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Tinbergen Institute Discussion Paper

Microfoundations

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MICROFOUNDATIONS

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Abstract. This paper gives an overview and evaluates the literature on Microfoundations.

Key Words: Representative Agents, New Keynesian Economics, and New Classical Economics

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The quest to understand microfoundations is an effort to understand aggregate economic phenomena in terms of the behavior of individual economic entities and their interactions. These interactions can involve both market and non-market interactions. The quest for microfoundations grew out of the widely felt, but rarely explicitly stated, desire to stick to the position of methodological individualism (cf., Agassi (1960, 1975), Brodbeck (1958)), and also out of the growing uneasiness among economists in the late 1950s and 1960s with the co-existence of two subdisciplines, namely microeconomics and macroeconomics, both aiming at explaining features of the economy as a whole. Methodological individualism, as explained in the entry on the topic, is the view according to which proper explanations in the social sciences are those that are grounded in individual motivations and their behavior. The urge to make microeconomics and macroeconomics compatible can be understood from the perspective of the unity of science discussion initiated by the Vienna Circle in the philosophy of science in the beginning of the 20th century (cf., Nelson, 1984).

Efforts to understand microfoundations go far beyond the questions that lie at the heart of formal aggregation theory, i.e. the analysis of how to map aggregate economic variables and relationships back to similar individual variables and relationships that underlie them. One crucial issue in the microfoundations literature is the extent to which aggregate economic variables and/or relationships exhibit features that are similar to the features of individual variables and/or relationships and in particular whether certain features are emergent properties at the macro level that do not have a natural counterpart at the individual level. An important early example of emergence is the analysis of Schelling (1978) on segregation. He shows that segregation in neighborhoods may be an emergent property at the micro level that can be viewed as an unintended consequence of the individual decisions concerning where to live.

The discussion on emergence shows that there is no reason to assume or expect macro behavior to be in any way similar or analogous to the behavior of individual units. In order to have “proper” microfoundations in line with methodological individualism, it is thus by no means required that aggregate outcomes are represented as if they were the outcome of a single agent’s decision problem. On the contrary, the restriction to single individual decision problems found in modern macroeconomics is self-imposed and not implied by the methodological position of methodological individualism (cf., Kirman, 1989). In fact, one may argue that the interaction between different, and possibly heterogeneous, individual units should be at the core of macroeconomic analysis.

As the quest for “proper” microfoundations has arisen in the debate concerning the microfoundations for macroeconomics, this entry’s main focus is on this debate. The entry starts with a historical perspective on this debate and continues to discuss new classical and new Keynesian approaches to macroeconomics that emerged out of the microfoundations debate. The role of equilibrium notions and expectations is discussed in a separate section. The entry argues that the microfoundations for macroeconomics literature is best understood from the perspective of attempting to make microeconomics

and macroeconomics compatible with each other. The entry closes with a discussion of non-mainstream approaches to microfoundations and more recent approaches to microfoundations using the perspective of evolutionary forces and boundedly rational behavior.

Historical Background to the Microfoundations for Macroeconomics debate

Around the mid-1950s two more or less separate approaches existed to studying economy-wide phenomena: general equilibrium theory and (Keynesian) macroeconomics. Some of the more important theoretical issues within each of these approaches were settled. Existence of a general equilibrium point was proved by Arrow and Debreu (1954) and the macroeconomic IS-LM framework was well established (following the seminal paper by Hicks (1937)). Of course, some other issues were still to be tackled, such as questions related to how to deal with imperfect competition, incomplete markets and/or overlapping generations.

Both approaches explained economy-wide phenomena, but there were important differences between the perspectives from which each of them started. Flexible prices and market-clearing were at the core of general equilibrium theory; involuntary unemployment and effective demand important concepts in macroeconomics. The neoclassical synthesis reconciled general equilibrium theory and (Keynesian) macroeconomics by giving each of them their own domain of applicability: macroeconomics (with its assumption of sticky money wages) gives an accurate description of the economy in the short run, while the long-run developments of the economy were considered to be adequately described by the general equilibrium approach.

From a theoretical point of view this state of affairs was unsatisfactory. One cannot simply attribute unemployment to sticky money wages while leaving the theoretical structure of general equilibrium theory intact: the imposition of a fixed money wage (or, more generally, fixed prices) deeply affects the theory of supply and demand. It was natural then to inquire into the relationship between the two approaches, especially given that they study the same phenomena. In addition, the generally accepted view was that it is the market interaction between many individual agents from which economy-wide phenomena result, implying that general equilibrium theory is the more fundamental theory of the two. The quest for microfoundations was born.

The rise of interest in microfoundations can also, at least partly, be conceived as being driven by the perceived failings of important elements of empirical macroeconomics and in particular the fact that the Phillips curve turned out to be not a stable relationship that can be used for economic policy purposes (see, e.g., Friedman (1968)). Several essays in Phelps (1970) are written to reconcile microeconomic theory with the apparent temporary trade-off between wages and unemployment embodied in the new interpretation of the Phillips curve.

New Classical and New Keynesian Economics

One key controversy in the quest for microfoundations is how to explain the widely observed phenomenon of unemployment. From a market-clearing perspective, unemployment simply means that at the current (real) wage rate people do not want to supply more labor to the market. If there is registered unemployment it is thus either of a 'voluntary' nature, or a short-run phenomenon that quickly disappears. In this vein, Lucas (1978, p. 354) argued that involuntary unemployment is not a fact that needs to be explained, but rather a theoretical construct Keynes introduced in the hope it would be helpful in explaining fluctuations in measured unemployment.

In line with these ideas, new classical economists have attempted to reconcile macroeconomic phenomena such as inflation and unemployment, and the empirical observed trade-off between the two measured by the Phillips' curve, with a Walrasian notion of market clearing. Early models, such as Lucas and Rapping (1969) and Lucas (1972) stressed the idea that incomplete information regarding the money supply may cause business fluctuations. Later real business cycle models (such as Kydland and Prescott (1982)) looked at technology shocks to explain cyclical behavior. Thus, an important difference between the Lucas-Rapping approach and early real business cycle models is that the former, but not the latter, introduces frictions to explain business cycles. With these new classical models, the concept of the representative agent (consumer, firm or producer/consumer agent) became widely used in modern macroeconomics. In its most extreme form, the economy as a whole is represented as if it were the outcome of a single individual's decision problem. The possible differences between individual and aggregate economic behavior are thereby assumed away.

Economists who were oriented towards Keynesian ideas thought that there is an involuntary, non-transient component in observed unemployment figures. Many New Keynesian contributions therefore try to reconcile the notion of involuntary unemployment with a notion of market equilibrium.

A first approach considers the question how to incorporate the notion of price stickiness, especially concerning money wages, with the traditional theory of demand and supply. This issue was first studied by Clower (1965). He emphasized that because of the interdependence of markets, demand and supply curves on all markets are affected if money wages are fixed. If prices are restrained from bringing about market clearing allocations, then, other variables have to bring about some kind of fixed-price equilibrium. Clower (1965) and Leijonhufvud (1968) set out a research program studying the existence of fixed-price equilibria and their properties. The resulting equilibrium notion and the properties of such fixed-price equilibria were formulated by Barro and Grossman (1971), Drèze (1975) and Benassy (1975) among others. The idea of this literature is that agents express their demands on the basis of market prices and perceived quantity constraints. These models have microfoundations in the sense that they are based on decision-making individuals and a notion of equilibrium. Moreover, it turned out that

the fixprice models capture quite a number of ideas associated with Keynesian economics. By means of these alternative equilibrium notions, involuntary unemployment could be regarded as an equilibrium phenomenon in which optimizing households face a quantity constraint on the amount of labor they can supply. Also, the Keynesian notions of effective demand and the multiplier were reformulated within the new models. Finally, the models provided arguments for demand policies by the government. Of course, from a market clearing perspective, these fixprice models are unsatisfactory as they do not explain why (rational) individuals do not propose changes to the terms of trade at which they exchange. Clearly, if prices are fixed at no market clearing levels, some agents in the economy can mutually benefit by exchanging at different prices, and therefore have an incentive to propose changes in prices. A literature on small menu cost appeared arguing that introducing a very small cost for economic agents to change prices may result in large fluctuations in aggregate output (cf., Mankiw, 1985).

Another approach New Keynesian economists followed is to incorporate the literature on imperfect competition in macroeconomic models. Hart (1982), Blanchard and Kiyotaki (1987), Kiyotaki (1988) and d'Aspremont et al. (1990) are among the pioneering articles in this area. These models can explain why aggregate output is below the optimal full employment output level. Unemployment can be involuntary when there is imperfect competition in the labor market.

A third approach to explain non-competitive wages is to introduce some type of informational problem as in the literature on efficiency wages. The basic idea of this literature is that the average labor productivity is positively related to the wage a firm offers. Firms may set wages above the competitive level in order to induce employees to work harder and they therefore may be unwilling to lower their wage offers (cf., Yellen, 1984 and Lindbeck and Snower, 1987).

Yet, another approach relies on coordination failures formally analyzed in terms of multiple equilibria (cf., Bryant (1983), Roberts (1987)). Cooper and John (1988) point out that many new Keynesian models are based on strategic complementarities between agents' actions, i.e., these models do not rely on an assumption that prices cannot adjust to their market equilibrium values. When strategic complementarity exists, there may be multiple equilibria that can be Pareto-ranked. Agents may then find themselves in a 'bad' equilibrium, but individually they cannot benefit by deviating to another choice. They call this a 'coordination failure'

There is a parallel between the coordination failures literature and the overlapping generations general equilibrium literature (see, e.g., Geanakoplos and Polemarchakis (1986)). The latter literature views the economy as a process without definite end that is such that what happens today is underdetermined as it depends on what people expect to happen tomorrow, which in turn depends on what people expect to happen the day after tomorrow, etc. In such a world, there is a continuum of equilibria. Geanakoplos and Polemarchakis (1986) show that depending on how this indeterminacy is solved, i.e.,

which variables are chosen to be exogenously determined, classical or Keynesian oriented conclusions may be derived.

Work on all these different models has resulted in a shared methodology of how to go about building macroeconomic models. The traditional distinction in macroeconomics between Keynesian and classical economists is disappearing and a common methodology is surfacing. Economists share the understanding that the ultimate question that matters is how well markets function. The differences in importance attached to various market frictions are more a matter of degree than of fundamental divergence between different methodologies. The nature of what used to be macroeconomic theory has undergone dramatic changes alongside these developments. Traditional macroeconomic issues such as how to explain the business cycle or how to account for inflation are now studied using the same tools and techniques as those that are used in microeconomics. Along these lines, and by using the assumption of the representative agent, modern macroeconomics has assumed away the heterogeneity that may exist at the individual level. Lucas's prediction that we may soon simply speak of economic theory, instead of separate microeconomic and macroeconomic theories, has turned out to be fairly accurate (cf., Lucas, 1987, pp. 107-8). Somewhat paradoxically, one may say that the modern economist who still is a "hard line microeconomist" is now called a macroeconomist.

Rationality, Equilibrium and Expectations

The efforts attempting to create a microfoundations for macroeconomics have resulted in a more unified approach of doing economic theory. The approaches discussed so far (also Keynesian oriented models) all postulate rational behavior on the part of economic agents and some notion of equilibrium. If expectations are important, it is postulated that agents' expectations concerning important variables coincide with the model's predicted values concerning these same variables. This assumption concerning agents' expectations have been termed "rational expectations" (cf., Muth, 1961).

Parallel to the microfoundations literature, a literature questioning the eductive justifications for the notions of equilibrium and rational expectations emerged. This literature on the foundations of game theory basically argued that if we assume that agents (players) are rational and that their rationality and the model (game) in which they operate is assumed to be common knowledge, then it is not implied that these agents will play according to an equilibrium of the game. Fundamental papers in this respect are Bernheim (1984) and Peirce (1984), among others. These and other papers show that a much weaker notion, named (correlated) rationalizability, can be derived from assumptions regarding common knowledge of the rationality of players.

On the basis of this literature, Guesnerie (1992) argues that the notion of rational expectations should be regarded as an equilibrium notion that is also not solely based on postulates regarding the rational behavior of individual players. It is rational for individual players to have "rational expectations" if other players have these very same "rational expectations", but not necessarily otherwise. As the notion of rational

expectations is essentially an equilibrium or consistency notion, it suffers from the same drawbacks that it is not implied by the individual rationality assumptions that players will form rational expectations.

Another literature (see, e.g., several essays in Frydman and Phelps (1983) and, for example, Bray and Savin (1986)) studies the question whether in a decentralized economy economic agents may learn over time to have expectations that are consistent with those that are assumed by the rational expectations hypothesis. The general conclusion of this literature is that due to the feedback from expectations to economic behavior, the outcomes of an economic model with learning agents do not converge to the rational expectations solution.

It then follows that the microfoundations literature mentioned so far has not really succeeded in deriving all macroeconomic propositions from fundamental hypotheses on the behavior of individual agents. The requirements of methodological individualism have thus not been satisfied by the microfoundations literature that has pre-dominantly presumed that individuals behave rationally (cf., Janssen, 1993).

Non-mainstream Approaches to Microfoundations of Macroeconomics

Apart from a long-lasting debate in the mainstream literature, the term 'microfoundations' has also stimulated work by other economists and they have provided their views on the relation between microeconomics and macroeconomics. Horwitz (2000) provides an overview of the Austrian perspective where individual knowledge, prices as conveyers of information and subjective evaluations play important roles. Especially the essays in Hayek (1948) and his views on spontaneous order are important in this respect. It may seem then that macroeconomics is not an important term in the Austrian vocabulary. However, this is only partly true. From an Austrian perspective, an important question is, for example, what kind of monetary system will most likely preserve the communicative function of prices. Austrian economists have, as Horwitz shows, addressed such issues in a way that is compatible with methodological individualism.

A post-Keynesian view of the economy holds that long-term expectations are largely determined by non-economic processes such as those determined by mass psychology. These expectations therefore should be regarded as exogenous to the economic model, rather than as endogenously determined as in the case of rational expectations. Interestingly, this post-Keynesian view comes close to the result that is established by Geanakoplos and Polemarchakis (1986) in their overlapping generations general equilibrium model where they show that indeterminacy of equilibria implies that expectations concerning future market outcomes may be chosen exogenously. Important investment decisions are according to post-Keynesian economists, by their nature, long-term decisions and these decisions are thus largely determined by the state of these long-term expectations. This fundamental uncertainty requires a different decision theoretic approach than what is typically used by mainstream economics. Informally, some post-

Keynesians have argued for the irreducibility of macroeconomic issues to purely microeconomic considerations where individuals' actions are based on expected utility calculations (cf., Weintraub, 1979).

Alternative Types of Microfoundations

Most of the literature up to the 1990s discussing microfoundations of macroeconomics has focused on rationally behaving self-interested economic agents. More recently, attention has shifted to other forms of behavior. Using evolutionary mechanisms or learning, economists have studied the evolutionary foundations of equilibrium notions (cf., Kandori et al. (1993), Young (1993)). Allowing agents to imitate best practices they observe around them, or choosing best replies to some adaptively formed expectations of what others will do, the literature shows that under some conditions concerning the dynamic process the economy will converge to equilibrium play. Early work in this direction by Schelling (1978) shows, as noted in the introduction to this entry, that macro phenomena such as racial segregation may be regarded as the unintended long-run outcome of the interactive effects of decisions of individual households to move into other neighborhoods. This literature is further reviewed in the entry on social interaction.

Alternatively, economists (such as Fehr and Falk, 1999) have recently looked at the consequences of nonselfish preferences for macroeconomic outcomes. They consider preferences for fairness and reciprocity to be important in explaining why managers do not consider cutting employees' wages. Wage cuts may be perceived as unfair and hostile and managers fear that they will be followed by hostile actions on the part of employees. This literature provides an alternative foundation for the downward rigidity of monetary wages and may start of a literature on behavioral macroeconomics.

Conclusions

The microfoundations literature has brought about many changes in economic theory. Macroeconomic theory in the form of studying the interplay of a few aggregate relationships is almost nonexistent nowadays. Instead, an extreme form of "microfoundations" is sometimes used in which the economy as a whole is represented in terms of a single agent decision problem. In this way, it is precluded from the analysis that emergent properties appear at the macro level that do not exist at the individual level as the micro and macro level simply coincide!

Together with the many other models in the microfoundations literature reviewed in this entry we now see a wide spectrum of partly overlapping models dealing with different types of market frictions and market imperfections. Most of the literature before the 1990s considers fairly traditional assumptions concerning individual behavior. More recent contributions in the area of behavioral economics and evolutionary models with (adaptively) learning individuals start to explore the implications of different behavioral assumptions at the individual level and to consider the macro implications. These models have the potential to analyze how macro phenomena may emergence from the interaction

between a heterogeneous set of individuals. Thereby, they may provide economic theory with a more plausible empirical underpinning, while sticking to the requirements of methodological individualism.

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Related Entries

Involuntary Unemployment, Methodological Individualism, Microeconomics, Social Interaction

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