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Equilibrium and System Analysis in Economic Dynamics

A Comment on the “Guidance of an Enterprise economy” by Martin Shubik and Eric Smith

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Abstract: Many economic theories rely on equilibrium. Notwithstanding its widespread framing role, the very notion of equilibrium shows epistemic and methodological limits when confronted with space, time, human behaviour and institutions. A systemic perspective may upgrade equilibrium by considering the featuring roles of economic organisation (entity), money and accounting in the economic process. This article tributes to Martin Shubik’s scholarship and friendship by providing a systemic perspective on his last co-authored book with Eric Smith.

Keywords: economic organisation, money, accounting, minimal institution, economic theory

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Tribute to Martin Shubik

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1 Introduction

Co-authored with a physics scholar working on stochastic processes and non-equilibrium systems, Shubik and Smith (2016) constitutes a summary of lifetime work by Martin Shubik and yet another achievement in his amazing research endeavour. My modest commentary draws mainly upon this book and Shubik (2015).

Martin Shubik’s scholarship combines rigorous and controlled analysis with path-breaking theoretical intuition, unfaltering curiosity, creative imagination for inferring novel pathways and implications, his own sharp way with words, and a good dose of sense of humour on human affairs.

The overall purpose of this book is to extend and upgrade general equilibrium economic theory and analysis to include time and institutions.

2 Time and Institutions

In the general equilibrium framework, time was added as an additional notation generating a stampede of time-labelled tradable commodities which covers all the possible future states of the world. When complete and efficient markets exist for each of them, each equilibrium point comes to be represented as a self-contained arbitrary instant beyond time and context (Shackle, 1957).

Contrary to this mechanical and instantaneous approach, Shubik and Smith (2016) understand time as a process, an ongoing flow of occurrences, a conditioning pattern of decisions, an unbound happening of events that frame and shape human behaviour and endeavour outcomes at individual and aggregate levels.

Economies are then in perpetual disequilibrium, while possible and actual patterns and outcomes are oriented by institutions which are defined as carriers of process. Institutions define the rules of the game, where the game

itself results from the interaction between agents (and rules) over time and circumstances. Institutions play a pervasive role in setting agent identities, constraining its available options, and eventually arbitrating its possible paths of play.

Markets themselves become institutions from this perspective. They enter the institutional frame through the various mechanisms that aggregate agent orders (bids and asks) and organise *formation* of market prices through time and circumstances, a fundamental aspect that general equilibrium analysis left unexplained (Biondi, 2015). Concerns of coordination and guidance emerge along with this role of institutions in the economic system as a whole. As for institutions, including markets, achieve coordination through aggregation while providing guiding feedbacks to individual interactions. This interacting process generates an economic dynamic system that comprises: single agent idiosyncrasies and strategies; horizontal individual agent interactions; and dimensional (vertical) links between structures and individuals.

Accordingly, institutional economic analysis of this process pays specific attention to legal rules, especially default and restructuration, and organisations whose managers hold both operational control on corporate affairs, and fiduciary duties toward ultimate beneficiaries deprived of direct access and control. Along with the master references to Keynes and Schumpeter, Shubik pursues here the combination of organisational system analysis and models of behaviour initiated by H. Simon.

On the one hand, Shubik's approach to economic theory paves the way to qualitative inquiries on history, politics, sociology and law. On the other hand, it requires innovative mathematical methods. Shubik and Smith (2016) combine game theory with dynamic systems analysis. Game theory provides a frame of reference and analysis for (bottom-up) individual interactions and strategies. Systems analysis addresses the contexts in which these interactions take place (top-down). Together, these methods seek to develop treatable models of interaction between human behaviour and social institutions, featured by complexity and time dependence.

The notion of minimal institution is fundamental here. Mathematical economic theory deals with concepts and mechanisms though a highly abstract description and analysis. Minimal institutions are introduced to denote the simplest set of complete rules that are required to define a specific economic function. This set frames and shapes the related economic process across agents and time periods, enabling coordination and control. This set is designed to point to the invariant properties of a system. Invariant properties in political economy are in function, not form. Historical forms may then be reconsidered as special

accidental cases (historical accidents) which happen to provide (or not) sufficient conditions to functions which are necessary to the ongoing economic process.

This institutional economic dynamic further shows the limit of equilibrium analysis. Self-consistent expectations do not longer stand in actuality. For instance, even in the simplified case of government-sponsored innovation that can be solved mathematically (Shubik & Sudderth, 2012), one single realisation of one chance event of innovation puts the system out of equilibrium, making inordinately difficult to prove whether and how long the system may take to restore equilibrium. While this statistical approach excludes the possibility of general equations of motion, that is, a mathematical model of the whole economic world dynamics, it paves the way to both general understanding of function (and related institutions), and well-oriented applications in view to provide short-term economic guidance and control of process. Contrary to received economic wisdom, it stresses coordination through institutions, not prediction.

3 Money and Financial Institutions

The introduction of money and financial institutions requires a complete and treatable model of process where different forms of money and credit and credit issuers are defined and distinguished. Their definition especially includes the rules concerning creation and destruction of both money and credit forms, specifying both the rules of issuance and conservation, and why and how conservation is violated. This setting implies defining the model out of equilibrium, as well as at the points of equilibrium. In this context, bankruptcy and reorganisation can be understood in ecological terms, related to mutation in an evolutionary system.

Money does not play a specific role in general equilibrium analysis, where simultaneity of transactions and complete markets scope out even its function as universal medium of exchanges. When time and institutions enter the scene of economic analysis, economic theory must follow and include the specific role of money and financial institutions. Theoretically speaking, money emerges indeed by the logical need to make exchange transactions possible across time. From this perspective, money is no longer one commodity among others, but an ensemble of financial institutions that deal with cash holdings, cash flow constraints, and credit facilities that ease those constraints, in exchange of money interest rate payment and with the possibility of default.

According to this frame of reference and analysis, money and financial institutions play a fundamental role as *control* mechanisms over the institutional economic process that allocates resources in economy and society. The idea of money and financial institutions as financial control paves the way to include corporate entities where this control is enacted and carried over. Monetary and financial institutions embed then a specific power over the polity, as well as a purchasing power and a controlling power over economy and society. Financial control is exerted not only through banks and non-bank financial entities, but also through non-financial corporate groups.

This monetary and credit dynamic approach fundamentally revises received understanding of the working of monetary and credit economies. For instance, utilizing a stochastic dynamic program, Geanakoplos, Karatzas, Shubik, and Sudderth (2014) were able to show that the equilibrium money rate of interest required to sustain a stationary equilibrium growth in a stochastic economy was not equal to the optimal growth real rate of interest.

4 General Equilibrium and Beyond: Money, Accounting and Entities

The main purpose of Shubik and Smith (2016) does also define its self-imposed limit. Its purpose operates as an institution does, by further defining the boundaries and the specific course of action that should and have been undertaken and possibly achieved. This limiting purpose was to extend and upgrade general equilibrium analysis to introduce time and institutions. The resulting essay summarises a lifetime search for path-breaking and treatable solutions consistent with this purpose.

Equilibrium and general equilibrium have been the main frame of reference and analysis for economic theory and analysis for long. General equilibrium provided a focal point for academic economists at least in the second half of XX century. Today economics has multiplied directions and applications. And from the viewpoint of pure theory, one might ask whether and to which extent this evolution has generated a patchwork of ‘ad hoc’ assumptions inconsistently added to the original equilibrium framework (Duhem, 1906). Some academic economists came to call the equilibrium emperor naked if not dead, seeking to move beyond its overarching (and reductionist) assumption of one representative agent (Kirman, 1987).

Shubik and Smith (2016) provide a thought-provoking critique of general equilibrium, yet taking it as the mainframe in view to anchor and assess their

theoretical progress. This seems laudable for the cumulative process of knowledge (Lakatos & Musgrave, 1970), while entertaining the high hope rising eternal that social scientists, if not academic economists, aim at and are capable of such an accumulation. At the same time, this anchor limits the scope of their theoretical innovation.

Notwithstanding, I wish fostering theoretical creative destruction three steps further. As for three logical and institutional dimensions emerge from the institutional economic dynamic venture the authors undertake: money, accounting, and organisation (entity). Shubik (2007) – reprinted in Shubik (2019) – foreshadowed these dimensions. And they resonate with the combination of evolutionary models of behaviour and adaptive markets advocated by Lo (2018). Both Diamond (2019) and Sobel (2018) further argue that money and liquidity are fundamentally related to time, expectations and transactional details to be considered, in view to advance mathematical institutional economic models.

Once time and institutions are properly considered in the working of economic system, equilibrium analysis is no longer sufficient to define and represent this working. Equilibrium and System become two distinctive concepts of reference, with *system* constituting an extension and an upgrade of *equilibrium*. The latter is then a reduced (if not reductionist), instantaneous (if not frozen) version of the former.

From this perspective, the equilibrium representation of money as measure of value(s) may be superseded (Biondi, 2010), since the presence of time and institutions prevents any meaningful and consistent connection between ‘values’ and ‘prices’. This hint compares with the search for a useful invariant quantity that is a recurring theme of Shubik and Smith’s essay (Lo, 2018). Money creation – that is, the ways money enter into the economic system under investigation – is especially significant here, since the interaction of financial institutions in a credit economy may remove the inner limits of the monetary system capacitance (Biondi & Zhou, 2019). It is not only through default and reorganisation that the economic system reorganises itself out of equilibrium – ex post and when things went wrong, so to speak – but by the very introduction of means of payment and debt settlement. Money is understood then as a process and an institution, which embeds several functions that are essential to the ongoing working of economic system (Biondi, 2018).

In this context, an equilibrium understanding of default could reduce debt and equity to bets on the future that involve and somehow imply the safe harbour of bankruptcy filing, whenever underlying risks materialise. Economic process would resemble and being set as “a by-product of the activities of a casino” (in Keynes (1936, p. 159)’s words),

And, as Ace Rothstein said: “In the casino, the cardinal rule is to keep them playing and to keep them coming back. The longer they play, the more they lose, and in the end, we get it all.”¹ (quoted by Biondi, 2011).

But the economic process prompts and implies “a steady stream of enterprise” (in Keynes (1936, p. 159)’s words, again), organised in lasting enterprise entities set to navigate and subsist over time and the hazard of realisation, for which banking, money and credit provide financial facilitation and resilience.

Money functions relate therefore to a larger set of financial institutions which perform credit and accounting functions over time and circumstances. Equilibrium analysis delegates valuation to a system of complete and efficient market prices. Like money, accounting does not matter. But dynamic systems analysis can and should introduce a specific institution that performs accounting and disclosure across agents and time periods. This accounting institution embeds at least a part of the knowledge structure which is generated and disseminated across agents and time periods throughout the economic process (Biondi, 2015). Accounting does further condition allocation of resources by tracking, representing and governing generation and distribution of cash flows, but also flows of economic income. As for it defines one set of rules on cash basis, and another set on non-cash, accruals basis of accounting (Biondi, 2010). This latter basis lever upon the cash basis to provide an economic representation useful to manage and govern economic organisation through time and circumstances. It may disentangle, extend and clarify the ambivalent wealth constraints that are introduced by equilibrium analysis. This accounting structure helps understanding the role of time in economics, since it makes periods interdependent. It provides economic and financial measurements of reference for behavioural decision-making, corporate governance and institutional regulatory ruling.

This accounting institution further helps understanding the role of entities in the ongoing economic allocation of resources. Together with money and accounting, entities were relegated to the backyard of equilibrium analysis, treated as passive mechanical devices that transform individual commodities (including land, labour and money itself) contribution into market-priced products through marginal cost pricing. The inclusion of money and accounting consistently calls for entities to be carefully reconsidered. Accounting institutions are especially significant in the context of economic entities, since accounting structures provide one of the constitutive dimensions of these entities along with those of management and organisation already highlighted by Shubik and Smith (2016). This

1 Voice-over of the leading character in the Martin Scorsese’s film titled « Casino » (1995).

theoretical combination of money (credit), accounting and the business firm as a going concern (enterprise entity) was already foreshadowed by Schumpeter's *Theory of Economic Development* (Biondi, 2008).

In this context, the idea of corporation as a synthetic legal person (acting as fiduciary for its ultimate owners) is insufficient and quite inconsistent with a systemic perspective (Biondi, 2013). It seems paying an undeserved tribute to the individualistic epistemic inherited by received economic thinking. From a dynamic systems perspective, economic entities constitute another temporal institutional space where individual interacting behaviours are certainly constrained, but also prompted, framed and enhanced. Within this space, collective action is made possible over time and circumstances; aggregation and coordination and control keep occurring. The physics notion of field may provide here a useful metaphor and an analogy, if not a source of inspiration for economic theory and analysis of economy as a dynamic system. Elsewhere, we investigated and put forward the notion of entity as going and becoming concern, which is common to economics, accounting and the law (Biondi, 2005; Biondi, Kirat, & Canziani, 2007).

5 Concluding remarks

Shubik and Smith (2016) provide Martin Shubik's lifetime work *summa* and an outstanding contribution to both understanding the limits of equilibrium economics, and addressing path-breaking challenges of economic process, in view to comprehend economy in polity and society. Instead of focusing on existence of sets of market prices at equilibrium, the authors put forward investigating formation of market prices over time and circumstances. Markets are no longer equilibria, but institutions that arrange this price formation, embedded in an overarching set of complementary institutions that operate through space and time.

For academic economists, their contribution reminds two structural needs behind economic analysis: on the one hand, to explore its theoretical dimension and its connection with other social sciences; on the other hand, to develop consistent elaboration of meanings clothed by formulas and assumptions. For seekers of economic understanding, therefore, Shubik and Smith (2016) call for investigating the institutional foundations of economics, combining mathematical methods that intent achieving completeness, consistency and clarity, with qualitative inquiries that delve into socio-economic dynamic with implications for model-building and policy-oriented applications.

Acknowledgement: We mourn the loss of Martin Shubik (1926 – 2018), a gifted scholar and a dear friend. Through his remarkable ideas and insights, Shubik helped founding and shaping the CONVIVIUM with his guidance, advice, and inaugural contribution “Accounting and Economic Theory: Past, Present, and Future” (DOI: <https://doi.org/10.2202/2152-2820.1012>). At the time of his passing on August 22, 2018, editorial work on this symposium on his last book with Eric Smith, *The Guidance of an Enterprise Economy*, has been underway. It is now published to honour him and his outstanding contributions to economics, management science, game theory, and accounting scholarship

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