



## New Thinking in Austrian Political Economy

Treating Macro Theory as Systems Theory: How Might it Matter?

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# TREATING MACRO THEORY AS SYSTEMS THEORY: HOW MIGHT IT MATTER?

Vipin P. Veetil and Richard E. Wagner

## ABSTRACT

*Standard macro theories have the same analytical structure as their micro counterparts. Where micro theories work with equilibrium between supply and demand for particular products, macro theories work with equilibrium applied to aggregates of products. This common approach treats the micro–macro relationship as scalable, with macro variables being aggregations over micro variables. In contrast, we pursue a systems-theoretic approach to the micro–macro relationship. This relationship is not scalable and rather entails a disjunction between micro- and macro-levels of theory. While micro phenomena are still susceptible to choice-theoretic analysis, macro phenomena are products of ecological interaction and so entail emergent phenomena. Our alternative approach treats macro theory as a form of systems theory where the behavior of the system has properties that are not reducible to properties of the individual elements within that system. Besides sketching this alternative approach, we examine some of the different insights this approach offers into such topics as unemployment and stabilization.*

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## INTRODUCTION

If economists were asked to describe the relationship between micro and macro theories, most of them would surely describe that relationship as one of aggregation or, equivalently, as one of reduction. With aggregation, macro entities are constructed through aggregating over micro entities. Just as micro equilibrium is described in terms of supply and demand functions for individual goods, macro equilibrium is described in terms of supply and demand functions for an aggregate of goods. With reduction, macro variables are merely scaled-up versions of micro variables, which lead to theories that pertain to representative agents and societal averages.

In contrast, we treat the micro–macro relationship as one of ecological interaction, where macro variables supervene on micro-level interaction. There are still microfoundations for macro theory, but those foundations are the ones that praxeological action bears to catallactical interaction within a non-equilibrium ecology of plans. The micro–macro relationship is one of parts-to-whole, and with the whole not being reducible to a part of itself because the whole has qualities not contained within individual micro entities.

We seek to transcend the standard micro–macro dichotomy and to do so by fulfilling or extending the formulations that [Mises \(1912\)](#) and [Hayek \(1932, 1935\)](#) initially advanced. Among the macro theorists and theories that [Haberler \(1937\)](#) chronicled in his well-received *Prosperity and Depression*, the formulations of Mises and Hayek stood out in seeking to link macro volatility to micro-level action, as against relating macro variables directly to one another. They did this, however, by adopting systemic equilibrium as their analytical point of departure, and then postulating some exogenous increase in the supply of credit that was not matched by an increase in the supply of saving. The increased supply of credit lowered the market rate of interest and increased the apparent profitability of capital projects. This capital goods boom would subsequently turn into a bust because consumers had not reduced their demand for consumer goods, which led to a reversal of the capital goods boom. A process of liquidation

would ensue, and once it had run its course, the structure of production would once again be consistent with consumer preferences and systemic equilibrium will have been restored.

Hayek's analysis rested on microfoundations long before macro theorists cared about microfoundations, in that it sought to generate macro instability through micro-level action. Lucas (1975) recognized this quality of Hayek's framework, and sought to extend it through his "islands" model where macro volatility was a feature of the cost of transmitting relevant information. Soon thereafter, however, Lucas abandoned that research program when he recognized that aggregate monetary data are readily available and so don't provide a good grounding for a line of analysis based on the costliness of acquiring information. While we agree with Lucas's critique, we think that Hayek's intuition about micro malcoordination was on the right theoretical track, only its explanatory potential was neutered by the Walrasian framework in which he set it. In this neutering there is a lesson to be learned: substance and methodology are not independent, for what appears as substance reflects methodology just as methodology influences what appears to be substance. This situation is unavoidable, so must be faced, which we do next.

### **SUBSTANCE-METHOD INTERACTION: ONTOLOGY, EPISTEMOLOGY, AND SOCIAL THEORY**

The Walrasian framework adopted as an analytical point of departure by Hayek and Lucas, along with most other economists, creates a simple framework for organizing a wide variety of comparative static exercises. On epistemological grounds there is much to be said in favor of such analytical parsimony, as is summarized by references to Ockham's razor. The presumption that economic observations pertain to states of equilibrium provides a framework for organizing a wide variety of empirical work. Yet epistemology does not invariably trump concerns of ontology. Economists work with objects they denote as economies or societies. It is surely reasonable to think that our theories should reflect what we regard as enduring qualities of those objects as well as being able to offer empirical insight.

Consider two distinct social objects which everyone has experienced. One is a parade. The other is a piazza. Both of these contain large numbers of people who operate in generally coordinated fashion. Both social configurations are orderly, but their orderliness stems from different sources. The

parade is an organization whose orderliness is established by a parade marshal in conjunction with the musical and marching abilities of the participants in the parade. The parade is reasonably reducible to a point-mass entity. Even though the parade is one mile in length and is 50 feet wide, it can be represented as a point on a map that moves from origin to destination. An equilibrium model is perfectly suitable for reflecting the ontological qualities of the parade. At any moment, someone standing at a particular point along the line of march will know which unit is passing simply by consulting the marshal's order of march. This social configuration is reasonably examined as being in equilibrium at each instant, unless some exogenous shock occurs. For instance, a car pulling a float might break down or a member of a band might collapse. In either event, the parade will halt until the car is replaced or the band member revived. With that shock absorbed, the parade will continue, behind schedule but still theorized as a point-mass object.

Within this equilibrium framework, it is reasonable to wonder how entrepreneurs could be misled into undertaking investment projects that were destined to fail because the underlying data had not changed to warrant the adoption of a more roundabout structure of production. A methodology grounded on the hard-core presumption that all observations pertain to states of equilibrium supports a substantive conclusion that entrepreneurs would never respond in a manner inconsistent with systemic equilibrium. Evidence that appeared to be contrary would be explained away through operation within the hard core's protective belt, as illustrated by positing the appearance of some exogenous shock.

A piazza is a different kind of social configuration, even though it is also orderly. In contrast to the parade, the motion within a piazza is not reducible to an entity with point-mass status. Not only are the inhabitants of the piazza going in different directions, but they are staying in the piazza for differing lengths of time. They also enter and leave the piazza at different times of the day. The piazza is an ecology of interacting agents. Within this ecological framework, macro is not reducible to micro, but rather supervenes on micro interaction within the piazza. In observing economies in action, we are watching the equivalence of a continually changing congeries of people passing through a piazza. The piazza is not an organization; it is an order of organizations. Many of those organizations will be single persons or proprietors. But the piazza will also contain groups of people traveling together, as corporations so to speak.

Ontological issues come into play at this point. If a snapshot is taken of the piazza and with the positions of the participants presumed to denote

some equilibrium among the participants, the piazza can be reduced to the same point-mass status to which a parade can be reduced. After all, any distributed mass of people can be reduced to a center of gravity. Any such analytical effort, however, would be recognized as irrelevant for explaining life within the piazza. No meaning can be attached to the snapshot, for meaning resides in the patterns of action of the participants over the various durations of time they spend in the piazza. A scheme of thought suitable for capturing that motion is necessary for apprehending the qualities of action within the piazza.

Despite his adoption of a Walrasian point of analytical departure, it is nonetheless clear that Hayek's analytical intuitions and insights ran in terms of the social equivalents of piazzas rather than parades. All thinkers, however, are captives of the schemes of thought available to them for expressing their thoughts. Systemic equilibrium was pretty much the only game in town early in the 20th century. Hence, this became the maintained hypothesis, with the analytical challenge being to explain how deviations from that hypothesis could occur. While [Walras \(1874\)](#) worked with the fiction of an auctioneer who achieved a pre-coordination of activity among market participants, it is noteworthy that he embraced this fiction not because he thought it was reasonably accurate but because it was analytically tractable. Late in his *Elements*, [Walras \(1874, pp. 377–381\)](#) broached the idea of market activity as being continuous and not pre-coordinated. While he recognized this formulation was more accurate, he also lamented that he couldn't do anything analytically with that idea, and so returned to his scheme of pre-coordinated equilibrium.

But tools for thinking about a continuous market process now exist, even if they are still in the early stages of development. For instance, [Vriend \(2002\)](#) asks whether Hayek would have been an “ace.” By “ace,” Vriend means someone who uses agent-based computational models to explore and convey ideas. Such computational tools of thought were not available when Hayek wrote. Hence, Hayek had to set forth his ideas about limited and distributed knowledge through literary means against a background of systemic equilibrium. The literary foreground gave way to the equilibrium background in the development of the theory, even as illustrated by Hayekian triangles and similar images. Had agent-based tools of thought been available when Hayek was working, Hayek would surely have been an “ace.”

An ace-grounded theoretician, however, would not reduce macro to micro by postulating that all observations pertain to states of equilibrium. Such a theorist would work in non-equilibrium or ecological terms where

different phenomena occupy different levels within a structured system of thought. In particular, macro phenomena would supervene on micro-level interaction, much as a traffic jam is a macro object that supervenes on the individual cars that constitute the jam (Resnick, 1994). This is the perspective of macro theory as a version of systems theory, where all systems theories are concerned with relationships between parts and wholes in which the system has properties that are not reducible to properties of the elements within the system, and with a still valuable treatise on systems theory presented in Bertalanffy (1968) and a concise textbook presented in Meadows (2008).

## MICRO AND MACRO IN SYSTEMS-THEORETIC PERSPECTIVE

Fig. 1, adapted from Wagner (2012a) conveys an elemental analytical framework for a macro theory treated in terms of ecological or systems theory. The upper part of the figure denotes a macro-level relationship between macro variables. Shown there is a market for loanable funds because this has been commonly used in expositions of Austrian cycle theory, but such other familiar macro models as AD-AS or IS-LM could also have been used. Whichever formulation is used, conventional macro theory works as if these variables are analytical primitives, and so act directly on one another and can be estimated in terms of one another. Within the ecological or systems perspective, however, macro variables are derivative and not primitive variables. Basically, macro variables are constructed from national income accounts which, in turn, are summaries of earlier micro-level transactions which are the primitive variables of economic interaction.

The lower part of Fig. 1 depicts the micro level of an economy as constituted through a network of interacting entities. Some of those entities are shown as circles, others are shown as triangles. When combined, those entities and the pattern of connection within which they interact describe the ecology of plans through which a social economy is constituted. The distinction between circles and triangles corresponds to the distinction between entities that are established and governed largely by private property and private ordering and those that are established and governed through political property and political ordering. This distinction between types of entity is significant for our subsequent ecological or systems analysis, and we mention it here just to clarify Fig. 1.

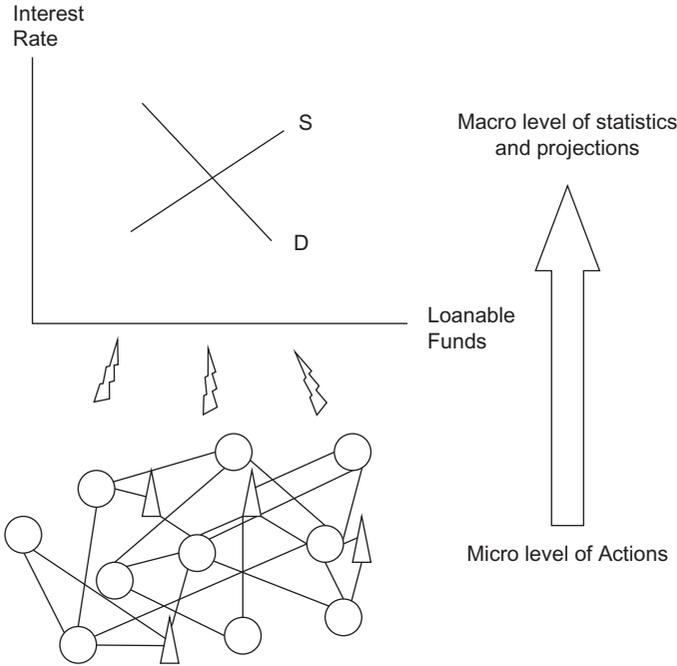


Fig. 1. Micro Interaction within the Ecology of Plans.

The three lightning bolts pointing from the lower to the upper part of the figure illustrate the supervenience of the macro level on the micro level. As shown in Fig. 1, the relationship between the two parts appear to be simultaneous and instantaneous, but it really isn't because the upper part lags in time the action depicted by the lower part. The incorporation of time into economic analysis is challenging enough, as noted in such works as O'Driscoll and Rizzo (1985), Currie and Steedman (1990), Katzner (1998), Vickers (1994), and Wagner (2010). To depict motion through time by using snapshot-like graphics rather than films will require different technology than printed texts. Yet the lower part of Fig. 1 does pertain to action through time. This is what we mean by describing a social economy as an ecology of plans.

Each node in Fig. 1 denotes an enterprise and its plan. That plan, however, extends forward in time, which can't be depicted in Fig. 1. For that plan to work, moreover, requires that enterprise to fabricate a variety of commercial connections, both with input suppliers and with

customers, which also can't be conveyed by Fig. 1. Those input suppliers and customers, moreover, will fabricate connections with yet other enterprises. What results is a complex ecology of enterprises and their plans evolving through time. Adding yet more complexity is recognition that at each instant of time, some enterprises are coming into existence while other enterprises are dying or are otherwise being abandoned through liquidation. Within this ecology of enterprises, no meaning can be attached to the common distinction between short and long run. That standard distinction can pertain to individual enterprises, with long run denoting some planning horizon while short run denotes tactical responses to unforeseen situations. For a society conceived as a population of continually changing enterprises, however, the long run is a term without a referent.

The upward pointing arrow on the right side of Fig. 1 illustrates the relationship of supervenience between micro and macro. All action takes place on the micro level. There is no such thing as action at the macro level. In this respect, nearly all discussions of public policy embrace incoherence to the extent that they portray public policy as acting on society as an entity. Doing this is impossible, for all action regardless of how it is described enters the ecology at the ground level, for this is the only place action can enter. Micro action generates products that can be converted into statistics and projected onto the macro level. For instance, a program of spending a few billion dollars to give to people who replace their old cars with new cars might be portrayed as a macro policy, but this is a meaningless portrayal because its macro projection is derived from micro-level interaction where the primitive data originate.

The added spending can enter the catallaxy only at the micro level. Its projection onto the macro level will depend on the pattern of interaction that policy sets in motion. Some people might increase their spending while others might keep their spending constant by reducing other spending. Further questions arise regarding the disposition of the old cars that are swapped for new cars, consideration of which quickly dissolves into a lesson in the impossibility of genuine collective planning. A staple of micro theory is Read's (1958) examination of the gigantic complexity of even producing a pencil. While no one could truly articulate all the orders at the right dates to yield a pencil in a particular store on a particular date, such outcomes are common occurrences within the market ecology of plans. How this happens is the central lesson of mainline economics (Boettke, 2012). Yet standard macro theory reduces a macro economy to a one-good model designated as output. Something is deeply

askew theoretically when the whole of a system is treated as being simpler and more amenable to control than the individual parts. Systems-theoretic macro seeks to create a scheme of thought that extends the complexity of micro interaction to macro-level theorizing.

## ECOLOGICAL MACRO THEORY: EXPLORING ITS SCHEMATICS

Approaching macro theory through ecological or systems theory is surely consonant with the pre-cognitive analytical visions held by such Austrian economists as Mises, Hayek, and Schumpeter. Due to the absence of tools of thought to work with those intuitions, however, the Austrian theorists embraced a Walrasian point of departure which, in turn, neutered the force of their intuitions. While economists agree that the object of economic analysis is to explain observed patterns of social organization and coordination, theorists differ in how they go about doing this. There are two primary dichotomies among schemes of economic theory. One dichotomy concerns whether time is treated as virtual or real. Most theories treat time as virtual, as illustrated by equilibrium theories. The effort to treat time as real is particularly challenging because people learn as time passes, which conflicts with taking wants and knowledge as data. For instance, [Bilo and Wagner \(2015\)](#) explain that even propositions about the long-run neutrality of money fail once time is treated as real. The other dichotomy concerns whether an economic system is treated as closed or open. Most economic analysis has worked with a presumption of a closed system. Ecological theorizing works with open systems. [Table 1](#) presents four categories of economic theory according to whether

**Table 1.** Types of Economic Theories.

	Closed System	Open System
<i>Virtual time</i>	General equilibrium; Nash equilibrium; recursive macroeconomics; new Keynesian economics	
<i>Real time</i>	Computable general equilibrium; computational complexity of general equilibrium and Nash equilibrium; decentralized allocation process	Economy as creative process; radical uncertainty; creative destruction

time is virtual or real and whether the economic system is closed or open. To be sure, the combination of virtual time and an open system is nonsensical and so is left empty, leaving only three of our four analytical boxes to be filled.

### *Closed System, Virtual Time*

This class of theories views the economy as a closed system in which the problem of coordination is solved in virtual time as an act of the theorist's imagination. This includes much of mainstream economics including General Equilibrium Theory (and its search variant), New Keynesian Economics, and Recursive Macroeconomics. A fictitious auctioneer solves the problem of coordination by computing equilibrium prices. The auctioneer has a top-down view – and a very good one at that – of the economic world. Moreover, the Auctioneer computes prices instantaneously as if she has access to an oracle. Once prices are computed the economy settles down to an evenly rotating system, unless distributed by outside forces. No agent is capable of creating new goods or new ways of doing things. There is no internal impetus to change.

Fixed point theorems are the fulcrum of analysis for this group of theories (Debreu, 1984). A variety of assumptions on individual economic agents and how they interact are necessary for the application of fixed point theorems. Many of these are not qualities found in reality. For instance, Nash's (1951) proof of existence assumes that the strategy space is convex, for otherwise Brouwer's theorem cannot be applied. The strategy space is convex if and only if all agents are capable of playing the full continuum of mixed strategies. A variety of results from cognitive science cast doubt on the ability of human beings to make such computations (Bourguine & Nadal, 2004; Camerer, Lowenstein, & Rabin, 2004; Gigerenzer, 2007; Gigerenzer & Selten, 2002; Gigerenzer & Todd, 1999; Kahneman & Tversky, 2000; Rabin, 1998).

Paradoxically, the application of fixed point theorems assumes not just that human beings are "far smarter than they really are," but also that they are "far dumber than they really are." They assume away "creativity" and "innovation," the notion of Nash equilibrium is not meaningful if players "create" the strategy space in the course of their interaction. The fixed point approach, with all its bells and whistles, sheds little light on real world economic processes.

*Closed System, Genuine Time*

This class of theories views the economy as a closed system but pays attention to time. There are two distinct groups of theories that have this characteristic. The first group studies the time it might take for an auctioneer who looks at the economy from a top-down perspective to secure coordination (Hirsch, Papadimitriou, & Vavasis, 1989; Megiddo & Papadimitriou, 1991; Scarf, 1967). The second group takes a bottom-up view and studies the time it takes for decentralized interactions to secure coordination (Axtell, 2005; Kirzner, 1979). Neither the top-down nor the bottom-up view allows the system to generate novelty.

“Computable general equilibrium theory” (Eaves, 1972; Scarf, 1967; Watson, 1979) and “computational complexity theory” study the time it takes for a social planner to compute a general equilibrium solution. Computable general equilibrium theory studies algorithms for finding *approximate* solutions, and “computational complexity theory” studies algorithms for finding *exact* solutions. Results from “computational complexity theory” suggest that the time it takes for a Turing machine to compute general equilibrium grows exponentially in the size of the problem (Conitzer & Sandholm, 2002, 2008; Daskalakis, Goldberg, & Papadimitriou, 2009; Daskalakis, Mehta, & Papadimitriou, 2006). The Walrasian auctioneer may simply take far too long to do her job!

The bottom-up view of Kirzner (1979) and Axtell (2005) takes into account the problem faced by the blind men of Indostan who encountered different parts of what was an elephant. One touched the tail and thought it was a snake; another touched the knee and thought it was a tree. No agent has a complete view of the system. The economic problem is whether through interaction these men can form a consistent and correct opinion of what they had touched as they go about trading in search of profits. Entrepreneurship for Kirzner is the discovery of pricing errors. Entrepreneurs make profits by exploiting arbitrage opportunities. In this sense Kirzner views the economy as a closed system. Human beings do not “create” new goods or find new ways of doing things. Once the equilibrium configurations are found, the economy resembles an evenly rotating system – much like a Newtonian body at rest – until an external force acts upon it.

*Open System, Genuine Time*

This class of theories views the economy as an open system and pays careful attention to time. The participants in such systems are akin to the blind

men of Indostan, but they no longer come upon an elephant. Rather, each participant creates a part of a creature and the different parts must fit together for the creature to come alive. Order takes the place of equilibrium as the organizing principle of economic analysis. By this Hayek means

... a state of affairs in which a multiplicity of elements of various kinds are so related to each other that we may learn from our acquaintance with some spatial or temporal part of the whole to form correct expectations concerning the rest, or at least expectations which have a good chance of proving correct. (Hayek, 1973, p. 36)

Unlike equilibrium, the concept of order remains meaningful even when participants create novelty in the course of their interaction. The analytical scheme for an ecological macro theory fits within this class of theories.

Radical subjectivism is the idea that order is defined in the process of its creation (Buchanan, 1981). Order emerges through interaction among purposeful human actors. The future cannot be known until the system runs forward in time because capitalism elicits creative human action (Nelson & Winter, 1982). In fact, the idea of an evenly rotating economy is at odds with both human nature and the capitalistic economic order. There is no need for the price system in an evenly rotating economy. In so far as individuals go about doing the same thing day after day, *sheer habit* will far outperform the *price system* in bringing about coordination. The invisible hand is necessary precisely because the system incessantly produces novelty from within. It is perhaps for this reason that Mises (1996) said that evenly rotating economies “are certainly not suitable models for the construction of a living society of acting men” (p. 256).

## RECESSIONS: HOW THE TYPE OF THEORY INFLUENCES WHAT A THEORIST SEES

Within the closed systems perspective of equilibrium theory, a recession is an exogenous shock that has led theorists to wonder whether recessions are a pure loss or whether something useful might also be accomplished that might offset at least some of that loss. Real business cycle theorists, for instance, contend that a recession is a Pareto efficient movement to a lower rate of growth in response to some kind of exogenous change in economically relevant data. Without embracing the Pareto efficiency of recessions, other theorists have sought to explain recessions as periods of reallocation where less productive uses of resources give way to more productive uses, which would provide some benefit side to recessions.

This reallocation view of recessions, however, runs afoul of the empirical regularity that unemployment rises during recessions. An increase in reallocation during recession can account for the fall in output of consumption goods, but it can't account for the rise in unemployment. It is unclear why workers become unemployed when they can be employed in tearing down old buildings and creating new ones. Why is it that lost jobs feed into unemployment and not new jobs?

Recent empirical work also suggests that reallocation of both capital and labor is procyclical (Caballero & Hammour, 2005; Eisefeldt & Rampini, 2006; Foster, Grim, & Haltiwanger, 2013). The fact that both employment and reallocation is procyclical would seem to present a difficult challenge. Economists have responded to this challenge by looking for "frictions" and "failures" that prevent markets from taking up more reallocation activity during recessions (Caballero & Hammour, 2005; Eisefeldt & Rampini, 2008; Pissarides, 2011). What we have just described illustrates how methodology can influence substance. These theorists all operate with equilibrium models based on virtual time, and ask why a recession is not accompanied by an instantaneous reconfiguration of patterns of employment. In these models, recessions are exogenous shocks, but if time is virtual it is reasonable to wonder why reallocation doesn't take place outside of time just as is presumed to be the case for all other economic activity.

Once time is recognized to be real and economies are recognized as being open systems, an entirely different orientation comes into the analytical foreground. For one thing, and perhaps most significantly, it is nonsensical to speak of recessions and reallocations as independent phenomena. To the contrary, they are different images of the very same thing – turbulence within the ecology of plans. Entrepreneurs make their plans and own the value consequences of their plans. In implementing their plans they make a wide variety of contractual arrangements with other enterprises. Those enterprises, in turn, do the same thing with yet other enterprises. What emerges is a complex ecology of plans. Within open systems where time is real, the distinction between *ex ante* and *ex post* is also real, whereas that distinction is neutered within equilibrium theory by virtue of its being reduced to an exogenous shock. Within an ecological scheme of thought, the disruption of plans is an internal feature of the working of the system.

If labor and capital could undergo instantaneous reallocation into different activities there would be no such thing as a recession. The two phenomena are different images of the same phenomena. This recognition cannot come into view, however, when an economy is considered as a closed system and time is treated as virtual. It is necessary to think of an economy as

an open system operating in real time. One facet of any ecology of plans is the failure of particular plans, which happens when the entrepreneurs who own those plans decide to liquidate them. That act of liquidation will also affect other plans in the ecology, which could exert further disturbance within the ecology.

While any ecology of plans contains myriad interacting plans, we can focus on reallocation by looking at a single plan in terms of Fig. 1, only now the bottom part of the figure denotes the various actions undertaken by the people who propel the plan forward. The top part denotes the subsequent accumulation of accounting and other data regarding past operation of the plan. That data always lags action within the plan. For instance, a quarterly accounting period might pertain to January–March. It will be sometime in April or possibly even later before that report has been compiled and processed. Then an executive committee will have to deliberate about the meaning and significance of that plan, and only after doing that will the firm take action, perhaps by closing some of its operations. Then, that executive committee will have to decide what to do next. Farmland is not always fully employed in growing crops. Sometime it lies fallow. In analogous fashion, people live 168 hours a week in every week, but the particular pattern of activities can differ across the weeks. In some weeks they may be fully engaged in production, but times may come when they are trying to determine what to do next. Nearly all biological processes exhibit cyclical or rhythmic qualities, and a human ecology of plans would seem to have the same qualities, but to see those qualities requires recognition that economies are open systems and time is real.

## **CYCLES AS PHENOMENA OF ECOLOGICAL COORDINATION**

It is conventional to describe recessions as failures of coordination. This convention might be reasonable, but for millennia the long standing claim that the sun rose in the east and set in the west also seemed reasonable. It took Copernicus to create a different theory to order our observations about the location of the sun relative to earth. There are reasonable grounds for thinking that ecological processes within an economy will exhibit some natural pattern of volatility, much as real business cycle theorists claim. We would differ from those theorists only in that the correct order of economic patterns run from the bottom-up and not from the top-down.

This ecological orientation surely was present in the intuitions of such Austrian theorists as Mises, Schumpeter, and Hayek, even though their explicit theorizing had a comparative static quality.

Schumpeter in particular tried to incorporate such intuitions into his analytical framework by working with a form of punctuated equilibrium. Yet Schumpeter took equilibrium as a normal state as illustrated by mean reversion, and allowed that equilibrium to be disturbed by repeated injections of innovation. Schumpeter identified innovation as the driving force of growth in capitalist economies. In sharp contrast, Solow (1956), Swan (1956), and Ben-Porath (1967) tell fables in which economic growth is a consequence of a smooth process of accumulation of physical capital and education. To the contrary, innovation is disruptive within an ecology of plans. It spoils many economic plans, some of which die while others adapt. This situation arises because innovation is not predictable and rather reflects genuine novelty (Shackle, 1961, 1972). Though new ways of doing things tend to increase output in the long run, its impact in the short run is ambivalent. The question why recessions happen is the question why entrepreneurial activity slackens. What is necessary for a theory to be “economic” is that it provides a theoretical reason as to why entrepreneurial activity slackens without having to rely on external, non-economic factors. According to Schumpeter, entrepreneurial activity slackens because innovation makes it difficult to make new economic plans by upsetting cost calculations:

... since entrepreneurial activity upsets the equilibrium of the system and since the release of the new products, in particular, brings disequilibrium to a head, a revision of values of all the elements of the system becomes necessary and this, for a period of time, means fluctuations and successive attempts at adaption to changing temporary situations. This in turn *means the impossibility of calculating costs* and receipts in a satisfactory way, even if necessary margins are not altogether absent while that goes on. Hence the difficult of planning new things and the risk of failure are greatly increased. In order to carry out additional innovations, it is as necessary to *wait until things settle down ....* (Schumpeter, 1939, p. 135, *italics ours*)

Therefore, the process of innovation contains the seeds of its own destruction. Innovation creates mis-coordination by disrupting economic plans. The price system counteracts this by incentivizing economic actors to adapt. However at some point the disruptive powers of innovation overwhelm the coordinating capacity of the price system. Economic activity then enters a period of lull or crisis, a period during which plans must adapt to past innovations.

Schumpeter’s theory of macro-level volatility is a bottom-up version of contemporary real cycle theory, and in this respect is a forerunner of our

ecological motif. Schumpeter sensed that the data themselves were generated from inside the system and that entrepreneurs were constantly seeking to inject new data into the economy. Interestingly, Hayek's and Schumpeter's trade cycle theories are two sides of the same coin. In fact Hayek wrote the *Monetary Theory and the Trade Cycle* with the explicit aim of providing an *endogenous* theory of cycles, in contrast to Mises's exogenous theory. Hayek's theory was based on "divergences between the natural and money rate of interest which arise automatically in the course of economic development ..." (Hayek, 1932, p. 147). The problem of coordinating inter-temporal savings and investments is a difficult one in a money economy. This is because "the supply of, and the demand for, savings never directly confront each other" (Hayek, 1932, p. 200), rather they are mediated through a variety of credit instruments created by banks. A spurt of innovation may usurp a bout of credit creation, consequently lowering the ratio of reserves to deposits. The system as a whole may take on greater risk – reflected in the lower reserve ratio – when greater rewards are promised by new ways forms of commercial activity. Whether these activities succeed or fail cannot be known in advance. The problem of the trade cycle has much to do with their failures. Yet little of what we know as modern economic growth would be possible without risking these failures. Heterogeneity of capital and labor prevents the remains of failed projects from instantly shifting to new projects, a matter we shall discuss in the next section. While cycles might be mitigated by legal interventions that reduce banks to "the role of brokers, trading in savings" (Hayek, 1932, p. 190), this would come at the "price of curbing economic progress" (Hayek, 1932, p. 191). Credit creation is "the monetary complement of innovation" (Schumpeter, 1939, p. 111). Hayek's *Monetary Theory and the Trade Cycle* is the monetary chapter of Schumpeter's business cycles. Both Schumpeter and Hayek recognized trade cycles as the rhythm of the capitalist economic order, a consequence of the difficulty of coordinating inter-temporal plans in a bottom-up system capable of producing novelty from within.

## A THEORY OF CYCLICAL UNEMPLOYMENT

Schumpeter and Hayek thought that cycles arise because of problems people have in achieving coordination within a catallaxy. Innovation and credit creation may at times overwhelm the coordinating mechanisms of the capitalist economic order, thereby creating periods of ups and downs.

A recession is the beginning of the realization that economic agents have made many mutually incompatible plans. Unemployment of labor and capital during recessions reflect the fact that though old plans have been abandoned, new plans have not yet been implemented. The question is why does it take time to make new plans?

The host of theories that posit closed systems and operate with virtual time cannot address this kind of question. The Walrasian auctioneer brings about coordination in virtual time and hence at zero cost. This is a theoretical evasion of the problem and most definitely not a simplification that allows an analyst to peer more deeply into reality. Robinson Crusoe does not need to coordinate his activities with anyone. Stories of wage-price ratios that arise from Crusoe selling labor to himself and buying goods from himself are more than mere fictions; they are a gross misrepresentation of the very function of the price system. Prices are a system of communication through which economic actors learn about each other's plans. Crusoe has no need for the price system, for he has no one to talk to! Nor is there a need for the price system when Friday enters the proverbial island. For it is easy for Crusoe and Friday to talk to each other. Needless to say, Friday and Crusoe may trade, and in this they may exchange goods in certain ratios. Prices are however not merely exchange ratios, for such ratios exist even in centrally planned economies. If the island were however populated by thousands of Crusoes and Fridays, talking is no longer a practical means to coordinate activities. A system of prices becomes necessary for actors to communicate their plans to each other.

Much of economic theory takes the functioning of the price system for granted. The coordinating capacity of the price system, however, is not unlimited. It depends on and derives from the organizational structures within which human beings interact. The greater number of agents and the greater the novelty generated by each agent, the greater the need for coordination; "... economic problems arise always and only in consequence of change" (Hayek, 1945, p. 523). Over the last 300 years price systems have expanded to cater to the increasing need for coordination. This is no place to delve into theoretical and historical details of the process, suffice it to note that the emergence of polyarchical structures like specific commodity markets within the Chicago Mercantile Exchange and specific stock exchanges with the global economy reflect the expansion of the price system. It takes real resources, time, and organizational structure to produce price signals. Though in the long run the capacity of an economic system to produce price signals and coordinate actions can be augmented, in the short run the capacity will be limited.

For Schumpeter and Hayek, recessions start when a significant number of entrepreneurs realize they are engaged in plans that can't succeed. Some projects will have to be revised, while others will have to be abandoned. Machines and workers that are released from old projects will have to find new uses. The problem is difficult because there is no such thing as labor and capital in the abstract, but only specific kinds of workers and machines. This means that they must be employed in specific kinds of new uses, not just any new use.

As economic agents, none of whom has a global view of the economy, begin to formulate new plans, the price system comes under increasing pressure. This is particularly because agents will tend to formulate and reformulate their plans as they learn about other agents doing the same. Many rearrangements will be taken up that will be "disavowed the very next day" (Schumpeter, 1939, p. 137). The price system is called upon to communicate these incessant revisions: a heavy lifting for which it may not be prepared in the short run. This means the coordination of economic plans of individual actors will take longer than otherwise. From the perspective of individual actors it makes sense to wait for things to settle down as they learn more about the plans of others with the passing of time. The decision to wait is wise in the view of the fact that it has become difficult to make economic calculations. Labor and capital are not instantaneously put to new uses because economic actors do not know what uses to put them to. It takes time for agents to find a new ecology of coordinated plans simply because the price system is overwhelmed by the increasing demands placed upon it. This means that the economy goes through a period of decline in output, employment, and reallocation. The early phase of a recession is one in which new plans are being drawn and redrawn.

Yet in this sense recessions are not periods of decline in economic activity. They do reflect a decline in activities that appear in national income statistics. However not all economic activity is easily measurable. The exchange of information and redrawing of plans may not appear in aggregate statistics, yet paradoxically enough none of that which appears in aggregate statistics would be possible without the redrawing of plans. Time spent writing this article is easy to measure. The time spent on pondering over what to write is less amenable to measurement. Yet none of the writing would have been possible without the thinking!

There is, thus, a good deal of truth in the popular saying that "there is more brain in business" at large during recession than there is during prosperity .... (Schumpeter, 1939, p. 143)

The absence of increased reallocation during recessions appears to be a puzzle precisely because when we assume away the fundamental problem of reallocation: where to reallocate?

## ECOLOGICAL MACRO, COUNTERCYCLICAL VOLATILITY, AND SEARCH THEORY

An immediate prediction of our theory is that volatility of prices will rise during recessions. US stock prices exhibits countercyclical behavior. Stock volatility is almost 30% higher during National Bureau of Economic Research (NBER) dated recessions than NBER dated expansions for the period from January 1948 to December 2002 (Mele, Corradi, & Distaso, 2013). A few remarks about search theoretic explanations of why labor and capital spend time in inventory are in order. In these explanations, workers face given distributions of employment opportunities when searching for jobs. In the reservation-wage models, workers compute reservation wage given a distribution of wage and cost of search. They then accept the first job that pays greater than the reservation wage (McCall, 1970). An equilibrium wage distribution is one in which the workers search behavior is consistent with the wage distribution and vice versa. This is akin to Walrasian general equilibrium where the equilibrium price is consistent with individual choices.

Pissarides (1976, 2011) took a different approach to job search. In the real world “each worker has many distinct features which make them suitable for different kinds of jobs” (Pissarides, 2011, p. 397). This means that workers search for the “right jobs” as much as they search for the “right wage.” And employers search for the “right workers.” Pissarides’s augmented the Marshallian demand–supply model of labor market with a matching function. The “matching function” is meant to capture labor market frictions that prevent workers from meeting the “right” employers instantaneously. The matching function is like the production function in being “a black box of technology” (Pissarides, 2011, p. 398).

The matching function does not by itself say anything about wages. The wage is seen as a way in which the output from joint-production is split between worker and firm. A wage equation is then derived by using bargaining theory to describe a Nash equilibrium between workers and firms. With respect to macro volatility, the matching function and Nash wage equation do not account for job-creation and job-destruction. The benefit a

firm derives from creating a job depends on the productivity of the worker and the share of the product that must be paid as wages. This means a positive productivity shock will result in the creation of more jobs, while a negative productivity shock will result in the destruction of jobs. New jobs are not instantaneously filled because of labor market frictions reflected in the matching function.

For Schumpeter and Hayek unemployment of workers and machines means that the economy is not in equilibrium. In fact, the whole problem of business cycle theory was to explain phenomena that by definition could not be explained by equilibrium theory. In contrast, search theoretic formulations of unemployment seek to explain business cycle dynamics without abandoning general equilibrium theory. It does this by using two tricks. One is by placing the causes of the cyclical creation and destruction of jobs outside the domain of economics, which is what equilibrium theory accomplishes. The other is by placing the question of why there is not instantaneous adjustment of wages to maintain full employment into a black box called the matching function. Search-augmented equilibrium theory, like old general equilibrium theory, places the mechanisms by which an economic system coordinates the actions of the multitude of agents outside the domain of economics. It is like a director putting on *Hamlet* without having Prince Hamlet. In sharp contrast, Schumpeter's and Hayek's theories of cycles hinged on when, why, and how the coordinating mechanisms of a capitalist economic order function, fail, and recover.

## BANKING SYSTEMS AND MACRO THEORY

Austrian cycle theory has traditionally been presented in terms of credit intermediation through the loanable funds market, as Fig. 1 reflects. That market and its operation, however, can be treated in either equilibrium or ecological terms. Standard macro theories presume equilibrium, which places the action in the upper part of Fig. 1. So long as stability is maintained in the macro variables, stability is presumed to characterize the micro level as well. It is on the basis of this conventional scheme of thought that people have advocated such macro rules as stabilizing a price level, stabilizing a rate of monetary expansion, freezing the monetary base, or stabilizing nominal GDP. The idea in such cases is that stabilizing the macro relationship will ensure stability among micro relationships. Questions can be raised about the possibility actually of achieving such stability as well as

about the systemic properties of doing so, but addressing such questions are beyond the purview of this already long paper.

This common scheme of thought has the order backwards. It poses a direction of causation that runs from macro to micro, whereas causation actually runs from micro to macro. Here again we confront a situation where methodology is not independent of substance. If systemic equilibrium is incorporated into the hard analytical core, it must be the case that invariance at the macro level entails invariance at the micro level. There is no option to this invariance. That invariance is baked into the cake, so to speak. This invariance, however, is an analytical fiction and not a reflection of economic reality (Bilo & Wagner, 2015). It is invariance by assumption driven in turn by a desire for analytical tractability. It is not invariance as a reasonable feature of institutional and historical reality.

With respect to this reality, the micro level depicted by the lower part of Fig. 1 is surely an arena of continuing volatility. That volatility, moreover, is an inherent accompaniment of freedom of enterprise. All entrepreneurial plans have the property that plans are formed today whose consequences will not be revealed until some future date. Volatility at the micro level will translate into volatility at the macro level, though with participants as residual claimants having good reason to liquidate efficiently what they judge to have been failed plans (Wagner, 2012b).

There is no rule regarding macro action that can calm kaleidic turbulence at the micro level, for to assert such a claim is to reverse the direction of causal action. There are, however, rules governing interaction at the micro level that will influence for better or worse turbulence at the macro level. Compare, for instance, an institutional arrangement of free banking accompanied by clearinghouses as privately ordered systemic regulation with one of central banking. Clearinghouses must attract business; they can't compel it. It is reasonable to ascribe such self-regulation as something that tends to maximize the net worth of those who participate in that network, particularly if clearinghouses face competition.

The situation is markedly different when political entities enter the catalaxy. Through regulation such entities can compel transactions that would not be made under private ordering. With private ordering, the transactional structure will be oriented toward maximizing the net worth of market participants when viewed from an *ex ante* perspective. With public ordering, however, a political calculus comes into play. For instance, American financial regulation includes requirements that lenders make a significant portion of loans that would not have been made through a

commercial calculus, and with those loans repurchased by such entities as Freddie Mac and Fannie Mae.

At the ground level of Fig. 1, it is interaction among individual choices regarding the holding of money that projects onto the macro level. If there is constancy at the macro level, it is because this is a quality of the institutionally governed interactions at the ground level. The relevant policies for promoting stability at the systemic level are the rule of law policies that facilitate the readjustment of plans within a continually evolving ecology of plans. There is no such top-down policy as maintaining steady growth in monetary aggregates or stabilizing nominal GDP that will accomplish this independently of actions that people take at the lower level. In this respect, Mises explains that the average velocity of money is a useless and even destructive concept. He thought that to start economic analysis from a collective demand for money is an error. The total demand for money is nothing but the sum of individual demands for money. And no individual uses the formula  $Py/V$  to compute his or her demand for money. “If we wish to arrive at a description of the demand for money of an individual we must start with the considerations that influence such an individual in receiving and paying out money” (Mises, 1912, p. 132). And Schumpeter too is decisive on this question:

For it must never be forgotten that the theory of credit creation as, for that matter, the theory of saving, entirely turns on the purpose for which the created – or saved – means of payment are used and on the success which attends that purpose. The quantity-theory aspect or, as we might also say, the aggregative aspect of the practice is entirely secondary. (Schumpeter, 1939, p. 114)

The idea of targeting nominal GDP begins with the quantity theory equation  $MV = Py$ , where  $V$  is the average velocity of money ( $M$ ),  $P$  is the price level and  $y$  is real output. This equation is central to the monetarist version of business cycles and has much to do with why Lucas abandoned his Hayekian project. For Mises, Hayek, and Schumpeter this equation was of little importance and of great danger, for it hides nearly all important relations between the monetary and the real sectors of an economy. Hayek (1932, p. 19):

There is no reason to assume that the crisis was started by deliberate deflationary action on part of the monetary authorities, or that the deflation itself is anything but a secondary phenomenon, a process induced by the maladjustment of industry left over from the boom. If, however, the deflation is not a cause but an effect of the unprofitableness of industry, then it is surely vain to hope that, by reversing the deflationary process, we can regain lasting prosperity.

## CONCLUDING BY LOOKING FORWARD

While economists typically refer to economic systems, they do not generally think in systems-theoretic terms. Instead, they think in equilibrium terms. Thinking this way neuters any significant work that a systems-theoretic framework might accomplish. Where the key feature of a system is interaction among its elements through time, equilibrium theory reduces those interactions to equilibrated resultants of those interactions outside of time. This paper sets forth the systems-theoretic idea as it pertains to the material of what is commonly regarded as comprising macroeconomic theory. The systems-theoretic idea, however, points to material far broader in scope than what is commonly thought to be the domain of macro theory. It points toward a theory of economic systems in their entirety, for it is a theory of the whole that is generated through interactions among parts. Hence, macro theory would include, among other things, the influence of institutional arrangements on systemic performance, recognizing that that performance can be influenced only indirectly through actions that influence structural relationships among the notes the comprise the system. Macroeconomic theory, in other words, would become a general theory of economic systems.

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