that increases in inflation and unemployment each exert negative effects on the popularity of the governing party. These presumptions are represented in Figure 2 by the iso-vote functions described by v_1 and v_2, and with the value of those functions increasing toward the origin: if v_2 denotes, say, 48:52 odds of electoral success for the incumbent party, v_1 might denote 52:48 odds.

The opportunities facing an incumbent party are described by a Phillips relationship. Figure 2 shows an exploitable relationship in the short run, as illustrated by p_1 and p_2, but not in the long run, as illustrated by the natural rate claim, P. Contained within this description of opportunities is the presumption that an incumbent party can use its powers to enhance its electoral prospects by acting on those opportunities. In Figure 2, the pre-election position is denoted by *a*, which lies on v_2. Under the assumption that there is an exploitable Phillips relationship denoted by p_1, the incumbent part is presumed to use its policy power to shift the economy to *b*, where it faces more favorable odds of electoral success described by v_1. Under the assumption that there is no permanently exploitable Philips relationship, the economy subsequently shifts to c, where Figure 2 shows restoration of the pre-election odds of success at the next election; moreover, a third iso-vote could be added to Figure 2 to illustrate lowered odds of success.

Examination of the pattern a-b-c-d shows an election-inspired cycle. Starting from zero inflation and full employment at the natural rate, inflation is used to increase employment so as to increase electoral prospects. If the incumbent has good timing, and also the powers of policy presumed by the model, the reversion to the natural rate of employment will happen after the election. At this point the incumbent party faces a choice. Down one path it can continue with the permanent inflation and try yet another inflationary episode before the next election. Following this

path, however, will generate decreasing political oomph from inflation. Down the other path, the incumbent runs a deflationary policy that lowers its popularity as shown by the move to *d*. If this is done sufficiently far in advance of the next election, the economy will have returned to *a*, and the incumbent party will be poised to repeat the policy cycle.

Emergence and Supervention in the Macro Ecology of Plans

Emergent phenomena are products of interaction. In the social world they are phenomena that cannot be reduced to an individual because they emerge through interaction among individuals. Emergence theorizing thus operates in terms of levels of theorization, where some of the objects of theoretical interest supervene on other objects of interest. Emergent objects are distinct from the objects on which they supervene. This paper is concerned with aggregate economic variables and not such objects as traffic jams, patterns of termite droppings of wood, or patterns made by ants in searching for food. Nonetheless, each of these phenomena entails aggregate patterns that emerge out of micro-level interaction among acting entities and not through some act of intentional construction or coordination. Macro level theorizing, too, displays the centralized mindset that Resnick (1994) described. Dissolution of the centralized mindset requires the construction of theories based on emergence, networks, and supervention, where micro and macro designate different analytical levels and where macro-level variables supervene on micro-level interaction. Within such an alternative research program, macro theory would not seek to specify direct

theoretical relations among aggregate variables because such relations are intermediated through supervenience between the levels, or among micro, meso, and macro levels in the formulation of Potts and Morrison (2007).

Put differently, the macro level is inert in that it is not the locus of action but rather is just a statistical characterization of action and interaction at the micro level. The activity we call policy would likewise be located at the micro level, for that is where all action must be located. Consider open market operations by a central bank. In particular, assume the central bank buys government debt from the public. This is the standard illustration of money creation, and from here it is a short step to inquire into the effect of such money creation on such aggregate variables as prices, output, and employment. It is certainly possible to construct statistical relationships among those variables, but a statistical relationship is not a theoretical relationship.

There is no direct theoretical relationship, though this lack of relationship is obscured by the presumption that our observations are of equilibrium states. This is not to deny that purchase of government debt by a central bank can generate changes in such aggregate variables as prices, outputs, and employment. It is only to assert the significance of the networked structure of micro-level interaction for understanding both the causes of those central bank actions and their consequences. These phenomena cannot be captured adequately by remaining at the macro level, for a central bank resides at the micro level along with regular banks and other enterprises. There is no macro level at which anyone can reside. It could be claimed that macro actions and

policies are identified by their size: they are large relative to most actions and policies. This claim would have some coherence to it, but it would be a statistical and not a theoretical coherence. The central bank operates within some networked structure of relationships, with different structures having consequences both for central bank activities and the consequences of those activities. This is a general feature of networks where knowledge is local and distributed.

The challenge embraced here is to analyze the generation of orderliness cum turbulence within the ecology of plans that constitute a macro economy and not to compare the properties of some equilibrium arrangement of plans against some postulated Paretian standard. This ecology is analogized to a pedestrian crowd and not to a parade. With respect to what is denoted as policy, moreover, the entities of state are likewise members of the crowd and nothing like a parade marshal. Within an ecology of plans, new plans continually are being inserted into the ecology while existing plans sometimes are being revised or even allowed to die. The interconnection among plans in this ecology is a source of turbulence, not as an exogenous shock but as a systemic feature of what is a living even if not sentient organism.

Equilibrium theory can, of course, give an account of interdependence among economic activities. Indeed, such an account is perhaps the prime virtue of this theoretical framework. What it can't do, however, is give an account of turbulence that arises through inconsistencies among plans because no action is presumed to take place until all plans are mutually consistent. All plans are pre-

reconciled within the equilibrium framework, just as the actions of the members of a parade are pre-reconciled. The alternative to the equilibrium framework is to treat the ecology as an emergent process where macro-level objects supervene on micro-level interaction. Any relation among macro-level variables is thus intermediated through interaction among entities at the micro level.

What would result from this analytical effort is a form of spontaneous order macro theory. Micro theory would be the domain of intentional action; macro theory would be the domain of emergent phenomena, spontaneous order, and unintended consequences. Micro theory is praxeology; macro theory is catallactics. This line of analysis would reassert the sense of the distinction between what is seen and what is unseen. The micro domain of praxeological action pertains to what is seen and intentional. The macro domain of catallactical and emergent interaction pertains to what is not part of anyone's direct intention, but rather reflects interaction among participants. With respect to micro foundations, this effort points toward emergent-theoretic foundations for macro theory, as distinct from choice-theoretic foundations..

Macro-Micro Supervenience

Figure 3 illustrates an ecology of plans where macro phenomena supervene on micro interaction. The upper part of the Figure carries forward the Phillips relationship from Figure 2. Shown there are three different combinations of inflation and unemployment that would correspond to three different results of aggregation from the micro level. The three lightning bolts that lie between the

upper and lower part of the Figure denote that the direction of movement is from the micro level to the macro level. The micro level is where action takes place. The macro level is not an arena of action. It is in part a subsequent portrayal of some features of those actions during the previous period. It is also the domain of various projections, forecasts, and ideologies. Such macro portrayals and variables might well induce some participants at the micro level to revise their activities. Even so, that subsequent action likewise takes place on the micro level, with a subsequent macro-level pattern again supervening on the micro action. Those macro-level representations emerge out of interactions at the micro level that resides analytically beneath the macro level, as befits the relationship of supervention.

Several implications follow from this supervenience of macro on micro. For one thing, emergence takes time. The macro level description pertains to micro interaction in the past, and also to forecasts and beliefs about future circumstances. The simplest way of making this point, and one that is readily amenable to agent-based modeling, is to assert that micro interaction at t_1 produces macro level observations at t_2. A second implication is that the flow between micro and macro is uni-directional; the lightning bolts in Figure 1 point from micro to macro. Micro interaction yields macro phenomena. Macro observations or beliefs might influence micro actions, but they don't directly generate macro variables any more than a traffic jam generates cars. A third and less immediately observable implication is that the ecology of plans depicted in the lower part of Figure 3 is comprised of distinct types of entities, as illustrated

by some of the entities being triangles and others circles. Similar to Wagner (2007), the circles denote market-based entities and the triangles denote state-based entities.

The bottom part of Figure 3 represents both a conversion of polities and economies into networks of entities in place of unified fields and a commingling of political and economic entities within an entangled web of political economy. Market-based entities are denoted by circles; polity-based entities are denoted by triangles. What is particularly notable in this sketch is that both types of entities engage in both competitive and complementary relationships across both types of networks. All such entities are, as if were, part of a crowd of moving pedestrians, though with some of those pedestrians perhaps having different principles of motion than other pedestrians.

One of those state-based entities might be a central bank. This bank operates on the micro level through the connections it has established with other entities in the ecology. The central bank is an enterprise located on the public square that interacts with other enterprises within the ecology of plans, as distinct from acting on that ecology as if it were reducible to some point-mass entity. Moreover, the central bank exemplifies what Roger Koppl (2002) calls a Big Player, which is a participant in the economic process that is not subject to the ordinary rules of private property and residual claimacy. Big Players inject uncertainty and turbulence into a catallaxy because the absence of residual claimacy renders their actions less predictable to other participants. Different patterns of interaction are thus likely to generate different macro observations.

Furthermore, the resulting macro observations are not the province of the central bank alone because those observations depend on complex patterns of interaction within the catallaxy. Macro observations emerge through interaction among enterprises throughout the catallaxy. Principles of spontaneous order thus play out within the context of macro theory. Indeed, it is at the macro level where principles of spontaneous order would be at work, for spontaneous order and unintended consequences are products of interaction as distinct from action, and inhabit the macro or perhaps meso level level (Potts and Morrison (2007) and Aydinonat (2008) explore spontaneous order theorizing).

The central bank is an entity that resides on the same plane as other entities in society even if it is a Big Player. Several things are notable about this alternative line of theorization. One is that the macro impact is intermediated through the micro structure of networked relationships. The direction of movement is from micro-level action to macro-level summarization through statistics. Thus the activities of the central bank in buying government bonds leads to changes in the networked pattern of commercial relationships that statistically can be summarized by changes in indexes of outputs and prices. The properties of a network depend on its constitutive structure. Hence different network structures, as well as different paths of connection between a central bank and other participants in that network, will result in different outcomes at the macro level.

This does not mean that purchases of government debt by a central bank will yield weird results at the macro level. The macro result is a statistical

characterization of the results of micro-level interaction. The point is simply that there is not a direct and immediate relationship between increases in the stock of money and changes in prices and outputs because that relationship is intermediated through particular patterns of interaction among micro level entities. Different network structures and different patterns of connection and relationship between a central bank and market participants will yield different macro-level patterns.

The point of this alternative formulation is not to derive some alternative relationship between monetary changes and changes in outputs or prices. It is rather to pursue an alternative program of micro-foundations that reflects emergence and supervenience in micro-macro relationships. Doing this brings into the foreground relationships that are suppressed when macro entities are related to one another. A central bank can change its liabilities by changing its holding of government debt, which in turn will influence the stock of money. By moving from this observation to some statement about the resulting effect on prices and outputs is to leave out of view some significant features of the story, features that require a network conceptualization of society and the supervenience of macro on micro for their telling.

Return again to the macro-level treatment of political business cycles. As described by Figure 2, the movement from *a* to *b* denotes a macro-level to increase the odds of electoral success from v_2 to v_1 by exploiting the short-run Philips relationship through *a*, p_1. Consider a parliamentary system divided into 99 districts, with the incumbent party described by Figure 2 able to spend $99

billion. If the macro theory is accurate, it suggests that the aggregate size of spending might matter but not its composition because composition is irrelevant to Figure 2. An incumbent party would be pleased even to let an opposition party choose the composition, provided only that the desired aggregate amount was spent.

This presumption about the irrelevance of composition applies to no one, of course, and its irrelevance is what should be expected from the supervention of macro on micro. Micro is where action occurs; macro is just a set of statistical summaries of results of past actions. Only people act and the macro aggregates are just statistical recordings of such action. Something like Figure 2 might be a useful summary of some observations, much as illustrated by that statement that a picture is worth a thousand words. But the action on which Figure 2 is based is not captured by Figure 2 but rather takes place beneath Figure 2, as illustrated by Figure 3.

Suppose the hoped for movement from a to b in Figure 2 can be secured by spending $99 billion. This magnitude would surely have a pattern to it. To make the point in stark fashion, suppose the 99 election districts are divided into three identical sets: one set will support the incumbent regardless of the efforts of challengers, one set will oppose the incumbent no matter what the incumbent might try to do, and the third set is a tightly contested battleground. Within this setting, ordinary calculation would the concentration of the $99 billion on those 33 contested districts. Should a different pattern of electoral contestation be in play, a different

composition would result. While these compositional matters would be eliminated through aggregation, this is simply to recognition that action occurs at the micro but not the macro level.

With micro-level relationships construed in networked fashion, macro-level observations will vary with changes in the structure of network relationships. For field-based models, structure is irrelevant. By contrast, structure matters greatly for network-based models, as explained by Potts (2000) and Barabási (2002). A world that is generated in network-based fashion can always be characterized ex post in field-based fashion. This is what Figure 2 does. But when the connection between the field-based summary and the network-based source of generation is removed, the field-based summary is left standing by itself, and it doesn't look so good when seen in this manner because there is no micro structure from which the macro portrait is generated (Epstein 2006). It reminds me of Dennis Robertson's description of the liquidity preference function: "a grin without a cat." The path to sensible understanding surely resides in connecting the micro level of action with the macro-level summarization.

Suppose we theorize about societal coordination in terms of the image of the crowd of pedestrians and not a parade. The coordination of a crowd is not as smooth as that of a parade. For a parade, all marchers are evenly spaced and march at the same pace. Hence a parade has none of the jostling and bumping that you experience in a crowd; however, when viewed from high enough above, the two configurations would look similar,

and with the crowd being an imperfect example of a parade. Among other things, the crowd would exhibit macro-level turbulence, and in principle it would be possible to develop measures of this turbulence, or at least some features of it (Tononi, Sporns, and Edelman 1999). These measures would all involve phenomena that would be absent from the parade. For instance, a person wanting to exit the moving mass from the middle of that mass would have to work to the edge before leaving. This could cause some jostling that would slow down other people; moreover, the person in question might not have made it to the edge in time to take the desired exist and so might have to traverse a longer route. Such things as I have just described are forms of capital losses where plans didn't work out as anticipated because the success of those plans depends also on actions taken by other participants in that nexus.

The standard literature on political business cycles reflects a presumption that polity and economy are separate entities, and with action inside each entity proceeding in sequential fashion wherein polity acts upon given data from economy. The analytical challenge is to develop alternative conceptualizations wherein economic and political action both occur simultaneously, and with each being sources for the generation of data. When we come to political economy, we need to bring political participants into that crowd and to do so in entangled fashion where there is interaction between the participants, as against the two types of participants comprising distinct crowds. Since the analytical challenge is to

theorize about an ecology of enterprises in a setting where there are constitutive differences among the enterprises, the analogy to a crowd would seem naturally to assimilate to a model where market-based pedestrians have somewhat different rules of motion than polity-based pedestrians.

In any of several ways, these differences among entities would generate interactions that were detectably different from those among market-based entities. For instance, market-based entities have strong incentives to settle disputes without trial because they can retain the costs of the litigation that would otherwise have been necessary. It is different with a dispute between a commercial and a political entity. For a political entity there is no residual to claim. The expenses of litigation can, however, serve as a form of investment in seeking higher office. The commercial calculus of profit-and-loss would give way to an alternative though related calculus of political gain. Two commercial disputants speak the same language as it were, but this claim cannot be made for disputes between commercial and political entities. Much of the orderliness of ordinary pedestrian crowds comes about from the general dislike that people have in colliding with one another. The presence of political entities changes this setting by creating positions that gain utility by such collisions, as expressed by Jane Jacobs's (1992) treatment of how interaction between commercial and guardian syndromes can lead to "monstrous moral hybrids."

A Closing Note

Orthodox macro construes its object in simple fashion as befits its origination in the Keynesianesque vision of macro theory as an instrument of control. The spontaneous order alternative explored here does not allow direct control, for each individual agent has its own principles of action. Instead, it places the locus of normative interest on the patterns that people generate through their interactions. Those patterns can to some degree be shaped and influenced, as illustrated by Schelling (1978), but they are not subject directly to control. The spontaneous order orientation toward macro phenomena that has been adumbrated here connects directly with the concerns of constitutional political economy by probing into the way in which different constitutive frameworks at the micro level can influence the macro level patterns we observe, perceive, or experience.

Let me also add a further note that the PBC framework is really one of politically-induced miscoordination and not cyclicity. Miscoordination might entail cyclicity, but it need not do so. There are many sources of disturbance to patterns of economic relationship, and these can vary greatly in their macro-level impact. Disturbances to money and credit are particularly noteworthy because they operate across all markets, in contrast to many other sources of disturbance that are narrower in scope. But it should not be thought that miscoordination implies cyclicity.

Suppose we never observed fluctuations, at least of sufficient magnitude to be described as fluctuations as distinct from normal variability. Does this mean that miscoordination has vanished? This would be so only if miscoordination could manifest itself only through cycles. But miscoordination can manifest itself through other ways as well. Such activities as scrapping and renovating are surely examples of miscoordination. Any effort at plan revision points to miscoordination. There is no necessary reason why unemployment must accompany miscoordination, though as a practical matter the two would probably go together to some degree.

Consider a simple example of credit expansion within the framework of Austrian-style cycle theory as described by Garrison (2001). In that framework, credit expansion induces investment in projects that are relatively capital intensive. When that expansion comes not from saving but from credit creation, the initial expansion will be subsequently reversed because the investments will prove to be unprofitable. An investment-driven bust follows an investment-driven boom. This sequence of boom-and-bust is typically portrayed in terms of cyclical variability in employment. As a conceptual matter, however, it does not need to be this way. This process could conceivably work with continuous full employment, only with changes in the pattern of employment. In particular, more resources will be involved in revising and amending plans and in clearing away abandoned plans, than would have been the case that there

been no ACT-type miscoordination. As a substantive illustration, the boom could entail the planting of hickory forests to exemplify the credit-induced shift into projects of longer maturity. The bust, however, need not entail unemployment, such as might have resulted had the young hickory forest been allowed to go to weed. Instead, people who would have been employed in maintaining the hickory forest could now be used to uproot and shred the young trees, and subsequently to plant the land with broccoli.

Our objects of scientific interest are not objects that we can observe directly, for our objects are constructed through theoretical construction. Those theoretical constructions might illuminate our object of interest, but they might also place it in the shadows. The reductionism of the orthodoxy in political economy, whereby polities and economies are both reduced to point-mass entities and which is conveyed cogently in Drazen (2000), surely places the original concerns about the macro or systemic consequences of political-economic interaction into the analytical shadow land. What is required to escape that desolate place involves an extensive rethinking of macro and political economy within an analytical setting that involves network-based conceptualizations grounded in notions of complexity and emergent dynamics. That analytical setting is one where macro-level observation supervenes on micro-level interaction, just as a traffic jam supervenes on interaction among the individual cars that constitute the jam.

Table 1: Contrasting Micro-Macro Relationships	
Orthodox Theories	**Alternative Theory**
Equilibrium states	Emergent ecologies
Reduction of macro to micro	Supervention of macro on micro
Society as organized parade	Society as orderly crowd
Macro as simple phenomena	Macro as complex phenomena
Political Economy as separated	Political Economy as entangled

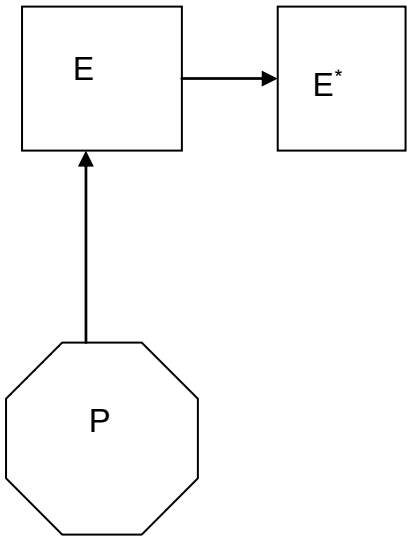

Figure 1: Political Economy as Object-to-Object Relationship

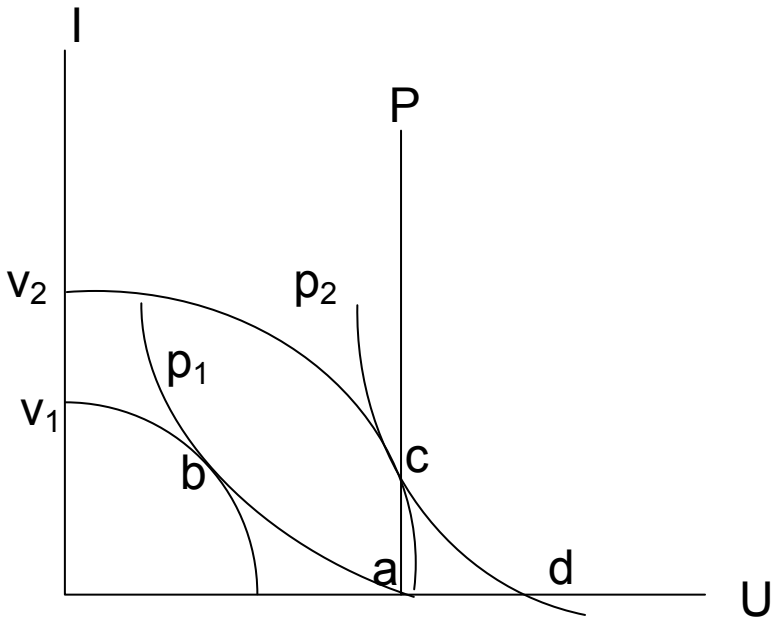

Figure 2: Orthodox Political Business Cycle

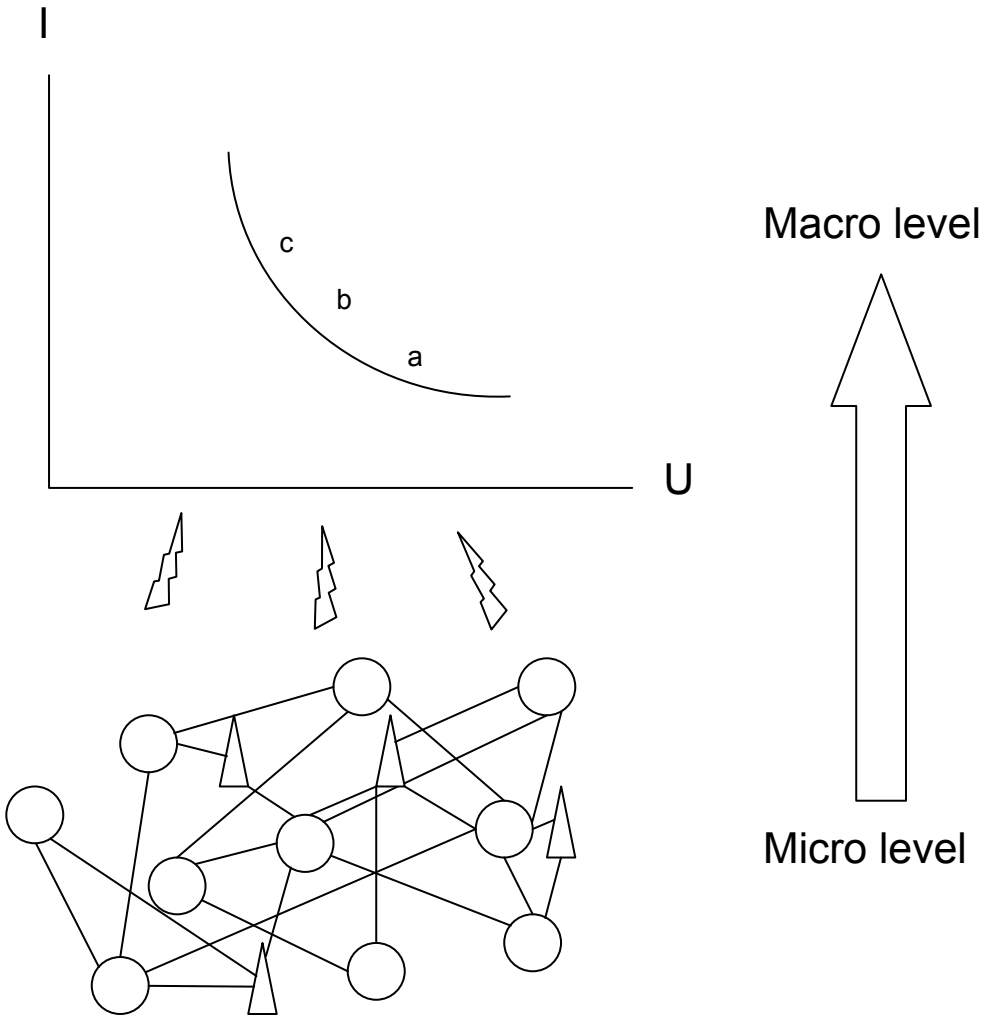

Figure 3: Micro-Macro Supervention

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