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Institutions, Games and Economic Theory

Comments on *the Guidance of an Enterprise Economy* by Martin Shubik and Eric Smith, MIT Press 2016

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Abstract: This article describes some of the amazing insights developed by Martin Shubik about the economics of money, trading and liquidity by commenting on his 2016 book with Eric Smith, *The Guidance of an Enterprise Economy*.

Keywords: money, institutions, liquidity

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Tribute to Martin Shubik

1. "Accounting and its Relationship to General Equilibrium Theory" by Martin Shubik, <https://doi.org/10.1515/ael-2018-0054>
2. "Martin Shubik's Curriculum Vitae" by Shyam Sunder, <https://doi.org/10.1515/ael-2019-2047>
3. "The Visible Hand" by Andrew W. Lo, <https://doi.org/10.1515/ael-2018-0012>
4. "What Makes Money Work? Comments on "The Guidance of an Enterprise Economy"" by Joel Sobel, <https://doi.org/10.1515/ael-2017-0051>
5. "Institutions, Games and Economic Theory: Comments on *the Guidance of an Enterprise Economy* by Martin Shubik and Eric Smith, MIT Press 2016" by Douglas W. Diamond, <https://doi.org/10.1515/ael-2019-0047>
6. "Equilibrium and System Analysis in Economic Dynamics. A Comment on the "Guidance of an Enterprise economy" by Martin Shubik and Eric Smith" by Yuri Biondi, <https://doi.org/10.1515/ael-2018-0027>

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1 Introduction: Beyond general equilibrium model

Martin Shubik had a big influence on my approach to economics and he was one of my dissertation advisors. His book, *The Guidance of an Enterprise Economy*, with physicist Eric Smith, provides an introduction to and integration of his many important models and an introduction to his worldview. The worldview is quite different from that of most other economic theorists. This worldview is worth understanding even by those who do not share it, because it shows where standard approaches based on competitive general equilibrium are either incorrect or irrelevant. Shubik argues that introducing institutions sufficient to make a model into a playable noncooperative game will in many cases provide the needed insights. Competitive general equilibrium models are not playable games in part because prices are either not set by anyone or are set implicitly by unspecified agents outside the model. Prices clear markets and decentralize allocation and production. In addition, the model is counterfactual because all the multiparty trades in all goods occur simultaneously. In addition, there is no notion of strategic uncertainty. Playable games (“Strategic Market Games”) suffer no such problems, but must be very detailed. Specifying the details can produce major insights. Martin Shubik called this research program “mathematical institutional economics,” because the details which must be specified are institutions and these institutions often have no place in competitive general equilibrium models.

2 Strategic market games with trading posts

Shubik’s research program on mathematical institutional economics began in the 1970s (Shubik, 1973; Shapley & Shubik, 1977) with simple game theoretic models of explicit trading posts where price of a good depends on the supply of the good offered relative to the amount bid with an explicit means of payment. This replaces the unlimited trade at prices to clear all markets set implicitly by a Walrasian auctioneer. I had the pleasure of reading many of these models as working papers when I was a graduate student. They opened my eyes to many unanswered questions in economic theory. I did not follow this approach explicitly, in part because it seemed too difficult and ambitious for a graduate student, but the worldview it illustrated motivated much of my research. Many of the very difficult issues were later developed and resolved by Martin and co-authors. This book provides a perspective on the significance of the many models, starting with the simplest one period models strategic market games without uncertainty, progressing to more ambitious and detailed models. In addition to presenting

more detailed models of trade using money, the authors apply their modeling perspective and worldview to comment on and develop many other applications, which go well beyond strategic market games with trading posts. These largely use the methodology of mathematical institutional economics by specifying sufficient detail to define a playable game with a non-cooperative equilibrium point.

3 Market price formation and the theoretical introduction of institutions

Shubik and Smith's presentation of one-period strategic market games without uncertainty provide very clear examples of the differing institutions (such as bankruptcy penalties or clearinghouses) needed to implement either a commodity money or a government fiat money as means of payment. The book presents the worldview that many details must be specified to understand money and credit in different environments, by describing a minimal set of institutions needed to make things work. When one takes this approach to applications, one gets a large number of very special models and to establish a reasonable model, the model builder must have detailed knowledge of the phenomena studied ("general theory is no substitute for knowing your business"). Like John Maynard Keynes, Martin Shubik was involved in the world of practice, working in industry (at General Electric) and finance (see Whitman & Shubik, 1979). Martin brought many of his practical insights to his economic theory.

Because the details of the models become quite complicated once dynamics and exogenous uncertainty are introduced, the analysis becomes more complicated beginning in chapter 5. The points are made by describing the details of a series of models, which are quite different from each other. Different institutions are needed for different issues and in many cases there are several possible institutions which are possible and each may be desirable. It takes real work as a reader to learn from these models, but there is much to learn. We see important links to results in physics, biology, and chemistry. We learn in chapter 7 that taking time scales and dimensions seriously (as they are in physics), in a model of explicit price formation can resolve some classic issues. They provide a way to see a proper interpretation of the equation of exchange ($PQ = MV$),¹ where this identity only has

¹ See Fisher (1911, chapter 2), where nominal value of cash transaction (*Price times Quantity*) equals the amount of money spent (*Money stock times Velocity*) in a period.

implications for the effects of changes in the supply money on prices once one specifies the explicit trading mechanism and is careful about the time units. In particular, the determination of velocity (V in the equation of exchange) depends critically on the trading institutions.

Shubik and Smith also explore a series of special topics that sometimes depart from the basic trading post models. These have great insights for the budding theorist interested in the particular application, but they claim no general result. The book presents a “hyperastronomical explosion of special cases.” The message is that many critical problems in economics would benefit from the more detailed modeling of the type required to make a playable game.

4 The Liquidity Problem

Parts of chapter 8 discuss the instability of the creation of liquidity by banks and markets. There are many new insights described here. This section discusses models showing that when there is the possibility of correlated strategic moves by investors, the liquidity of a market or an institution can evaporate suddenly. There can be a multiplicity of equilibria (where all play one of several equilibrium moves) as in a Diamond and Dybvig (1983) bank run, or in a repurchase agreement market (repo market) collapse described in Gorton (2010). Alternatively, there can be a unique equilibrium due to correlated private information inducing correlated choice of moves as in Morris and Shin (1998). Smith and Shubik (2014) apply evolutionary game theory to provide an alternative model of the probability of the evaporation of liquidity, as in a run. Multiple equilibria can exist, but the run equilibria must be rare. In addition to describing this formal model, chapter 8 presents very useful informal comments about the many alternative notions of liquidity and their relation to the velocity of money. Examples illustrate that to be precise about liquidity one must specify many details about the players, their expectations and the timing of all transactions. The insightful examples include a discussion of the velocity or turnover of cash settlement of repos and of the clearing mechanism for chips in a game of roulette. Some of the insights on liquidity provided by this section are useful to read along with the informal discussion of the many different properties of assets in Tobin and Golub (1998, chapter 2). Tobin and Golub discuss the distinction between assets that are liquid, reversible, or generally acceptable in exchange.² The distinction between these

² Tobin and Golub (1998) is another book by one of my dissertation advisors (Tobin) published late in his career, describing much earlier work.

asset properties becomes much clearer once one follows Shubik and Smith and takes a position on details of the players, their expectations and the timing of all transactions.

5 Conclusion: Martin Shubik, game theory and mathematical institutional economics

Martin Shubik was one of the earliest users and proponents of game theory as a framework to bring into all applied fields of economics. He was at Princeton as a graduate student advisee of Oscar Morgenstern in the early days of game theory and had Lloyd Shapley and John Nash as classmates. Few can produce as much detail and rigor as he achieved, but the economics profession has evolved to work with search models and mechanism design models, which are usually playable games and follow an approach with which Martin would likely approve. Martin and co-authors succeeded in getting a truly coherent model of money and prices. *The Guidance of an Enterprise Economy* is worth careful attention by applied economists and those in disciplines related to economics (such as physics and biology, as the authors suggest at the end of their first chapter). I especially recommend the book to economic theorists who have not followed the progress of mathematical institutional economics. The research agenda of mathematical institutional economics is unfinished, but is very difficult. I hope that the next generation of economic theorists will adopt Martin's worldview and push it forward.

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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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