Rational and moral action: a critical survey of rational choice theory

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CHAPTER VIII

THE MICROFOUNDATION DEBATE

1. Introduction

When the unintended consequences of intentional actions are in general beneficial for society, then there must be some mechanism that coordinates the actions of the millions of agents. Usually (competitive) markets are seen as such coordination mechanisms. It is not too difficult to imagine that perfect markets fulfill this role, but then the question arises how the coordination in less than perfect markets and between markets, for instance between the goods market and the labor market, is organized. Unemployment could be seen as a consequence of coordination failures between these markets.

In this chapter I intend to specify the first notion of invisible hand processes namely, that market-processes tend automatically to Pareto-optimal equilibrium states. Thus, I will discuss equilibrium theory, including the transformation
of the concept of equilibrium.

In section 2 I discuss two options: the first is that macro-phenomena can be directly deduced from micro-units; the second grants that micro and macro may refer to two distinct domains. Next I present some historical background about the transformation of the equilibrium concept. In section 4 I conclude that the idea that a system of interrelated markets will automatically tend towards a stable and unique equilibrium cannot be sustained and that the micro-foundations project is a failure.

Therefore, I discuss an alternative approach that acknowledges that though the macro-level is more or less dependent on the micro-level, it cannot be reduced to it. The same macroeconomic state can be deduced from several microeconomic states. The macro-level is not reducible to the micro-level but supervenes upon it. In the sections 6 and 7, I discuss the supervenience approach and conclude that we should view the micro-macro relation as one of mutual dependency.

122 The term equilibrium theory does not always refer to the same thing. The Arrow-Debreu general equilibrium theory, which is a mathematical elaboration of Walras’ equilibrium theory is often taken as standard. However, the most discussed equilibrium theory today refers to the work of Phelps, Lucas, Sargent and others. Their assumptions about the world have much in common with the Arrow-Debreu model, but they are not exactly the same. They have worked on equilibrium models of the business cycle, in that, unlike Keynesian models, they assume perfectly competitive markets that are continuously in equilibrium. The former macroeconomic models were systems of equations that determined current outcomes given the values of predetermined variables, and values of any stochastic shocks. The prototype of such a macroeconomic model had a consumption function, an investment function, a money demand function and, sometimes, a Philips curve. The new classical approach uses models of general equilibrium with households maximizing utility, firms maximizing profits and markets that clear. Within this framework empirical knowledge is organized around preferences and technology, and preferences refer to the preference for income and leisure. (see Prescott, 2006)
2. Two micro-macro relations

The micro-macro debate in economic science is first of all a consequence of the separation of economic science in a micro- and macro-theory, a separation that took place during the Keynesian revolution.

Traditionally economic science was divided into value and money theory. Ragnar Frisch introduced the term macroeconomics in 1933 and Keynes adopted this term. Keynes defined microeconomics as the study of the allocation of a given quantity of resources, whereas macroeconomics is the study of input and employment determinants. Classical and neoclassical theorists identified the study of individual households and firms next to the study of markets, but they did not regard this as separate theoretical domains. From the study of individual households and firms they deduced supply and demand curves, that is, aggregates. The micro- and the macro-level of the economy are integrated in general equilibrium theory. The micro-macro debate, therefore, started as a competition between rival schools of thought and the discussion about the micro-foundation of macroeconomics, that Phelps among others started, was a continuation of this competition. Theorists either wanted to restore or recover the unity of economic science and/or wanted to reconcile the fact that in many markets the price mechanism leads to (temporary) equilibria and the fact that unemployment may persist. (see for a short overview, Howitt, 1991).

A long time it was taken for granted that events at the macro level were the result of the total effects of events at the micro level. All the phenomena economic science studies should be deduced from the actions of individual agents. The doctrine

123 Phelps called the book he edited in 1970 “Microeconomic foundations of Employment and Inflation Theory” as a statement against Keynesian theory. The new classical economists, like Lucas, reject the distinction between macro- and microeconomics. This illustrates that the microfoundation debate was closely tied up with the discussion between rival schools.
of methodological individualism mentions epistemological and ontological considerations to justify the search for micro-foundations. The epistemological claim is that we can only know about social entities through our knowledge of individuals. Methodologically, this means that macro-economic theory must not have exogenous variables that do not exist in microeconomic theory. Social facts may not be explained in terms of other social facts. “The problem of micro-foundations is to show that necessarily the logical validity of any macroeconomic theory depends only on the logical validity of micro-economic principles.” (Boland, 1982, 85) The ontological claim is that what really exists are not societies, or governments, but the individuals that comprise them. Social phenomena, therefore, are abstract objects that have no existence separate from the constituent individuals. Of course, no one denies the existence of social organizations like firms and governments. But from this point of view they do not belong to the fundamental units that make up social and economic reality.

It seems, however, that, instead of one, we have two options to specify the micro-to-macro relation. (Nelson, 1984) The first is that we accept the traditional theories of microeconomics and the commonly used aggregation procedures and we create a macro-theory by carrying out these procedures. This option delivers "macroeconomics with micro-foundations by construction". (Nelson, 1984, 581) Hoover mentions two aggregation strategies in economics: aggregation by summation and aggregation by analogy. The former constructs a macro-economic entity by summing over micro entities. The latter treats the macro entity as if it were

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124 Methodological individualism will be considered in more depth in chapter X.
125 Many economists have thought that a good way (and perhaps the only way) of establishing satisfactory micro-foundations would be to solve what is usually called ‘the problem of aggregation’. Hoover introduced a quite damaging argument against the option of constructing a macro-theory by simple aggregation. He pointed to the need to distinguish two types of aggregates: natural aggregates and synthetic aggregates. The first
a micro entity. This strategy uses representative agent models. (Hoover, 1995a, 240)

In the alternative option, we assume that there are separate theories of micro-and of macroeconomics and then construct aggregates that are consistent with the two theories. The functional relations among macro-variables must be consistent with the functional relations among the micro-variables.

Which of the two options is chosen depends on the way micro- and macroeconomics are defined. When microeconomics is considered to deal with single economic entities (as individuals, households or firms) and with the properties of specific markets, and when macroeconomics is the study of the combined effects of the choice behavior of these micro units, then, by definition it follows that there is no independent macroeconomic realm. There are only macroeconomic variables, which are obtained -coordination failures being absent- as the sum or as averages of micro-economic variables. However, when microeconomics, for example, is defined as the theory of choice behavior under conditions of a fixed output and macroeconomics as the theory of the output and employment determinants, then micro- and macroeconomics are recognized as separate domains of economic inquiry.

The first approach leads straight away to (general) equilibrium theory. In the second approach micro-and
macroeconomic theories are assumed to have a more or less independent existence. And it is the function of microeconomics to provide for a functional relations among microquantities and the business of macroeconomics is to do the same for macro-quantities; both under the condition that the functional relations are consistent with each other.

3. The transformation of economic science

In the decades after WW II the economic discipline underwent a drastic transformation, known as the formalist revolution. Instead of dealing with market forces, the new image of economic science was to demonstrate the existence of equilibrium. Not its actual, empirical existence, but its conceivable logical existence. A formal model finds its justification in the proof of the absence of any internal inconsistency. The question of empirical truth is replaced by the question of consistency.

Samuelson restricted dynamic analysis to the limited task of the investigation of the stability properties of equilibrium, while abandoning the process through which the system converged to equilibrium. He simply negated the study of the out-of-equilibrium working of the economic system. The neo-Walrasians finished the task of eliminating the impasse by not longer seeing equilibrium as a balance of economic forces but rather as a static fixed point. The main problem became the task of showing the existence of such a fixed point.

Arrow and others developed global stability analysis in a General Equilibrium framework. Their goal was an ambitious one, namely, to demonstrate that a competitive economy was global stable. This literature marked the definitive transition from the economic discourse of the balance of (market-) forces to the mathematical discourse of a system of relations. One of the key items was that if aggregate demand satisfies the weak axiom of revealed preference, the economic system is globally stable. The result called for the imposition of a strong consistency requirement on aggregate demand that made sense only if the economy was reduced to just a
representative individual. The key event of the neo-Walrasian approach was the Arrow and Debreu's existence proof. Debreu's *Theory of Value* was born and developed in axiomatic form, completely emptied of empirical references and logically entirely disconnected from economic practice. The gist of the new image of economics is that a model is a tool for conceptual explanation that aims at answering the question: is it possible that?

Hicks criticized the assumption that the economic system always tended to equilibrium as inadequate because it overlooked the fundamental forward-looking character of economic models. An equilibrium analysis allowing for the influence on behavior of future, as well as present prices, had to be developed. Consistency of the intentions of individual agents requires correct expectations of prices. Mutual consistency requires that individual agents have correct expectations regarding the expectations of other agents. The out-of-equilibrium working of the system could only be modeled in terms of the revision of expectations and plans of agents with only limited information and forecasting abilities; that is, in terms of *learning*.

Friedman, Phelps and Lucas accepting imperfect foresight, provided new micro-foundations for neoclassical economics by rationalizing expectations. Their challenge was to maintain the unity of economic science and to make sure that unrestrained individual choice behavior is compatible with an efficient allocation. Their models were no longer based on complete and costless information but on learn- and search processes. The question was: how should actions be modeled which are based on imperfect knowledge? Their contributions opened new grounds into the way information is acquired and processed, its impact on the formulation of expectations and how agents learn from mistakes. These search- and learning processes were meant to conquer coordination problems. We can formulate the theoretical challenge in another way: how should we model expectations? (see Dow, 1985) The concept of adaptive expectations was the first attempt to incorporate expectations
in microeconomic models. In this concept expectations are adapted on the basis of new information. In neo-classical equilibrium theory expectations are modeled as passive qualities, and agents react to external shocks. The process of adaptation is slow; an example is money illusion, the correction of the wage level for changes in the general price level. Money illusion plays a crucial role in the short run Phillips curve. Wrong information leads to temporary, unstable equilibria, until the agents’ actions are corrected. A stable equilibrium emerges when the expectations of inflation are adapted to the factual change in inflation. The incorporation of imperfect information in the form of adaptive expectations has led to the concept of temporary equilibria, which on the very long run tends to a stable and general equilibrium. But path dependency (or hysteresis) and the indeterminateness of the new equilibrium necessitated the analysis of dynamic disequilibrium.

Lucas and Friedman criticized the concept of adaptive expectations as being inconsistent with the behavior of rational agents. They claimed that rational agents make optimal use of all available information. Applied to the example of money illusion and the short run Phillips curve, they deny that both phenomena are real. Only the long run vertical Phillips curve is relevant. The concept of rational expectations takes it for granted that, when agents explore all options for action which are based on processed information

126 This implies that there is no trade-off between inflation and employment and Keynesian policy, therefore, is an illusion. Lucas argued that large-scale econometric models, and more generally, empirically estimated aggregate relationships are likely to be unstable because they reflect the decisions made by economic agents in particular policy environments and those policy environments change. For example, the expectation-augmented Philips curve, which relates the unemployment rate to inflation rate would not remain stable if there was a change in monetary policy. Agents would integrate their knowledge of how policy was conducted into their expectations of future policy outcomes (e.g., knowledge of the money supply into knowledge of the future path of money supply), changing the relationship of unemployment to inflation with each shift in policy regimes.
they will reach a stable equilibrium for there are no unexploited chances left. The rational expectation hypothesis says that when individual agents make optimal use of all available information, then their expectations must be correct, i.e., there is a normal dispersion around the correct expectation. This means that the (collective) expectations of all agents match with the probability distributions of predictions in an econometric model that makes use of the same information. On the short run expectations can deviate from the correct expectation due to shortcomings in information, but in the long run the only information that is not available takes the form of random shocks. Systematic shocks are incorporated in the expectations. The rational expectations hypothesis claims that the subjective distribution of probabilities of outcomes/events (expectations) coincide with the objective distribution of probabilities of outcomes/events as a result of which stochastic processes become stationary and the equilibrium permanent.

The rational expectations hypothesis reduces uncertainty to risk. Vercelli (1991) denies the validity of the rational expectations hypothesis. Lucas believes that it is acceptable to talk about risks when the stochastic process that the individual agent faces is stationary and the agent is able to adapt himself completely. But Vercelli believes that this process assumes ergodicity, i.e., that it is a matter of reversible processes or recurrent situations. This requires dynamic stability (i.e., swift adaptation of prices) and a high degree of structural stability (i.e., stable long term expectations thanks to a stable environment). Only under these circumstances will agents be able to acquire knowledge.

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127 Rational expectations are akin to self-fulfilling prophecies. They generate what they foresee, and they are generative as well as predictive.

128 “Today, the idea that economic agents can be modeled as perfectly rational beings who know the relevant economic theory, reason as expert econometricians and can calculate all the model equilibriums is widespread in the literature.” (Giocoli, 2003, 395)
about the systematic characteristics of the processes in the situation in which they have to take decisions. Reasoned from the requirement of ergodicity the rational expectations hypotheses leads to the assumption that the future is predictable. Ergodicity requires that the long run average of a given (historical) situation must be equal to the average of all possible situations in the future. Or that history repeats itself. Both assumptions are evidently false.

The idea that the coordination problem could be prevented by the rise of forward looking mutual expectations is not warranted.

4. The micro-foundations of equilibrium theory

A modern economy represents millions of people, all pursuing their own interests. In equilibrium theory it is claimed that the interaction and coordination of all the activities of single agents can be represented in terms of equilibrium.

Kirman (1992) draws attention to the fact that contrary to what might be expected the macroeconomic models do not model the interactions between multiple heterogeneous transacting agents, but present the choice of a representative agent instead, thereby neglecting, or rather, evading coordination problems. The reduction of the behavior of a group of heterogeneous agents to one representative individual leads in his opinion to misleading and wrong conclusions. These models are unsuited to studying macroeconomic phenomena like business cycles, which could be viewed as coordination failures, or to study system effects such as the paradox of thrift. The assumption of a representative individual is far from innocent, “it is the fiction by which macroeconomists can justify equilibrium analysis and provide pseudo-micro-foundations.” (Kirman, 1992, 125) The use of such an artificial device as the representative individual is an attempt to construct a macro domain
by analogy. 129

The micro-foundation approach is usually based on two assumptions: macro-phenomena must be reduced to micro principles, and this reduction must take place within the context of general equilibrium theory. (see Janssen, 1991; Rizvi, 1994). The question posed in general equilibrium theory (GET) is whether there is always a set of prices at which supply equals demand for every commodity and to explain the characteristics of such points. Thus, the thing to do is to specify the demand and supply functions for each agent, and to find a set of values or prices, which will bring about equilibrium such that excess supply in every market is zero. The obvious thing to do is to derive an aggregate excess demand function from the individual excess demand functions hoping that the aggregate excess demand function has similar restrictions as the individual excess demand functions. Why? Because aggregate demand is not as well behaved as individual demand. If the theoretical figure of the representative individual were used, there would be no problem. Unfortunately the aggregation problem is intrinsic and inescapable.

129 There is also, as we have seen, the attempt to construct a macro theory by summing up individual utility functions. The aggregation of micro variables or utility functions in order to derive macro variables or a collective utility function makes demands with regard to the consistency and the representation of such an aggregation.

The requirement of representation is that the behavior of the collectivity must be described in a manner that is analogous to the behavior of those individuals. Take the example of the relation between the income of households y(i) and the consumption of a specific commodity (j). The functional relationship between Y and Cj only is feasible when the explanatory variable Y contains all the information necessary to explain Cj. The implication is that the way in which the individual variables y(i) are distributed do not effect the value of Y. This means that the dispersion of the values of y(i) must be limited. In other words, the income of the households must be to a high degree identical. If one wants to determine Cj by the summation of c(i,j), then the marginal propensities to consume must be identical. These problems, of course, disappear with the construction of a representative agent.
Theorists in the early 1970s faced the following problem. It was shown that in aggregating individual excess demand functions in aggregated excess demand functions (AED), "three properties will carry over from the individual excess demand functions to the aggregated demand function: continuity; the value of total excess demand equals zero at all positive prices (Walras’ law); and that excess demand is homogeneous of degree zero (only relative prices count)." (Kirman, 1992, 122) The question was raised: do the AED’s belonging to a consistent model of GET have any additional properties beyond the three mentioned? No full-fledged investigation on these conditions was carried out until the advent of the SMD theory. The conclusion of the SMD theory was that the answer to this question was no! This meant that assumptions concerning the variables in GET do not put restrictions on the macro level manifestations of the model. But, in order to obtain uniqueness and stability of equilibria some restrictions have to be imposed, for else we would get arbitrary AED functions instead of a unique one.

The result of the SMD theory was criticized, among others, because it did not place any restrictions on the distribution of agent’s characteristics and this might be the reason why this result was obtained. Kirman separated the problem into two sets of restrictions: one on the distribution of preferences and one on the income distribution. The reason behind this is that a too large dispersion of characteristics allows for too many

130 Individuals are characterized by indifference curves and bundles of goods (initial endowments). His/her indifference curves represent his/her tastes. From these tastes, in combination with the goods he owns, an individual demand curve can be derived and subtracting the initial endowments from the demand curve gives the excess demand curve for each individual. A market clearing equilibrium has the property that there is no commodity for which there is a positive aggregate excess demand. If all goods are desired (i.e., aggregate demand of a good is positive, if its price is zero) then no commodity can be in excess demand.

131 The SMD theory is named after Sonnenschein, Mantel and Debreu who delivered seminal contributions into the investigation of the properties of aggregate excess demand functions.
degrees of freedom to allow results at a useful level of specificity. "If the distribution of characteristics were to be sufficiently concentrated -or, to put it another way, if people were sufficiently similar to each other- then maybe the desired properties of stability and uniqueness could be recovered. Unfortunately, no matter how close individuals are to each other in terms of their characteristics, there is no hope in this direction. Even when all individuals have identical preferences the results of the SMD theory hold". (Ib., 128) When, on the other hand, the distribution of income is considered and the income distribution is chosen at random, except for complete uniformity, then it can also be proven that it is impossible to guarantee well-behaved excess aggregate demand functions. Thus trying to squeeze the economy down to almost one kind of individual does not help generate the sort of equilibrium properties that macroeconomics would like to have". (Ib., 128)

Kirman then makes, what looks like, an unexpected turn. After he criticized the too wide dispersion of preferences and

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132 These restrictions on the distributions of agent’s characteristics usually are not made about agents individually, but about agents collectively (the shape of the distributions of something among a group). "This is a significant departure from the narrow micro-foundations view (…) since this approach makes some assumptions about the organization of society before it identifies other macroeconomic phenomena". (Rizvi, 1994, 370) This raises the question whether a pure micro-foundations approach to macro-level regularities is possible at all.

133 “Whilst the idea that aggregate behavior will have desirable properties if the economy behaves as one representative individual is obviously correct, it is not very useful. Agents may be similar as desired, but the economy can still have a number of unstable equilibria.” (Kirman, 1992, 129) It makes a difference whether we have an economy with one kind of agent or an economy with only one (representative) agent. Groups of people can display patterns of behavior that are not present in the behavior of the individual members. "From a mathematical point of view, there are too many dimensions of possible variation, too many degrees of freedom, to allow results at a useful level of specificity". (Ackerman, 2002, 63)
income distribution, comprised it and concluded that this did not work; he starts wondering whether the answer is to be "seeking heterogeneity rather than avoiding it". (Ib., 129) Between uniformity and heterogeneity Kirman opts for heterogeneity to a plausible degree. Heterogeneity of agents may be useful in making aggregate behavior more regular. Unconventional and unexpected individual behavior may deliver the required smooth aggregate demand behavior, if individuals differ enough. But Kirman believes that it is not enough to introduce heterogeneity into standard general equilibrium models. The basic limitation for such models is that individuals interact solely through the autonomous forces of the market. The source of “[t]he problem seems to be embodied in what is an essential feature of a centuries-long tradition in economics, that of treating individuals as acting independently of each other”. (Ib., 137) In this tradition the demand behavior of individuals is completely independent of other individuals. "Economic theory effectively treats consumers as particles in a space with one dimension per commodity. (...) This extremely high dimensional model of aggregate demand allows all manner of mathematical pathologies, such as the SMD theorem". (Ackerman, 2002, 63) 134 If nothing imaginable is excluded by mathematical analysis then almost any equilibrium is possible. The independence of individuals' behavior plays an essential role in the construction of economic models generating arbitrary excess demand functions. As soon as this independence is restricted the class of functions that can be generated is limited. "Thus making individual behaviour dependent or relational may open the way to obtain meaningful restrictions". (Kirman, 1992, 138) We may well be forced to theorize in terms of groups who have collectively coherent patterns of behavior. This

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134 According to Ackerman the problematic assumption is the commodity-based utility. This assumption means that the representation of the utility or preference function requires a mathematical space with one dimension per commodity. Useful mathematical analysis of consumer behavior requires a more compact manageable structure. (Ackerman, 2002, 63)
holds in particular when social norms and institutions are seen as responsible for giving regularity to the actions of individuals taken collectively, where, logically speaking, myriad outcomes are possible. (see Rizvi, 1994, 372)

It is clear that making assumptions on the distribution of agents’ characteristics or on social rules amounts, in some way or another, to making assumptions about the organization of society. Thus a pure micro-foundations approach to macro-level regularities is not possible; systematic macro-phenomena have some intrinsically macro-component. A next step would be to use macroeconomic models in which heterogeneous agents interact directly through trading, organizing and so on. However, most models neglect the dynamics of allocations and distributions, concentrating on the other hand on the convergence to stable aggregative states. To introduce dynamic behavior we must turn to game theory.

5. Game theory to the rescue?

In the last decades there have been many attempts to give general equilibrium theory a game-theoretic basis (see Janssen, 1990). The market that played such a dominant role in Walrasian theory is pushed to the background in favor of the actions of interacting agents. Game theory employs mathematical models to analyze situations in which agents have common or conflicting interests. Therefore, there are cooperative and non-cooperative games. Cooperative game theory does not require that players take prices as given. They can negotiate but also re-negotiate contracts. One can imagine a process of proposals and counterproposals. Necessary for a game theoretic approach is the assumption of an exchange of information among the potential members of a coalition with which the ‘core’ can be reached. The most important results are that allocations that deliver equal shares of utility are always in the ‘core’ and that the ‘core’ shrinks when the number of negotiators increases, until, in the limit, the ‘core’ coincides with the competitive equilibrium. The
'core' is an equilibrium concept, for it is an allocation which once reached will not change, unless a coalition emerges that improves the existing allocation.

In non-cooperative game theory players do not bargain. The concept of the solution that is in the core of non-cooperative games is the Nash-equilibrium. A Nash-equilibrium is a strategic combination in which each player maximizes his share given the strategies of the other players. Applied to markets it can be shown that in a Nash-equilibrium the equilibrium price approaches the market clearing price and the equilibrium allocation approaches the market clearing allocation as the number of players increases. But why would rational players play Nash? Until recently the idea was that Nash-equilibrium was the natural solution for non-cooperative games. When each player believes that the other players play Nash, then each rational player will also play Nash for in this way he maximizes his share. But when a rational player does not expect the other players to play Nash, he wills not either. The Nash-equilibrium is not the natural consequence of individual rational action. There must be some kind of coordination to warrant that players play Nash.\textsuperscript{135}

\textsuperscript{135} How does a player maximize his pay off given the strategies independently chosen by his rivals? There is of course a best reply that a rational agent can play against the other players' strategies, however the player expects his rivals to do the same that is to play their best replies. The ensuing infinite regress can be broken only if there is a strategy $s(i)$ for each agent $i$ that satisfies what is considered to be the defining feature of NE , namely that is the best reply to the other players' best replies to itself. Giocoli argues that this argument highlights the fixed-point nature of NE. "The difficulty with this approach is that such an explanation is entirely static; (...) the equilibrium is simply imposed on the model without any reference to the process by which it is reached". (Giocoli, 2003, 315) These difficulties "explain the success of an alternative approach that directly addresses the process through which NE is arrived: the eductive or epistemic approach". (Ib., 317) This approach is conducted with the tools of Bayesian game theory. The breakthrough of Bayesianism came when rationality considerations were extended to cover each player's beliefs about his rival's beliefs about himself. That is when players were modeled as capable of theorizing according to rationality criteria on the other players' thought processes.
Will the Nash-equilibrium come about when we portrait agents with rational expectations? It can be proven that a Nash-solution only will be realized when all the agents expect that the average price-expectation of the other agents equals the price-expectation of the rational expectation hypothesis. Individual rationality and knowledge of the model are not enough to justify the rational expectation hypothesis. All actors must expect that the average expectation conform to that of the rational expectation hypothesis. "In other words, to justify REH we have to make a stringent assumption about expectations of expectations". (Janssen, 1990, 124)

In normal form games, agents have to decide which strategy to adopt in ignorance of the strategies other agents actually choose to play. As a consequence agents choose strategies that are best responses to the expectations of the other agent’s strategies. Only when agents already are in a state of general equilibrium can it be argued that the average expectations conform to rational price-expectation of the econometric model. Therefore, the hypotheses of rational expectations cannot be considered as securing the micro-foundations of a general equilibrium, since it is only an equilibrium condition.

We can conclude that the attempts to deliver a game-theoretic foundation of the equilibrium concept have failed. There is a lack of mechanisms that coordinate the actions of agents by providing them information about the intentions of other agents. This conclusion holds even when rational expectations are introduced. This means also that the first notion of invisible hand processes, namely that competitive markets, described in neo-classical terms, ensure a unique and Pareto optimal equilibrium, is not sustained.

6. General equilibrium theory as political theory

Modern economic theorizing is a very formalized activity. Its main objective is to formulate more mathematical precise proofs. Economic theoretical activity is mainly a series of
thought experiments, which start from some kind of constrained maximizing behavior and appeal to some kind of equilibrium. These experiments are to yield insights into the real world and to contribute to theoretical developments. These thought experiments use very stylized images of the world. It is a mistake to claim that in the thought experiment the world is described. All of this is to test our ‘understanding’ of both the theory and the world. Usually these models take a state of nature as point of departure, next postulate the existence of perfectly competitive markets, full information and rational, price-taking agents. But what parades as perfect competition is a model that has little to say about competition. This may be due to its intellectual origins in the 18th century debate between mercantilists and free traders. The debate was not about competition per se, but about the proper scope of government regulations in economic affairs. “What is modeled is not competition but extreme decentralization (.). The actors in this model maximize utility or wealth, and they do so in complete disregard of the decisions of others or, indeed, of even the existence of others. (.). If such impersonal maximizing behavior is competition, it is a very restricted variety. (.). No small amount of mischief has resulted from identifying this model with competition. Its appropriate name is perfect decentralization.” (Demsetz, 1993, 160)

Demsetz’ conclusion matches Rosenberg’s diagnosis that we should approach general equilibrium theory as social contract theory. Rosenberg concluded that neoclassical theory fails to show any predictive progress. Therefore, he thinks that we need to seek a rationale for the continuing commitment of economists to neoclassical microeconomics. He mentions two of such rationales. First, the idea that economics is fundamentally a normative discipline. Second, is the notion of economics as a branch of applied mathematics. Rosenberg thinks that economics is fundamentally part of a normative enterprise, and we should approach economics from the perspective of social contract theory. Rosenberg’s argument is that in recent years so many social scientists have adopted the
analytical framework of Walrasian general equilibrium theory that it now represents a contractarian argument for the adoption of the market structure. Thus economic theory has now become one important component in the research program of contractarian political theory. Therefore, when (general) equilibrium theory is meant as an invisible hand explanation it is better to see it as an exercise in political (institutional) economic theory.

Rosenberg doubts that most economists will be satisfied with this result. Therefore, he explores the possibility that economic theory is a branch of applied mathematics. If we give up the claim that economics has the ambition to become an empirical science of human behavior, we could view it as a branch of mathematics devoted to examining the formal properties of axioms that implicitly define a technical notion of ‘rationality’.

Rosenberg thinks that this abstract notion of rationality may have different interpretations, more than economists seem to realize (for instance in biology), but that it is not very relevant for the study of human behavior. "Until an alternative theory turns up, we should not apply economic theory to justify policy beyond its generic power to prove how the actual is possible, and how the possible might be actual. (...) Accordingly, the laissez-faire economists were probably right, albeit for the wrong reasons". (Rosenberg, 1994, 233)

7. The supervenience relation

I now turn to the second option concerning the micro-macro relation. In this approach macro and micro levels are more or less separate, but not completely independent, domains. This is the supervenience relation. I shall first introduce the main features of supervenience. The initial conception of the supervenience relation can be found in moral philosophy; in the discussion that followed Moore's notion of a 'naturalistic fallacy' (see chapter XVI). Supervenience tells us that qualitative properties (such as 'goodness') correspond with or depend on natural properties,
and that if objects or states of affairs are equivalent in natural properties they must be equivalent in qualitative properties. Kim distinguishes two forms of supervenience: a weaker and a stronger form. The definition of weak supervenience is:

‘A weakly supervenes on B iff necessarily for any x and y if x and y share all properties in B then x and y share all properties in A - that is, indiscernibility with respect to B entails indiscernibility with respect to A.’ (Kim, 1984, 158)

Kim calls A the supervenient family and B the supervenience base; properties in A are supervenient properties and those in B are the base properties. Any differences in A must be accounted for by some difference in B. To illustrate this, Kim takes the example of a good man and three traits that characteristically belong to a good man: those of courage, benevolence and honesty. Every good man must have some combination of these traits, but several combinations in the base family can ground a good man. Y can be honest and benevolent, whereas Z is honest and courageous. "Generally speaking, a supervenient property will have alternative supervenience bases". (Ib., 165)

Thus, in case of weak supervenience the base properties do not fix the supervenient properties. "Weak supervenience (...) only requires that any two things having the same natural properties must be either both good or both not good". (Ib., 161) If two men share the properties of benevolence and honesty, but lack courage, then they must both be good or neither. Or, what is the same, if one is good but the other is not, there must be some property in B with respect to which they differ (say, the first is courageous, but the second is not). "This is surely not enough for saying that a thing being good “follows” from its having the natural properties it has; weak supervenience, therefore, cannot explicate the notion of dependence". (Ib., 161)

The definition of strong supervenience is:

‘A strongly supervenes on B just in case, necessarily, for each x and each property F in A, if x has F, then there is a property G in B such that x has G, and necessarily if any y has G, it has F.’ (Ib., 165)
In case of strong supervenience there is a necessary coextension between a supervenient property and a base property.

The supervenience relation embraces two crucial ideas. First, supervenience is a relation of dependence, where that which is supervenient is dependent on what it supervenes. Second, in case of weak supervenience it is a non-reductive relation: supervenient dependency does not entail the reducibility of the supervenient to its supervening base.

In another article Kim summarizes the three desiderata of supervenience: (Kim, 1990, 9)

1. covariance: supervenient properties covary with their subvenient or base properties. We distinguish strong and weak covariance.

2. dependency: supervenient properties are dependent on, or determined by, their base properties. This relation is asymmetric. In cases of asymmetric dependence, the mental, for example, strongly co-varies with the physical, but the physical does not co-vary with the mental; we find similar relations between the evaluative and the descriptive.

3. non-reducibility: the supervenient is irreducible to its base properties. This depends on the ‘condition of strong connectibility’.

A theory is reducible to another when bridge laws are available that connect terms of the reduced theory with those of the lower level theory to which it is reduced. These bridge laws only need to satisfy the “condition of strong connectibility”. Weak covariance, obviously, does not entail strong connectibility.

8. Supervenience and explanation

The idea of strong supervenience helps us to understand the micro-foundation’s claim that one domain can be reduced to, or defined or explained in terms of another through the discovery of interconnectedness. But weak supervenience rejects "all significant conceptual or epistemological relationships." (Kim, 1984, 176)
The point that matters in discussing all forms of reductionism in the social sciences is that either individuals exhaust the economic world and that once all the facts about individuals are set, so too are all other aggregate economic facts, or that the economy supervenes on the activities of individuals. The exhaustion principle is arguably false for the obvious reason that isolated individuals do not constitute a society, an economy, or an economic entity such as a corporation. A society also includes individual relations and social institutions that regulate these relations.

An altogether different issue concerns question: on what facts about individuals do the aggregate relations supervene? In other words, which individual variables suffice to determine for instance the income distribution? Are human capital variables sufficient? Or are such factors as race, sex, sector, and other more social variables involved? (see Kincaid, 1995, 381)

Another issue that needs to be considered is the specification of microeconomic facts. When we introduce economic agents but attribute to them institutional roles as 'banker' or 'stockholder' or 'manager', then we cannot use these roles to explain macroeconomic events. Microeconomic theories that already make use of macroeconomic facts cannot be used to explain macroeconomic events.

In the final analysis, supervenience explanations must be judged case by case, according to whether any of the following holds: (Kincaid, 1988, 275)

1. the relevant lower-level theory is unable to specify all supervenience bases,
2. the supervenience base fixes multiple properties,
3. the higher- and lower-level predicates only overlap, even in each specific application and
4. lower-level descriptions of supervenience bases presuppose higher-level explanations.
Van den Berg and Gowdy argue that micro- and macro-economic theories and models should be regarded as complementary. They can provide complementary descriptions of economics. A framework of interdependency, i.e., upward and downward impacts, or micro-levels influencing macro-levels and vice versa, provides a more acceptable approach to the study of macro-economics. (see Van den, Berg, and Gowdy, 2003, 79)

An interdependent framework combines the idea of weak supervenience with the theory of emergent properties. The notion of emergent properties is invoked to do justice to the following idea. Interactions between elements or entities identified at a lower level of description sometimes produce effects at a higher level of description that are novel and surprising (in the sense of unexpected) and cannot be deduced (or explained or predicted) from even a complete knowledge of the lower elements or entities.136

There are writers who think that the produced effects have causal repercussions for the subsequent behavior and interaction of the lower-level elements and entities. This is a more controversial intuition and therefore we distinguish a weaker and a stronger notion of emergent properties. The weaker notion only involves the claim that some configuration at a lower level of organization gives rise to surprising properties at a higher level of organization.

The stronger notion of emergent properties involves the reconstitutive downward causation claim that, once arisen, emergent properties have causal power of their own that change causal powers at the lower level of organization, the levels from which they emerged. The intuition seems to be that absent some emergent phenomena at a higher level of organization things at a lower level of organization would look and proceed differently.

The idea of weak emergence or ‘upward causation’ is widely accepted in the social and natural sciences: elements at a

136 I thank Jack Vromen for attending me to the phenomenon of emergent properties.
lower ontological level somehow affect those at a higher level. Viruses cause illness and individuals can change institutions. Upward causation may be reconstitutive, because lower level changes may alter fundamentally a higher-level structure. ‘Downward causation’ occurs when higher cultural values have power to downwardly control the more immediate, inherent humanitarian traits. 137

9. Conclusion

In this chapter I discussed the first attempt to derive an invisible hand explanation by examining general equilibrium theory. GET employs a microeconomic orientation on epistemological and ontological grounds. It wants to reintroduce the individual decision maker against all functionalist's explanations (to "recover intentionality" as Hoover expressed it, Hoover, 1995a, 249) and claims that society is merely the sum of all individuals who constitute it. From this the micro-foundation approach follows automatically.

The micro-foundation project encounters severe theoretical and practical objections. In aggregating individual excess demand functions it appeared that no stable and unique aggregate excess demand function could be derived. Kirman concluded this was due to the individualistic approach, or, to put it differently, to the negligence of structure in individual relationships. And there are practical problems. It is usually a practical impossibility to gather a sufficient amount of data for micro-variables, while macroeconomics often suffers from an embarrassment of riches when it comes to data. Therefore the available empirical data is almost invariably values for macro-variables. This requires that we have to formulate functions that enable us to determine a micro-quantity from a macro-quantity. And if we could transfer some well-explained facts in the macro-domain to less clearly explained

137 For more on emergent properties and downward causation see chapter XIII.
facts in the micro domain, then there is a strong sense in which macroeconomics is methodologically at least as sound as microeconomics. In this situation it seems that no foundations in microeconomics are required and that microeconomics may be in need of macro-foundations. (see Hoover, 1995a, b) Hoover concluded that "[t]he intentional character of economic behaviour, because it limits the precision of prediction and explanation at the individual level, demonstrates [that] the micro- foundations of macroeconomics (...) is impossible; macroeconomics is autonomous and must seek improvement through its own development." (Hoover, 1995b, 730)The micro-foundation project based on GET has reached a dead end.

The idea of a structured social reality in which structure represents the interdependencies between agents has induced the supervenience approach. Supervenience was introduced to argue that there could be dependence between the macro domain and the micro domain that does not entail that the macro domain is reducible to the micro domain. The concept of emergent properties, in its weak form, supports the weak supervenience approach.

Since Adam Smith, economists have devoted themselves to formalizing their interpretation of his doctrine of the invisible hand: the coordination of the economic system by the price-mechanism. As an existence proof of a system of extreme decentralization it has been quite influential.

Whereas Rosenberg does not (yet) see any viable alternative to neoclassical theory, he does not reject it but judges that the job it does is something different from what economists think it is. I believe that Rosenberg hits the mark. The micro-foundation debate concerns the feasibility of an (extreme) decentralized design of society. By proving the existence, on the theoretical level, of an orderly, though extremely decentralized economy, the viability of an orderly market society is shown. Much of (mathematical) economics seems to involve the drawing blueprints for ideal political arrangements -the mathematisation of social contract
theory", as Hoover coined it. (Hoover, 1995b, 731)
The micro-foundations debate was concerned with the choice of constraints (and not with choices within constraints). And in this debate general equilibrium theory displayed itself as political theory.

In the discussion about micro foundations Kirman noticed that, in order to get relevant results, it might be necessary to put restrictions on human characteristics by making human behavior relational. We could translate this into the idea that we should impose structure on human relations and study the structural interdependencies of human agents. The agency-structure relation will be discussed in the chapters XI, XII and XIII after I have introduced institutional theory.

In the following chapter I discuss the second notion of the invisible hand. The unintended consequences of human actions are thought to come to light in the institutional framework of society. The concern of this view is not to prove the existence of a state of equilibrium, but to prove that evolved institutions warrant the existence of an orderly society.