

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM: AN EXPLANATION OF THE CO-EXISTENCE OF MARKETS AND FIRMS

UGO PAGANO¹

The explanation of the causes for the existence of the firm relies on market transaction costs, such as monitoring and enforcement costs, which can be observed in an equilibrium situation. The purpose of this paper is to show that 'disequilibrium transaction costs' can be even more important than 'equilibrium transaction costs' in explaining the nature of the firm, and the co-existence of markets and firms. Managers are not only dealing with organizational issues; they also try to balance supply and demand. In order to explain the co-existence of markets and firms, their success must be compared with the performance of the market.

1. INTRODUCTION

Questions like 'why do firms exist?', 'why do markets exist?', and 'why is firm-organization more extended in some sectors than in others?' have recently attracted the interest of economists. The starting point for recent literature has been the seminal article by Coase (1952). Coase observed that if markets provided a cost-free way of organizing economic activity, then the existence of firms could not be justified. He suggested that a comparative analysis between firms and markets is necessary in order to understand the existence and the properties of these organizations. Coase concentrated his attention on the costs of finding the relevant prices and the costs of writing and enforcing market contracts. These costs share an important property: they can be observed in a situation of market equilibrium.

Coase's line of inquiry has been influential. Explanations for the existence of firms based on 'the equilibrium costs' of the market economy, have also characterized subsequent explanations for the existence of firms advanced in the 'New Institutional Literature': the cost of specifying from the outset all the actions which should be performed in each particular state of the world (Simon, 1957), the monitoring costs in team production (Alchian and Demsetz, 1972) and, more generally, the agency costs in situations of asymmetric information (Jensen

¹ I would like to thank Fabio Petri, Bob Rowthorn and R. Ramana for useful discussions. Particular thanks go to Frank Hahn and Alessandro Vercelli for their useful comments to a preceding version of this paper (Pagano, 1989). Finally, three anonymous referees gave me valuable suggestions for which I am very grateful. The usual caveats apply.

54 UGO PAGANO

and Meckling, 1976). The costs incurred in compensating an agent who invests in specific resources in a world characterized by uncertainty and opportunism (Williamson, 1985) are all costs which do not disappear in a market equilibrium and can be conveniently studied in an equilibrium framework.

In my opinion, a limit of the 'New Institutional Literature', stemming from Coase's article, is that the transaction costs existing in a market equilibrium provide only a partial explanation for the existence of the firm.² This explanation puts an exaggerated emphasis on the comparative advantages of the 'policing' activity of firms' managers in situations where market contracts would be very costly to write and enforce. Indeed, if we start from a market equilibrium, the 'simplification' of market contracts and their enforcement is all that is left to explain the existence of firms. The main issue is whether 'the authority of competition', existing on the market, can do better than the 'authority of command' existing within the firm.³

The situation changes if we take as our starting point not 'market equilibrium transaction costs' but 'market disequilibrium transaction costs'. In this case, the existence of firms can be explained with reference not only to their 'policing' advantages but also to their co-ordination advantages with respect to the markets.⁴

The introduction of disequilibrium introduces a new dimension in the comparison between firms and markets. The main issue becomes the way in which disequilibrium is to be eliminated and, specifically, whether there is an attempt to eliminate disequilibrium before or after the implementation of economic decisions. Following the Marxian terminology, I will denote the first case by 'ex-ante

² Williamson himself has maintained that a limitation of the New Institutional Literature is that 'possible disequilibrium features are ignored' (Williamson, 1985, p. 272). Other aspects of this literature are considered in Pagano (1991a, b), where its results are compared to and integrated with those of the Radical and/or Labour Process Literature.

³ The terms 'authority of competition' and 'authority of command' are used by Marx (1967). In the New Institutional Literature the term 'authority of command' and 'authority of competition' are respectively replaced by the terms 'authority relation' and 'competition' or 'market discipline'. Coase (1952) and Simon (1957) consider the authority relation as the fundamental characteristic of the firm. This view is shared by Williamson (1985), who also considers the concept of governance which emphasizes the importance of complex forms of shared authority. By contrast, in their famous monitoring explanation of the firm, Alchian and Demsetz (1972) rejected the 'authority relation' as a fundamental characteristic of the employment relationship. They argued that, since monitoring is voluntarily accepted by the workers, it does not involve any form of authority. They seem to believe that authority is such only when it is involuntarily accepted. In my opinion they are wrong. As other authors show, authority can be voluntarily accepted. Indeed, Hobbes' (1968) theory of the State is founded on the voluntary acceptance of the absolute authority of the King and the solution of many problems of collective action (Olson, 1965, 1982) involves that some form of authority is (often voluntarily) accepted.

⁴ Of course, the opposite argument is also possible. The existence of markets could be explained by their relative efficiency with respect to firms when the latter do not have simply to enforce decisions but also to co-ordinate them. We could either start from an economy completely organized by markets and 'discover' the reasons for the existence of firms or start with a 'single firm economy' and 'discover' the reasons for the existence of markets. The issue of state intervention (in what many economists call 'market economies' but are in fact 'mixed markets-firms economies') is strictly related to this analysis. For instance, the arguments in favour of 'complete state intervention' can be similar to those supporting a 'single firm economy' (which is equivalent to a 'centrally planned economy').

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 55

co-ordination' and the second case by 'ex-post co-ordination'. Ex-ante co-ordination and ex-post co-ordination together with authority of command and competition give rise to four possible combinations. This provides the structure of the table of organizations that I am introducing in this paper and that will be used to re-examine the issues of the existence of firms and of their relative efficiency.

I will identify Marx, Hayek, Lange and the Rational Expectations theorists as the advocates of each one of the four possible combinations of forms of authority and co-ordination embodied in our table of organizations.

Using these economists as the authors of an entry in our table has left me feeling somewhat uncomfortable. Certainly, limiting them to a box in a table insults the complexity of their contributions. Still, I found no better way of expressing these different organizational possibilities than using a stylized exposition of their contributions and of their 'revealed preferences' for a particular solution.

I will try to show that no single organizational solution advocated by these economists is likely to be optimal for the economy taken as a whole. Each solution has its own disequilibrium costs and has some relative advantages. These relative advantages are likely to imply that each solution is appropriate for different situations and for different decisions. There are some good 'a-priori' reasons to believe that these solutions may have to co-exist in real-life economies in spite of the possible reciprocal distaste of their advocates. In other words, I will conclude by trying to show that, when these authors are 'forced to co-exist' in a single analytical framework (as their organizational solutions are 'forced to co-exist' in real-life economies), they can jointly offer an explanation of the limits of market and non-market organization which integrates and improves on the explanations given by New Institutional Economics.

2. MARX'S DYNAMIC 'COASIANISM' AND THE 'FATAL ATTRACTION' OF A SINGLE-FIRM PLANNED ECONOMY

Marx (1967, in particular pp. 354–359) proposes two pairs of categories which can help us to answer the question 'why do firms exist?' (Coase's famous question). The first pair is used to distinguish between different sequences of co-ordination and implementation of economic decisions while the second is used to distinguish between different forms of authority.

The sequence between co-ordination and implementation of decisions is distinguished in 'ex-ante' and 'ex-post' co-ordination. A set of desired actions is said to be co-ordinated 'ex-ante' if they are implemented only after the agents try to make them mutually consistent. In other words, in the case of 'ex-ante' co-ordination, co-ordination precedes implementation. 'Ex-post' co-ordination defines an opposite system. In this case the implementation of desired actions is carried out without any 'ex-ante' co-ordination. If the desired actions are mutually inconsistent, then some of them cannot be implemented and actual actions will differ from desired actions. The system is, however, characterized by 'ex-post' co-ordination only if it satisfies the additional condition that it tends to

56 UGO PAGANO

react to mutual inconsistencies by generating a new set of desired actions such that at least some of these inconsistencies are eliminated.

The second distinction used by Marx is that between the authority of command and the authority of competition. The authority of command is based on a direct sanction that the command giver can apply on the command taker if the latter does not implement the orders of the former. The authority of competition is based on different principles. It relies on the fact that an agent can punish a trading partner by breaking their trading relationship and moving into a new one. Unlike the authority of command, the authority of competition does not involve any direct power relation; it involves simply the fact that each one of these two agents can establish a relation with other agents if he thinks that this could be more advantageous to himself.

Marx uses these categories to define and distinguish between firm-type and market-type co-ordination. Firm-type organization is defined by two fundamental ingredients: ex-ante co-ordination and the authority of command. By contrast, ex-post co-ordination and the authority of competition define market-type organization.

Within a firm, a central agent (the management) works out a production plan before production takes place. The purpose of the plan is to co-ordinate *ex ante* the production activities to be implemented. The central agent also has the authority to give some commands and can apply some sanctions against the individuals who do not carry out this plan.

In a market economy there is no central agent who tries to work out a production plan co-ordinating 'ex-ante' production activities. In contrast, the market economy is characterized by 'ex-post' co-ordination: there is a tendency in the market system to correct the mistakes implemented by the agents in the previous period by generating a new set of desired actions such that some inconsistencies are eliminated. Because of the lack of 'ex-ante' co-ordination, it is possible that in a market economy the individuals produce commodities that turn out to be in excess supply. In this case the actions which the agents desired to perform (i.e. to produce a commodity which could be sold at least at the cost of production) cannot be implemented. However, as a result of this failure, the agents will try to reduce the production of an unprofitable, oversupplied commodity and try to move on to the production of a profitable, undersupplied commodity. In this way each agent contributes to a movement towards equilibrium or, in other words, towards a situation where the actions desired by the agents are mutually consistent. Therefore, even if the market has no 'ex-ante' system to ensure the consistency of economic decisions, it has, according to Marx, an 'ex-post' co-ordination mechanism which tends to eliminate inconsistencies.⁵

Moreover, even if no central agent can give orders to the other agents, the market is characterized by a mechanism which has a function similar to the

⁵ The 'ex-post' elimination of inconsistencies can generate new inconsistencies. The market can therefore be in a permanent situation of disequilibrium. For this reason, Marx observes that, in a market economy, the 'constant tendency to equilibrium of the various spheres of production is exercised only in the shape of a reaction against the constant upsetting of this equilibrium' (p. 356).

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 57

authority of command. Suppose that a worker is taking more time than the other workers to produce a unit of output. If the worker is the employee of a firm, the employer can apply some sanctions against him, such as lowering his pay, or even firing him. But suppose that the worker is an independent producer who sells his products on a competitive market. The authority of competition now has an effect similar to the authority of command existing in a firm. The producer will have to sell his product at the same lower price at which his more efficient competitors sell it. His per hour pay will be lower than that of his competitors; sometimes, it can be so much lower as to push him out of business. Thus, market-type and firm-type discipline can have similar effects.

These results are collated in Table 1, where markets and firms are defined as combinations of alternative forms of authority and co-ordination. We put the name of Marx in brackets to indicate that, according to Marx, firm-type organization (or planning) is the best economic system and we will follow the same convention for the optimality claims advanced by the other authors.

The Marxian approach starts by considering a single-firm economy and a complete market economy. These two ideal types are used as analytical tools to define other organizations. In particular, capitalism is defined as an economy where both firm-type and market-type organizations co-exist. According to Marx, the employment contract defines the boundaries between these two organizations.⁶ Before the signature of the employment contract the employer and the employee are two agents of the market economy; after that, the market is replaced by the firm—the organization within which the employer allocates and uses the labour power he has bought on the market.

Marx believed that firm-type co-ordination was more efficient than market-type

TABLE 1.

Forms of co-ordination	Forms of authority	
	Command	Competition
Ex-ante	Firm (Marx)	Market
Ex-post		

⁶ In the Marxian theory, the employment contract is defined as a peculiar market transaction by which labour power is exchanged for a wage. Labour power, or capacity for labour, is defined by Marx as the 'aggregate of those mental and physical capabilities existing in a human being which he exercises whenever he produces a use value of any description' (Marx, 1967, Vol. 1, p. 167). Labour power (or capacity for labour) is exchanged on the market and its allocation among firms is co-ordinated by the market mechanism. By contrast, labour itself (or the use of labour power) is co-ordinated by the employer who, after the signature of the employment contract, acquires the right to the capacity for labour of the employee for a certain length of time. According to Marx, under capitalism the use of labour power (labour itself) is not the object of a market transaction. The organization by which the allocation of labour is carried out is the firm and not the market. In other words, the employment contract defines the 'boundary' between the two organizations—the market and the firm—which, according to Marx, co-exist under capitalism. A detailed assessment of the comparative analysis of firms and markets carried out by Marx can be found in Chapter 3 of Pagano (1985). In this chapter the relationship between this analysis and the Marxian alternatives to capitalism is also considered.

58 UGO PAGANO

co-ordination in the management of a modern industrial society. According to Marx, modern technology implies a strong interdependency of irreversible investment decisions. In this situation, the ex-post co-ordination system, which characterizes ex-post market co-ordination, can correct mistaken economic decisions only by a terrible waste of real resources. The tendency to eliminate inconsistencies arises too late, only after major irreversible investment decisions have been implemented. In contrast, the ex-ante co-ordination which characterizes firm-type organization allows the elimination of these inconsistencies before their implementation.⁷ He interpreted the growth of big industrial conglomerates under capitalism as evident proof of this greater efficiency of firm-type co-ordination. However, in his view, this clear tendency to replace the market by the firm was still too slow and too weak under Capitalism. Under the capitalist system the existence of many private producers implied that their numerous independent decisions had to be mediated by the market. Only under Socialism, after the abolition of private ownership of the means of production, could the economy be managed as one single big firm.

3. GENERAL EQUILIBRIUM INSTITUTIONAL CONFUSIONS

The Walrasian description of the working of a market economy uses the device of a ticket economy. It is assumed that an auctioneer announces a set of prices and asks the agents of the economy to write down on a ticket the quantities of the commodities which they desire to sell, buy and produce at those prices. The auctioneer collects these tickets and, for each commodity, calculates whether there is an excess demand or excess supply at the prices he has declared. The auctioneer then announces a new price vector such that all the prices of the oversupplied commodities are decreased and all the prices of the undersupplied commodities are increased. Given some special assumptions, such as gross substitutability, an equilibrium price vector can be obtained by repeating this procedure several times.⁸

How should we classify the Walrasian mechanism within the Marxian table of organizations considered in the preceding section?

It can be argued that, in spite of the fact that the Walrasian mechanism was intended to approximate to the working of a market economy, it should be included in the north-west corner which, according to Marx, describes planning

⁷ There is no doubt that, after more than a hundred years, the Marxian answer appears fairly weak and extreme. In our time few economists would exaggerate the advantages of a centrally planned single firm economy as Marx did. But, in spite of the weakness of his answers, Marx' way of setting out these questions still has some methodological lessons to teach us. Of course, this claim can only be substantiated by comparing the Marxian theory with the ones accepted in our time by the majority of the profession. This is what we are going to do in the following sections.

⁸ Walras was aware of the institutional differences between his 'ticket economy' and a market economy. But his main aim was to construct a model of an ideal economy where social justice and maximization of 'material welfare' were mutually consistent. He was aware that this goal could be realized by the 'ticket economy' and not by the market economy. On the other hand, he believed that the market economy could be reformed on the lines implied by his ticket economy. On this point see Pagano (1985, Chapter 6).

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 59

and/or firm-type co-ordination. This conclusion can be justified by observing that the Walrasian ticket economy is characterized by ex-ante co-ordination and some authority of command. Ex-ante co-ordination characterizes the ticket economy because the decisions are first co-ordinated by an exchange of tickets and prices between auctioneer and economic agents and, only after that, are they implemented. Before the achievement of the equilibrium (i.e. before the co-ordination of the actions desired by the individuals) no production or trade decisions are implemented. Moreover, it may be argued that some authority of command exists in the ticket economy. A central agent (the auctioneer?) must have the authority to make the agents write their 'true' production and trading intentions on the tickets. The central agent must also have the authority to prevent the other agents from implementing their decisions before the achievement of the equilibrium and the power to enforce their decisions at equilibrium prices.

The 'auctioneer parable' can give us a misleading representation of the market economy. An idealized form of planning (more precisely, decentralized planning) is used as a model of a market economy. Characteristics of firm-type organization, such as ex-ante co-ordination and the existence of a central agent, are employed to represent the working of the market mechanism. Furthermore, the optimality properties of the model are used to ensure that the 'hidden hand' of competition does not require the help of the 'visible hands' of planners and managers to allocate economic resources efficiently.⁹ In fact, once the optimality of the market mechanism is shown by approximating its mechanism to that which is only possible in an idealized single-firm economy, a paradoxical question arises: 'why do firms exist?'. If markets can optimally organize economic activity without cost, the existence of firms is left unexplained.

The answer to this question has been the starting point of the New Institutional Literature. But an interesting and different answer is already contained within the Marxian framework. Firms exist because ex-ante co-ordination and authority of command have some relative advantages over ex-post co-ordination and the authority of competition. From the Marxian point of view the optimality results

⁹ In other words, what is simply an 'auctioneer equilibrium' is called a 'competitive equilibrium'. Two good reasons run against this interpretation. Firstly, when production and exchange are allowed in disequilibrium, the endowments of the agents change. Whereas the 'auctioneer equilibrium' can be defined on the basis of the initial endowments, a 'competitive equilibrium' must be defined on the basis of endowments which are also the result of the adjustment process. Secondly, the agents of the auctioneer economy (except the auctioneer himself) can be defined as price takers (because prices are changed by the auctioneer) whereas the agents of a market economy must set prices. In disequilibrium situations, because of the possible existence of unsatisfied buyers, the agents will not face perfectly elastic demand curves. This circumstance is inconsistent with the concept of perfect competition, which requires the agents to be price takers and/or to face perfectly elastic demand curves. However, the terminology is confusing because the definition of perfect competition itself is consistent with the characteristics of an auctioneer economy but contrasts with the institutional characteristics of market competition and with a reasonable concept of competitive equilibrium, where the fact that the agents set prices should be taken into account. We may conclude with Frank Hahn (1987, p. 137): '... the behaviour postulated for the auctioneer will implicitly define what we are to mean by equilibrium: that state of affairs when the rules tell the auctioneer to leave prices where they are. But the auctioneer's pricing rules are not derived from consideration of the rational actions of agents on which the theory is supposed to rest. Thus the equilibrium notion becomes arbitrary and unfounded.'

60 UGO PAGANO

of the Walrasian model can only reinforce this conclusion. The optimality properties of the Walrasian model could be used to support the Marxian claim that planning or firm-type organization is superior to market-type organization. This follows from the fact that, unlike market organizations, planning and the auctioneer economy share common institutional characteristics—namely ex-ante co-ordination and the existence of a central agent.¹⁰

The institutional similarity between planning and the auctioneer is therefore suggestive and, in some respects, more appropriate than that between the auctioneer and the market. But it can be equally misleading. Although planning and the auctioneer economy are both characterized by ex-ante co-ordination and the existence of a central agent, they are substantially different. For instance, in the auctioneer economy, the central agent (the auctioneer himself) is implicitly assumed to work for nothing and does not consume real resources. In contrast, under 'feasible' planning, the central agent (the planning office) does not work for nothing: bureaucrats and planners do consume real resources which could be used in the production of useful goods. Moreover, the managers of the auctioneer economy maximize profits. There is no reason to believe that the bureaucrats of a planned economy would do the same only because the central planners instruct them to do so.

4. NOBODY CAN BE A RATIONAL 'PLANNER': THE AUSTRIAN DEFENCE OF THE MARKET INSTITUTION

The costs of economic planning were discussed in the famous controversy about the economics of socialism initiated by the Austrian economist von Mises (1920). Von Mises questioned, in this context, the economic rationality of central planning. In his opinion, rational economic decisions are only possible if the costs of the resources or their estimated values for some alternative uses are known to the agents. The market makes these values known. Agents, planning to employ the resources in alternative ways, compete by offering prices related to their estimate of the value of the resource for these alternatives. Therefore, the market prices provide each agent with information about the cost of the resource or information about its estimated value for the alternative uses planned by rival agents. Without this rivalry among alternative plans, which is only possible under market competition, price would not be attached to the costs of resources, and taking rational decisions would be impossible.

As Hayek (1935) clarified by developing von Mises' argument, under a system of collective property, a central agent decides how the resources of the whole

¹⁰ Indeed, Walrasian models of the ticket economy, where the auctioneer has been substituted for a planning office, have been explicitly used as planning models. The co-ordination advantages of this procedure have also been compared with those of other planning procedures. Alternative planning procedures can improve on the properties of the auctioneer-planner model. For instance, this can be done either by letting the planner have some 'cumulative memory' of the preceding steps of the procedure (Malinvaud) or by 'inverting' the information flows between the planning office and the agents (Kornai and Liptak). For a presentation of these viewpoints and a general survey of this literature see Heal (1973).

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 61

society should be used. But the knowledge concerning the expected net benefits of each of these uses is dispersed among the agents who know their production and consumption opportunities. In the absence of a market economy, the agents cannot communicate the opportunities which they perceive to the other agents because the competitive bidding for economic goods cannot take place. Under central planning the knowledge of the agents is, therefore, locked in their minds. The central planning office, being unaware of the opportunities available to the agents of the economy, cannot take rational decisions. Society is not able to make an efficient use of the knowledge acquired by its members.

In spite of their different conclusions, Marx, Hayek and von Mises have some points in common which differentiate them from the Walrasian approach. In both approaches the market is analyzed as an institution where individuals, having ex-ante un-coordinated plans, compete with each other to utilize resources in employments where they expect the greatest benefit. Both Marx and the Austrians consider the market as a system characterized by a permanent disequilibrium¹¹ and share the idea that in a market economy there is no necessary ex-ante compatibility among the competing plans of the agents but simply a tendency to eliminate some inconsistencies ex-post. According to both approaches, it does not make sense to evaluate the advantages and disadvantages of a market economy in an ideal situation of equilibrium where, under certain conditions, it could be characterized by Pareto optimality. The Marxian and the Austrian schools maintain that the institutional characteristics of each system have to be described and evaluated by examining their systems of coordination and implementation of economic decisions. Obviously, this cannot be done in an equilibrium situation where decisions have already been co-ordinated by some mythical figure (the auctioneer) and contracts have the property of being self-enforcing (so that no authority is necessary for their implementation).

Although Marx and the Austrians employ many of the same criteria in the comparison of alternative economic institutions they arrive at opposite assessments of the relative merits of the market and central planning. According to Marx, the waste of real resources, due to the inconsistencies arising in the course of the ex-post adjustment process of the market economy, justifies the replacement of the inefficient market economy by central planning. In contrast, according to Hayek and von Mises, the costs, or even the impossibility, of constructing a plan ex-ante for the whole economy are such that the only rational solution is to break the central plan into many independent sub-plans co-ordinated by the market. According to the Austrians, the market is not 'optimal' and does not eliminate all inconsistencies ex-ante. But it is the only system by which economic activity can be organized when one considers that all the relevant information only exists dispersed in the minds of the individuals. Or, to put it another way, according to

¹¹ The similarities between the Austrian and Marxian approaches and their difference with the General Equilibrium school are nicely illustrated by Lavoie (1985) who also clarifies how Lange and Lerner failed to give an adequate answer to von Mises. Hayek (1949) criticizes the equilibrium approach of mainstream economics.

62 UGO PAGANO

the Austrians the market is optimal in the 'strong' sense that it is the only feasible organization by which dispersed knowledge can be transmitted.

5. FALSE EQUIVALENCE RESULTS FOR AN ADDITIONAL OPTIMALITY CLAIM

The discussion of the relative 'disequilibrium' merits of firm-type and market-type organization had promising foundations in the opposite arguments and conclusions of Marx and the Austrian economists. Unfortunately, the development of the discussion was somewhat blocked by Oskar Lange's famous work¹² on the economic theory of socialism. Lange appeared to prove a substantial equivalence of markets and the planning activity which could be carried out in a single-firm socialist society. This is an unfortunate consequence of Lange's contribution. His 'equivalence' result neglects fundamental institutional differences which underlie the dynamics of firm-type organization (or planning) and market organization. I will suggest that Lange's model does not show any equivalence between the organizational solutions considered in the preceding sections and is not equivalent to any of them.

Lange's famous answers to the objections of von Mises and Hayek against planned systems were based on the general equilibrium theory of Walras. Lange interprets the Walrasian disequilibrium adjustment as a real market process where prices move according to the actual imbalances between demand and supply which occur in a competitive economy.¹³ He re-exposes the process by which the equilibrium is achieved in the Walrasian system without mentioning the role of the auctioneer in both co-ordinating decisions before their implementation and setting prices. Lange does not seem to be aware of the importance these assumptions have in showing the convergence of a market economy to an equilibrium position. He stresses the 'parametric function of prices' (Lange 1936a, p. 26) without realizing that, in the Walrasian system, prices can be regarded as parameters and the individuals can be regarded as price takers only because the auctioneer performs the task of setting prices.¹⁰ More important, he does not perceive that von Mises' and Hayek's arguments on the informational function of prices can only be understood by considering the agents as price setters who compete for resources offering prices related to their expected benefits. According to the Austrians, under a market economy the freedom of price-setting according to the subjectively perceived opportunities enables each individual to gain immediate information about the opportunities perceived by the other individuals. Thus, Lange misses the 'Austrian' point. He does not really understand the 'Austrian' argument about the informational role of prices when he emphasizes that the *parametric function* of prices is the essence of competition.

¹² Lange (1936a, b); see also Lerner (1936). Lange was not the first to contribute to the economic theory of Socialism by a re-interpretation of the general equilibrium theory. The most complete statement of this view was advanced by Barone (1908).

¹³ Indeed, the only difference which Lange considers between the Walrasian model and the real market economy is that, whereas in the former case we 'start with a set of prices given at random' (Lange 1937, p. 26), in the latter 'it is the *historically* given prices which serve as a basis for the process of successive trials'.

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 63

At the same time, Lange does not realize that the equilibrium is eventually reached in the Walrasian economy only because the auctioneer ensures that decisions are implemented when the opportunities perceived by the agents are mutually consistent. In this way, Lange also misses the 'Marxian' point about the existence of permanent disequilibrium and waste of resources in a market economy.

The main difference between Walras and Lange's interpretation of Walras is that the former refers to an idealized 'ex-ante' co-ordination system where adjustments occur on paper, whereas the latter attributes the properties of this idealized system to real markets reacting 'ex-post' to real imbalances between demand and supply. This must be kept in mind when one considers Lange's own model of planning because this is intended to show that planning can replicate (his model of) the market system. In fact, as in Lange's model of socialism, the planning office adjusts 'ex-post' real imbalances between demand and supply by increasing (decreasing) prices when there is excess demand (supply) and the agents take these prices as parameters. Under planning, 'the parametric function of prices must be imposed on them by the Central Planning Board as an accounting rule' (Lange, 1936a, p. 30). Moreover, the prices fixed by the Central Planning Board have the same function as market prices. 'Any price different from the equilibrium price would show at the end of the accounting period a surplus or a shortage of the commodity in question' (Lange, 1935a, p. 31). 'Thus the accounting prices in a socialist economy can be determined by the same process of trial and error by which prices on a competitive market are determined' (Lange, 1936a, p. 33). This procedure could work 'much better in a socialist economy than it does in a competitive market. For the Central Planning Board has a much wider knowledge of what is going on in the whole economic system than any private entrepreneur can ever have; and, consequently, may be able to reach the right equilibrium prices by a much shorter series of successive trials than a competitive market' (Lange, 1936a, p. 34).

There is a substantial difference between the Walrasian auctioneer and Lange's planning office. In Lange's model, the central planning office works by correcting 'ex-post' the imbalances which arise in the real economy; it increases (decreases) the price of goods whenever there is excess demand (supply) in the economic system. In contrast, in Walras' model the auctioneer works by correcting ex-ante the imbalances which arise in the ticket economy where production and exchange decisions are written simply on paper and are not implemented until all the imbalances have been eliminated. It follows that, if we accept the institutional definitions given by Marx, the Walrasian auctioneer, who was intended to be an approximate description of the working of a market economy, is much more a 'true planner' than Lange's planning office. Unlike the auctioneer, who co-ordinates decisions ex-ante, Lange's planning office shares the characteristic of ex-post co-ordination with the market economy.

Lange's model was intended to prove a substantial equivalence between the planning and the market systems. But it is very different from both systems (if we accept Marx's and Hayek's definition of these systems). If we refer to Table 1,

64 UGO PAGANO

Lange's model fits in the south-west corner, which describes ex-post co-ordination through command—a box which is not occupied by either the planning or the market institutions (when these institutions are defined according to the common Marx-Hayek terminology). On the one hand, unlike the case of 'Marxian' planning or firm-type co-ordination, Lange's model contemplates only the possibility of ex-post intervention of the central authority who corrects imbalances which arise in the real economy by changing accounting prices. On the other hand, unlike the case of Hayek's and Marx's market economy, in Lange's model a central authority exists and commands the firms' managers, instructing them to take prices as parameters and to maximize profits.

Thus, the equivalent claims advanced by Lange are based on a re-definition of market and planning which in turn is based on a (mis)reading of Walras. In his view the two systems can achieve almost equivalent results only because they are both interpreted as a (modified) Walrasian auctioneer economy. Instead of proving a substantial equivalence between the two systems contrasted by the Austrians and Marx, Lange proposes a model which is different from both.

It could be argued that his model represents a successful compromise between markets and central planning. His model of 'market socialism' could handle some Marxian objection to markets in that the planning office could, according to Lange, react more quickly to disequilibrium than markets and change (accounting) prices with greater speed. Moreover, his model of 'market socialism' could answer some Austrian objections to planning in that the planning office only needs to know aggregate excess demand and supply in order to set 'rational' prices.

However, it can also be argued that Lange's solution has the worst characteristics of both markets and planning, and leaves both the Marxian and Austrian arguments without a satisfactory answer. On the one hand, from the Marxian standpoint, Lange's planning does not have the main advantages of firm-type organization (i.e. ex-ante co-ordination).¹⁴ On the other hand, from the Austrian stand-point, Lange's accounting prices cannot perform the role of efficient transmitters of the information dispersed among the agents. In Lange's model, the agents are not free to set prices according to the subjective opportunities which they perceive. Thus, even if the socialist managers have the same incentives as private entrepreneurs, they are unable to transmit information immediately about the positive opportunities perceived by them, because they cannot increase the prices of the resources employed in the exploitation of these opportunities. They can only increase the demand for these resources at the price given by the planning office. Their additional demand implies that all the users of that resource (including themselves) will be 'rationed' until the planning office adjusts prices. The agents perceiving the new positive opportunities cannot immediately acquire amounts of resources greater than their competitors by offering a higher price. Thus, resources are not immediately moved to a use where they have a higher value and the other competing agents are not

¹⁴ This 'Marxist' criticism was expressed by Maurice Dobb (1933) and (1935).

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 65

immediately aware of the increased opportunity cost of the resource which they employ.

Lange believed that he had found the optimal synthesis between market and planning. It is an open question, which goes beyond the scope of this paper, whether his model combines the advantages or the disadvantages of both systems. It is certainly different from both of them for reasons more substantial than those advanced by Lange. For this reason, his optimality claim has to be added to that of Marx and the Austrians as a claim advanced for a different model. We will see that a similar argument can be developed for the Rational Expectations school, which we are going to examine in the following section.

6. COMPETITION MAKES EVERYBODY A RATIONAL PLANNER: INTUITIONS AND PARADOXES OF THE RATIONAL EXPECTATIONS SCHOOL

In both the Marxian and the Austrian models the market economy is characterized by ex-post co-ordination and the absence of a central authority. No central agent ensures that decisions are taken only on the basis of equilibrium prices. The agents decide on the basis of current prices. They do not try to guess whether the current prices are (dis)equilibrium prices and whether they are likely to stay unchanged in the future. If production takes time, current prices may provide misleading information for making economic decisions. Suppose that disequilibrium prices prevail on the market. Cobweb theories have shown how the agents could keep on making wrong decisions *ad infinitum* if they base their decisions on current prices. If all the agents make their production decision on the basis of a high (low) price due to an undersupplied (oversupplied) market, the opposite situation will prevail in the following period.¹⁵

What is possible for one small agent—selling a different quantity at the current price—is not possible for all of them. Each agent ignores the effects of the reactions of all the other agents to the same current price and contributes to the endless repetition of the same mistake. In the case of cobweb theories, the market provides an ex-post co-ordination in the sense that an inconsistency of the previous period (excess demand) is eliminated. But this ex-post co-ordination mechanism is here particularly weak in that inconsistencies may be eliminated only at the cost of recreating new inconsistencies at the opposite extreme (excess supply).

Within the framework of the theories we have so far considered, the elimination of this unsatisfactory succession of mistakes at the opposite extreme

¹⁵ From a formal point of view these oscillations will exist under the usual assumptions that the demand curve has a negative slope and the supply curve has a positive slope. These oscillations will be explosive, of constant amplitude or damped if the supply curve has a slope greater than, equal to or smaller than the absolute value of the slope of demand. The standard cobweb model implicitly assumes that the agents have static expectations in that the agents expect the future price to be equal to the current price. The paradoxical consequences of the cobweb model, which appeared particularly unrealistic for the case of explosive oscillations, stimulated the formulation of adaptive expectations by Nerlove (1958). Adaptive expectations were criticized by Muth (1961) on the grounds that they were rational only under special conditions.

66 UGO PAGANO

would seem to require some form of central intervention whereby the agents could internalize ex-ante the consequences of their decisions. A move away from the market mechanism in the direction of central planning would seem to be necessary for the ex-ante elimination of these recurrent mistakes.

Muth (1961) offered an alternative view of the market mechanism. He argued that the agents of a market economy were able, on average, to avoid these systematic mistakes by making an optimal use of the available information which would have been processed by employing the relevant economic theory. The expectations of the agents were not naively and mechanically based directly or indirectly on current prices. They were formed, on average, on the basis of the same relevant theory which was used by the economist to model the economy. This hypothesis of the formation of expectations—appropriately called 'rational expectations hypothesis'—was, according to Muth, supported by the principle of competition itself. 'If the predictions of the theory were substantially better than the expectations of the firms, then there would be opportunities for the 'insider' to profit from the knowledge by inventory speculation, if possible, by operating a firm or by selling a price forecasting service to the firms' (Muth, 1961, p. 318). Or, in other words, '... if expectations were not moderately rational there would be opportunities for economists to make profits...' (Muth, 1961, p. 330).

What is claimed here is that the systematic mistakes, like those predicted by cobweb theories, will not take place because the agents will predict the equilibrium prices, which allow the compatibility of their decisions as if they knew the theory and the information utilized by the economist. Or, to put it a different way, the agents of a market economy will not make systematic mistakes because, like economic theorists, they learn from past experiences and eliminate this type of mistake from future expectation formation. The type of expectation mistakes which they make are necessarily random and are uncorrelated with the information which was available when they formed their expectations.

According to the Rational Expectations Theorists, not only are ex-ante co-ordination and the authority of competition compatible but the former necessarily implies the latter because the authority of competition implies that all the opportunities for profits, including those arising from the use of processing information, are exploited. Thus, the agents will hold rational expectations about future prices which make their decisions ex-ante compatible.

The rational expectations theory completes our table of organizations by occupying the north-east corner of the table which joins together the authority of competition with ex-ante co-ordination. Like the other theories, the rational expectations model has tried to describe an optimal world. But, like the other theories, it fails to take into account the organizational assumptions and costs which are required for achieving this type of configuration of the economy.

If we assume that the agents have all the necessary information on the economy and can use that information efficiently to compute the equilibrium solution, we are making assumptions much stronger and unrealistic than those Hayek believed to be necessary for the feasibility of the central planning solution. In the case of central planning we are assuming that only one agent (the planning office) collects

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 67

and processes this information. Here, we are assuming that all the agents achieve this result which, according to Hayek, is impossible for one complex organization. In the rational expectations case, the collection and the processing of information is much more costly than under central planning. Moreover, in the rational expectations case, each individual must be sure that all the other individuals are performing the same collection and the same processing of information as he is. Each individual must also know that this is done by all the other individuals on the basis of the same 'true' model and without making mistakes. If a relevant number of individuals use a different model of the economy, or fail to collect and process relevant information, or simply make mistakes, then the other individuals' efforts of predicting the 'correct' equilibrium outcome is useless. The outcome will be influenced by the actions that a number of individuals make on the basis of a wrong assumption. It can be observed that this problem does not arise for a central planner if he can be sure that the individuals will abide by his plan. Or in other words, unlike the agents of a market economy, the central planner does not have to pay attention to the actions that other agents would make on the basis of their own expectations.

Indeed, for several reasons, it would be extremely misleading to say that the rational expectations model has shown that the market can attain the same ex-ante co-ordination achieved by some idealized form of central planning, and that the authority of competition succeeds where the authority of command would fail.

In the first place, the possibility that different agents may choose on the basis of different models is simply ruled out by using the strange argument that 'expectations, since they are informed predictions of future events, are essentially the same as the prediction of the relevant economic theory' (Muth, 1961, p. 316). Thus, the co-existence of different agents with competing economic theories is ignored and each economist having a different economic theory can comfortably assume that each modelled agent shares the same theory as the author of the model. As Frydman and Phelps (1983, p. 27) have observed 'the rational expectations program of policy analysis logically requires the authority of a single model'. Thus it is appropriate to say that rational expectations replace the authority of command with the authority of a single model or theory imposed on the agents.¹⁶

Secondly, even if one accepts that the different agents act under the authority of a single theory and share the same model of the economy, rational expectations theorists are far from showing that a competitive economy can achieve ex-ante co-ordination. Even if people share the same theory, they are going to have heterogeneous information because of the dispersion of knowledge existing in society. Heterogeneous information implies that the information

¹⁶ Assuming that the authority of a single theory may ever be accepted is not only highly unrealistic, it also contrasts with the moral beliefs which are at the foundation of liberal democracies. These moral beliefs claim that accepting and promoting competing theories saves us from serious mistakes. In contrast, in the rational expectations world, the authority of a single theory is a necessary condition for avoiding mistakes.

68 UGO PAGANO

available to each individual is not sufficient to forecast the expectations of other people. This is true even if each individual not only shares the same theory but also knows that all individuals know that he knows that they know that he knows (and so on) that each individual shares the same theory by which he processes information and forms his expectations.¹⁷ Even in this case, each individual has to form expectations of other people's expectations, which he cannot assume to be the same because they are conceived on the basis of different pieces of information. Expectations of expectations, or expectations of a higher order, will introduce a situation of behavioural uncertainty.

In other words, in a situation of heterogeneous information the agents will be in the situation described by Keynes in his 'beauty contest' example, where the issue is to guess not which face is more beautiful but which is, according to the majority of people, more beautiful (Keynes, 1937, p. 156). Each agent attempting to guess average expectations tries to formulate his expectations of the expectations of the other agents, the expectations of the other agents of his expectations, his expectations of the expectations of the other agents of his expectations, and so on. The result is an infinite regress where average expectations are unlikely to be determined by any one of the agents. In this situation it is difficult to believe that the agents have any rational basis on which to form their expectations.

The fact that heterogeneous information generates a 'beauty contest' type of uncertainty has been shown in the context of the 'market island paradigm'¹⁸ and in the case of the cobweb model.¹⁹ In the former case, each agent knows the

¹⁷ Phelps (1983) considers the case in which all the individuals share the same theory but each individual does not know that the other individuals share this theory and is uncertain about their expectations. Then convergence to the rational expectations equilibrium is highly problematic even if each individual processes homogeneous information by means of the same theory. The infinite regress problem of expectations of expectations also arises in this case.

¹⁸ The 'market island paradigm' was originally formulated by Phelps (1970) and has been extensively used by Lucas (1972, 1973, 1975). Frydman (1983) has shown that the informational assumptions of the model are not consistent with the rational expectations assumption. In order to form rational expectations, the agents should know not only the supply parameters of their own market island, but also the supply parameters of the agents living in other market islands. This assumption is not only inconsistent with the 'market island paradigm' adopted by Lucas himself, but also with the assumption of the decentralization of information in market economies. Indeed, from the latter point of view, the market island paradigm itself is too demanding because it implies that the agents know the supply parameters of the agents operating in their 'market island'. From this point of view, the cobweb framework is more appropriate than the 'market island paradigm'. It shows that agents can have heterogeneous information even if they operate on the same 'market island' but face different supply shocks.

¹⁹ A complete analysis of this problem in the cobweb framework is provided in Chapter 4 of Pesaran (1987). Pesaran shows how the infinite regress problem of expectations of expectations, due to the behavioural uncertainty arising in beauty contest situations, does not admit any plausible solution in cases of real heterogeneous information. In particular, the formation of rational expectations is not possible when each firm knows only its own supply shocks which are serially correlated and when each different firm knows only its own adjustment costs. To assume otherwise would contrast with any assumption of the decentralization of information in competitive markets. Pesaran convincingly argues that the assumption of identical firms processing homogeneous information is hidden under the analytical framework of a single representative firm used by the rational expectations school (see, for example, Sargent, 1978). Observe that Pesaran is (at least implicitly) assuming that heterogeneous information causes problems only in inter-firm co-ordination and not in intra-firm co-ordination. This point will be examined in the concluding section.

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 69

current prices in its own market but has no information on current average prices, whereas in the latter, each firm knows its own supply shocks but has no information about other firms' supply shocks. Both results introduce serious doubts about the possibility that competition can generate any form of successful ex-ante co-ordination independently of norms, customs and rules internalized by the agents. Indeed, the latter could be the decentralized institutions which may stabilize real-life markets and promote some form of ex-ante co-ordination. However, an examination of this point is beyond the scope of this paper. Here, it is sufficient to observe that the market cannot be described as an idealized case of central planning when a central planner imposes the authority of a single model and of a single set of information to be processed by the model. In a market economy no such authority exists and the agents are likely to process heterogeneous information by means of different models.²⁰

Finally, even if we assume that all agents use the same model to process the same homogeneous information, and also assume that everyone knows that everyone knows that everyone knows etc. that this is the case, we are still very far from the possibility that the market can achieve ex-ante co-ordination. If we say that rational expectations are possible because in an ideal situation of rational expectations equilibrium people can estimate the parameters of the model, then we are simply assuming what has to be shown. This is because the economy can be in a rational expectations equilibrium only when all the agents have rational expectations or they have already learnt the equilibrium relations of the economy.²¹ Then, in order for the rational expectations solutions to be calculated, each agent should solve the same information and calculation problem that, according to Hayek, was impossible to solve for a single central agent. Even if all the agents accept the authority of a single model to process homogeneous information, and even if this is common knowledge, it is very difficult to believe that each agent could ever achieve this result. The issue is therefore how, starting from a disequilibrium situation, they can learn and converge to a rational expectations equilibrium without having to calculate this equilibrium solution. Typically, learning involves the following problem: while learning, the agents' actions will be influenced by their learning mistakes, but these learning mistakes change the economy about which they are trying to learn. In other words, the learning process is characterized by a feedback of learning on outcomes. Therefore disequilibrium learning mistakes may well inhibit the possibility of

²⁰ This is not necessarily a relative disadvantage of a market economy. Indeed, it may be its virtue. But this is far from being captured by the rational expectations model.

²¹ In order to give operational meaning to the rational expectations hypothesis Lucas (1975) restricted his analysis 'to the situation in which the relevant distributions have settled to stationary values' (p. 1121). Frydman (1983) observes that this solution involves a vicious circle. The major problem with this justification of the rational expectations hypothesis is that the relevant distributions can be at their 'stationary values' if and only if every agent 'knows' the parameters of these stationary distributions. Stated differently, the markets are in the rational expectations equilibrium if, and only if, every agent forms its expectations according to the rational expectations equilibrium forecast function. Thus, the assumption that relevant distributions have settled down to stationary values cannot be used to give 'operational meaning' to the assumption that the agents 'know' the parameters of those distributions (pp. 110-111).

70 UGO PAGANO

reaching a stationary state where the expectations of the individuals coincide with the actual outcomes of the economy. Learning implies that the economy cannot be in a stationary state even if it is assumed to be so in all other respects.

Two approaches have been taken into account in dealing with this problem: one is defined as 'rational learning' and the other is defined as 'boundedly rational learning'. Under 'rational learning' the individuals are assumed, except for a limited number of parameters, to know the true equilibrium relations of the economy in their structural form (and that everyone knows that they know that he knows etc.). 'Rational learning' involves various iterations due to the feedback of the disequilibrium estimation mistakes on the outcomes of the economy. In general 'rational learning' can be shown to converge to an equilibrium, but not necessarily to the rational expectations equilibrium, because the disequilibrium learning mistakes change the final equilibrium outcome.²² 'Rational learning' does not solve the learning problem because the agents are assumed to know, except for some subjective uncertainty for a limited number of parameters, the structural form of the equilibrium relations of the economy from the outset. Thus 'rational learning' departs very little from the assumption that the agents know the rational equilibrium relations. The fact that this assumption is incredibly demanding on the abilities of the individuals underlies the attempt made in the 'boundedly rational learning' models. At first sight the 'boundedly rational learning' models²³ have some attractive features. The individual needs to know and stick to a relatively simple learning rule. This requires the knowledge of the reduced form equations of the true model (apart from the values of a limited number of parameters) but it does not require the knowledge of the model. In spite of the usual feedback from learning to the outcomes, convergence to a rational expectations equilibrium (or at least to an equilibrium) can be shown to occur under these circumstances which seem to be considerably less demanding on rationality. But the attractiveness of 'boundedly rational learning' is largely deceptive. Indeed, the simplification of the learning process is only achieved by increasing the complexity of what is implicitly or explicitly done before the learning process starts. This is because convergence requires that the agents choose *ex ante* a good learning rule and accept its authority during the learning process. In turn the choice of a good learning rule can only be made by knowing the 'rational expectations equilibrium'.²⁴

When we add that in all the learning models the acquisition of information is

²² This general result of 'rational learning' comes from M. M. Bray and D. M. Kreps (unpublished data).

²³ As an example of this class of models see Bray (1983). Some limitations of the model are considered by Bray herself and by Roy Radner in his comment of Bray's paper. A full list of references is provided in Chapter 3 of Pesaran (1987).

²⁴ As Pesaran (1987) observes, '... all the authors who have studied the problems of convergence in boundedly rational learning models have assumed that the agents' choice of the learning rule is based on some common a priori knowledge of REE'.

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 71

assumed not to be costly,²⁵ and that continuous market clearing is assumed to hold during the learning process (this seems to require a Lange-type planner/auctioneer acting *ex post* with infinite speed), then it is difficult to avoid the conclusion that the rational expectations literature has dramatically failed to show that the authority of competition can achieve ex-ante co-ordination. One cannot avoid the feeling that a lot of unnecessary confusion is generated when a fair number of economists are persuaded by the claim that rational expectations are a simple extension of utility maximization²⁶ to expectations formation, or that consistency requires the modelled agents to have the true expectations generated by the model.

Still, this literature has made some useful contributions. The fact that the agents of a market economy take into account more information than current prices and may make an (only sometimes successful) attempt to forecast future prices and to achieve ex-ante co-ordination is a reasonable assumption. Moreover, the fact that some systematic mistakes can sometimes be eliminated also makes sense if one admits the existence of the disequilibrium and information costs involved in the elimination of these mistakes. Finally, the 'negative results' obtained by the literature stimulated by the defence or the criticism of the rational expectations hypothesis have clarified, together with the limits to rational expectations, the limits of the market system itself.

Indeed, the rational expectations hypothesis has stimulated the exploration of the only combination which has not yet been fully considered in the history of economic analysis: that between ex-ante co-ordination and the authority of competition. Like Marx, Lange and Hayek, the Rational Expectations theorists have not resisted the claim that their combination was the optimal one. The fact that their claim was even harder to justify can be considered a merit or a liability. It has certainly the very limited merit of completing our table of organizations (Table 2), which now shows an optimality claim for all the possible combinations of authority and co-ordination.

²⁵ If information is costly, then the agents will collect additional information only when its expected marginal benefit of search outweighs its marginal cost. But the expected marginal benefit will depend on their a priori beliefs, which can be wrong because there is no way one can be certain about the value of additional information before one has collected it (Stigler, 1961). Thus the individuals can be trapped in wrong beliefs which are not changed because the collection of information, which would show them to be wrong, is (wrongly) assumed to be costly. Thus, there is no successful reformulation of the rational expectations hypothesis which deals satisfactorily with the problems stemming from costly information. Nor is it possible to appeal to any equilibrium solution of the problem because if a competitive equilibrium is defined as a situation where all the arbitrage profits are eliminated, then in equilibrium there are no returns for those who eliminate systematic mistakes. 'Hence the assumptions that all markets, including that for information, are always in equilibrium and always perfectly arbitrated are inconsistent when arbitrage is costly' (Grossman and Stiglitz, 1980, p. 393). In fact, equilibrium analysis, far from solving the problem, simply shows one of the 'paradoxes of the pure equilibrium method' (Vercelli, 1989, pp. 26-29). Some 'equilibrium degree of disequilibrium' (Grossman and Stiglitz, 1980, p. 393) can be used to solve the existence problem, but not to show that competition eliminates all systematic mistakes.

²⁶ For instance, Kantor (1979, p. 1429) maintained that the rational expectations hypothesis was an extension of 'the maximization assumption to the use of information'.

72 UGO PAGANO

TABLE 2.

Forms of co-ordination	Forms of authority	
	Command	Competition
Ex-ante	(A) firm planning (Marx)	(B) markets (Rational Expectations)
Ex-post	(C) planning (Lange)	(D) markets (Hayek)

7. COMPARING 'PERFECT' MODELS: THE SUPERIOR 'IMPURITY' OF REALITY

We will now try to summarize the comparative analysis which, in spite of their optimality claims, emerges from the examination of the authors considered above. This will be done by comparing each one of the four entries²⁷ of Table 2 with all the others.

(A-D) Markets have relatively lower co-ordination costs because decisions are taken on the basis of cheap current price information, whereas firms have higher co-ordination costs because decisions are taken on the basis of relatively costly planning decisions. On the other hand, the planning taking place inside firms may save the resources which would be wasted by the inconsistencies arising in the framework of the ex-post adjustment existing in a market economy where the agents base their decisions on current prices.

(A-B) The disequilibrium cost of a market economy becomes lower if we assume that, under competitive pressure, the agents will try to forecast future prices and eliminate some inconsistencies. In this respect, the gap between the waste of real resources due to disequilibrium between market-type and firm-type organization can be reduced. However, it cannot be completely eliminated because the organizational requirements which are necessary for a market economy to eliminate this waste are too costly (they require multiplication of a single model or of a single learning rule by different agents and homogeneous information). On the other hand, a partial elimination of inconsistencies may be achieved. Insofar as this partial elimination of inconsistencies is less costly in the market than in the firm, this saving of organizational costs may be greater than the benefit of the more complete elimination of inconsistencies achieved within the firm.

²⁷ Indeed, other entries could also be considered as intermediate cases among the 'pure' cases examined in Table 2. For instance, 'indicative planning' can be described as an intermediate case between (A) and (B) where a central agent provides forecasts which are used by the agents to form their expectations about future trends in the economy. Information costs may be decreased if the state centralizes this function. Behavioural uncertainty can be reduced if the state can build a reputation for being reliable. 'Keynesian demand management' can be regarded as an intermediate entry between (C) and (D) where the agents act on the basis of current prices and the state steps in to correct the inconsistencies which arise at aggregate level. The concentration of the state on the intervention at aggregate level could be defended on two grounds: first, it is less costly to intervene on aggregate levels because it requires less information; and second, aggregate inconsistencies are more costly for the economy than simple mismatching of demand and supply in particular sectors. In this paper I only consider 'pure cases' because they are simpler and more important for understanding the disequilibrium reasons for the existence of firms.

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 73

(A-C) The organizational costs of planning may be decreased if management simply intervenes *ex post* to eliminate inconsistencies. Indeed, this is close to the idea of 'managing by exception', which is applied in actual firm management when the hierarchically superior managers intervene only when inconsistencies arise (Radner, 1989, p. 15). Again, the organizational costs to be sustained to eliminate inconsistencies should be compared with the benefits of this improved consistency. This way of reasoning can be illustrated by observing that a central agent acting like a Walrasian auctioneer will be able, by the exchange of tickets occurring in that economy, to eliminate inconsistencies after a certain number of iterations. These iterations are costly and the cost can be reduced by a central agent who, acting *à la* Lange, observes the real economy and changes prices when imbalances occur. But this decrease in planning costs is only achieved by increasing the cost of the waste of real resources because inconsistencies are not anticipated but only corrected *ex post* after some time.

(B-D) It is questionable whether 'Rational Expectations markets' ('weakly' defined as markets where the agents try to achieve some ex-ante co-ordination by trying to forecast future equilibrium prices on the basis of available information) are more efficient than markets *à la* Hayek, where the agents take their decisions on the basis of current prices. It is doubtful whether 'Rational Expectations markets' can reduce co-ordination failure. Moreover, when they succeed, the benefits of decreasing co-ordination failure should be compared to the greater computational and information costs which Rational Expectation markets imply in comparison with the markets *à la* Hayek. It seems reasonable to assume that the agents of a market economy take many decisions on the basis of current prices and make an effort to predict future prices only for 'major decisions'. Only in the case of major decisions may the cost of forecasting activity be compensated by the saving of real resources otherwise wasted because of co-ordination failure. In other words, the pressure, or the authority of competition, can have different effects on expectation formation in the two cases. In the case of 'major decisions', where mistaken forecasts of future equilibrium prices imply considerable losses, competitive pressure is likely to make the agents spend time and resources trying to form 'rational', or, rather, more 'reasonable' expectations. In contrast, in the case of 'minor decisions', where mistaken future equilibrium prices do not imply great co-ordination losses, competitive pressure is likely to make the agents save time and effort by taking their decisions on the basis of current prices. In other words, B and D, or Hayek's and the Rational Expectations theories taken in their 'weak' versions, are not necessarily two incompatible and competing models of the nature of competition. In contrast, they can be interpreted as two alternative real forms of co-ordination which the 'authority of competition' may imply for different decisions.

(C-D) A central authority may sometimes be faster than the market in correcting inconsistencies *ex post*. When and if this arises, real resources may be saved by centralizing decisions within a firm. This saving of real resources should be compared with a possible increase of organizational costs.

(B-C) A similar case can be made even when the agents of a market economy

74 UGO PAGANO

try to eliminate inconsistencies *ex ante*. They may be unable to eliminate all inconsistencies or able to eliminate them only at considerable costs. Then it is possible that the commands of a central authority do better than competition, even if the central authority tries to eliminate inconsistencies only *ex-post*. If the *ex-post* intervention of the central authority is sufficiently fast, the costs of co-ordination failure may be lower than those existing in 'Rational Expectations markets'. Moreover, the organizational costs of central *ex-post* co-ordination may be lower than the costs to be sustained when many agents attempt to achieve *ex-ante* co-ordination by trying to form 'rational expectations' about future equilibrium prices.

In general, different systems are likely to have different organizational costs and different results in the elimination of inconsistent decisions. For instance, one may argue that moving from *ex-ante* to *ex-post* co-ordination, and from the authority of command to the authority of competition, organizational costs decrease but the costs due to the inconsistencies of the decisions increase.²⁸ In this sense no organizational form is optimal. In contrast, there is a trade-off between organizational costs which have to be organized. For each particular set of actions the inconsistencies which would arise in the absence of a particular organization should be compared with its organizational costs. Given the variety of actions that we have in reality, it is reasonable to expect that a plurality of organizational solutions exist, and this is in fact the case: different forms and sizes of firms and markets do characterize different sectors of real life economies. This does not mean that what we have in reality is optimal or efficient, but simply that the 'impurity' of reality is much more 'reasonable' than any 'pure' application of the four solutions contained in our table of organizations.²⁹

8. CONCLUSION: WHY DO FIRMS EXIST? A DISEQUILIBRIUM ANSWER

Questions like: 'why do firms exist?', 'why do markets exist?' and 'why is firm-organization more extended in some sectors than in others?' find some answers when we observe the disequilibrium³⁰ costs of each institution. These answers should be considered to be complementary to the answers given by the New

²⁸ However this summary statement should be taken with some caution. An excessive reliance on *ex-ante* co-ordination and authority of command (as well as an excessive reliance on *ex-post* co-ordination and authority of competition) can increase both the costs of inconsistencies and organizational costs.

²⁹ The importance of the 'impurity principle' is forcefully underlined in Chapter 7 of Hodgson (1988).

³⁰ As Vercelli (1989) points out, many economists consider disequilibrium analysis to be irrelevant. He analyses the disappointing consequences that this approach has for macroeconomic analysis, and provides a full criticism of this methodology. I wish to stress that, quite unfortunately, the same criticism applies to New Institutional Economics, which has often taken the Arrow-Debreu equilibrium model with incomplete contracts as its implicit foundation. This paper confirms the point that 'it should never be forgotten, however, that the equilibrium configuration is much poorer in information than the "dynamic" representation. Any conclusion drawn from the subset of information which characterizes the equilibrium configuration may be gravely misleading if the real system is not guaranteed to be and remain in equilibrium' (Vercelli, 1989, p. 21). It can be added that, even if and when the dynamic analysis cannot achieve the same deterministic precision of equilibrium analysis, it is better to be roughly right than precisely wrong.

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 75

Institutional approach by introducing more realistic features in the equilibrium situation of an economy. It can be argued that the New Institutional Literature has concentrated its attention only on one of the two distinctions considered in our table of organization (i.e. that between authority of competition and authority of command), and has ignored the other (i.e. that between ex-ante and ex-post co-ordination). This is due to its 'equilibrium approach'. In equilibrium, the ex-ante versus ex-post co-ordination issue does not arise because it is implicit in the notion of equilibrium that some co-ordination of decisions has already been achieved. In equilibrium it is only possible to study the institutions by which equilibrium (incomplete) contracts can be best implemented, and to compare the relative efficiency of the authority of command competition, but it is impossible to compare the relative efficiency of alternative co-ordination systems.

In contrast, an important reason for the existence of management and an important aspect of the work of managers is to try to balance supply and demand within the firm in a way different from, and often superior to, the market when the latter is considered in a disequilibrium situation. When this superiority emerges (and I have tried to show that this is not necessarily the case), this may be due to the various means which are available to the firm in dealing with disequilibrium, which either are not available or are available at greater costs to the market: namely within a firm, its members (i) can act under the authority of a single plan derived from a single model; (ii) can learn how to formulate the plan according to consistent learning rules, the authority of which is accepted by the members of the firm; (iii) can save the costs which they would incur if each member of the firm had to formulate their own complete plan on the basis of their own model; (iv) can avoid costly inconsistencies by co-ordinating *ex ante* the actions before they are implemented; and (v) can eliminate unforeseen ex-post inconsistencies in the plan by constantly monitoring the emergence of ex-post imbalances. Or, in other words, firm-type co-ordination can within certain limits: reduce behavioural uncertainty (i and ii), decrease computation and information costs (iii) and save on mismatching between demand and supply (iv and v).

It is a worrying thought, given the enormous size of many firms, that the cause of their success is that the people working within them leave outside the firms that plurality of theories, models, plans and ideas which it is possible to implement in the context of a market economy, and accept the authority of some people formulating a plan on the basis of a single model. But if, within the firm, some form of authority of command can do better than the authority of competition, the organizational answer to these worries cannot be competition itself. It must, instead, be found in some form of internal decentralization of decisions and of democratic control of that authority. A solution to this problem is not easy but an effort in this direction may be highly rewarding.

REFERENCES

- ALCHIAN, A. (1984). 'Specificity, Specialization and Coalitions', *Journal of Institutional and Theoretical Economics*, 40, 34-9.

76 UGO PAGANO

- ALCHIAN, A. (1987). 'Property Rights', in Eatwell, J., Milgate, M. and Newman, P. (eds), *The New Palgrave*, 1031-4. Macmillan, London.
- ALCHIAN, A. and DEMSETZ, H. (1972). 'Production, Information Costs and Economic Organization', *American Economic Review*, 62, 777-795.
- ARROW, K. J. and HAHN, F. H. (1971). *General Competitive Analysis*, Oliver & Boyd, Edinburgh.
- BARONE, E. (1908). 'The Ministry of Production in the Collectivistic State', in A. Nove and D. M. Nuti (eds), *Socialist Economics*, Penguin, Harmondsworth.
- BRAY, M. M. (1983). 'Convergence to Rational Expectations Equilibrium', in R. Frydman and E. S. Phelps (eds), *Individual Forecasting and Aggregate Outcomes. Rational Expectations Examined*, Cambridge University Press, Cambridge.
- COASE, R. H. (1952). 'The Nature of the Firm', *Economica*, (1937), 4, 386-405; reprinted in G. H. Stigler and K. E. Boulding (eds), *Readings in Price Theory*, Richard D. Irwin, Homewood.
- DOBB, M. H. (1933). 'Economic Theory and the Problem of a Socialist Economy', *Economic Journal*, 19, 589-98.
- DOBB, M. H. (1935). 'Economic Theory and a Socialist Economy: a Reply', *Review of Economic Studies*, 3, 144-51.
- FRYDMAN, R. (1983). 'Individual Rationality, Decentralization and the Rational Expectations Hypothesis', in R. Frydman and E. S. Phelps, (eds) *Individual Forecasting and Aggregate Outcomes. Rational Expectations Examined*, Cambridge University Press, Cambridge.
- FRYDMAN, R. and PHELPS, E. S., (eds) (1983). *Individual Forecasting and Aggregate Outcomes. Rational Expectations Examined*, Cambridge University Press, Cambridge.
- GROSSMAN, S. and STIGLITZ, J. E. (1980). 'On the impossibility of informationally efficient markets', *American Economic Review*, 70, 393-408.
- HAHN, F. H. (1987). 'Auctioneer', in Eatwell J., Milgate, M. and Newman, P. (eds), *The New Palgrave*, Macmillan, London.
- HAYEK, F. A. (1935). *Collectivist Economic Planning*, Routledge, London.
- HAYEK, F. A. (1949). *Individualism and Economic Order*, Routledge, London.
- HEAL, G. M. (1973). *The Theory of Economic Planning*, North Holland, Amsterdam.
- HOBBS, T. (1968). *Leviathan*, Penguin, Harmondsworth.
- HODGSON, G. M. (1988). *Economics and Institutions*, Polity Press, Cambridge.
- JENSEN, M. and MECKLING, W. (1976). 'The Theory of the Firm: Managerial Behaviour, Agency Costs and Capital Structure', *Journal of Financial Economics*, 3, 305-60.
- KANTOR, B. (1979). 'Rational Expectations and Economic Thought', *Journal of Economic Literature*, 17, 1422-41.
- KEYNES, J. M. (1937). *The General Theory of Employment, Interest and Money*, Macmillan, London.
- LANGE, O. (1936a). 'On the Economic Theory of Socialism: Part I', *Review of Economic Studies*, 4, 53-71; reprinted in M. J. Farrel, (1973). *Readings in Welfare Economics*, Macmillan, London.
- LANGE, O. (1936b). 'Mr Lerner's "Note on socialist economics,"', *Review of Economic Studies*, 4, 143-4; reprinted in M. J. Farrel, (1973). *Readings in Welfare Economics*, Macmillan, London.
- LANGE, O. (1937). 'On the Economic Theory of Socialism: Part II', *Review of Economic Studies*, 4, 123-42; reprinted in M. J. Farrel (1973). *Readings in Welfare Economics*, Macmillan, London, UK.
- LANGLOIS, R. N. (1986). *Economics as a Process, Essays in the New Institutional Economics*, Cambridge University Press, Cambridge.
- LAVOIE, D. (1985). *Rivalry and Central Planning*, Cambridge University Press, Cambridge.
- LERNER, A. P. (1936). 'A Note on Socialist Economics', *Review of Economic Studies*, 4, 72-6; reprinted in M. J. Farrel (1973). *Readings in Welfare Economics*, Macmillan, London.
- LUCAS, R. E. (1972). 'Expectations and the Neutrality of Money', *Journal of Economic Theory*, 4, 103-24.
- LUCAS, R. E. (1973). 'Some International Evidence on Output-Inflation Trade-offs', *American Economic Review*, 63, 326-44.
- LUCAS, R. E. (1975). 'An Equilibrium Model of the Business Cycle', *Journal of Political Economy*, 83, 1113-44.
- MARX, K. (1967). *Capital*, New York International Publishers, New York.
- MUTH, J. F. (1961). 'Rational Expectations and the Theory of Price Movements', *Econometrica*, 29, 315-35.
- NERLOVE, M. (1958). 'Adaptive Expectations and Cobweb Phenomena', *Quarterly Journal of Economics*, 72, 227-40.
- OLSON, M. L. (1965). *The Logic of Collective Action*, Harvard University Press, Cambridge, MA.
- OLSON, M. L. (1982). *The Rise and Fall of Nations*, Yale University Press, New Haven, CT.

AUTHORITY, CO-ORDINATION AND DISEQUILIBRIUM 77

- PAGANO, U. (1985). *Work and Welfare in Economic Theory*. Basil Blackwell, Oxford.
- PAGANO, U. (1989). 'Firms, Co-ordination and Disequilibrium', *Quaderni del Dipartimento di Economia Politica*, 93, Siena.
- PAGANO, U. (1991a). 'Property Rights, Asset Specificity and the Division of Labour under Alternative Capitalist Relations', *Cambridge Journal of Economics*, 15, 315-42.
- PAGANO, U. (1991b). 'Property Rights Equilibria and Institutional Stability', *Economic Notes*, 20, 189-228.
- PESARAN, H. M. (1987). *The Limits to Rational Expectations*. Basil Blackwell, Oxford.
- PHELPS, E. S. (1970). 'Introduction: the New Microeconomics in Employment and Inflation Theory', in E. S. Phelps et al. (eds), *Microeconomic Foundations of Employment and Inflation Theory*. Macmillan, London.
- PHELPS, E. S. (1983). 'The Trouble with "Rational Expectations" and the Problem of Inflation Stabilization', in R. Frydman and E. S. Phelps (eds), *Individual Forecasting and Aggregate Outcomes. Rational Expectations Examined*, Cambridge University Press, Cambridge, UK.
- PUTTERMAN, L. (1986). *The Economic Nature of the Firm. A Reader*. Cambridge University Press, Cambridge.
- RADNER, R. (1989). *Hierarchy: The Economics of Managing*, Marshall Lecture, Cambridge.
- SARGENT, T. J. (1978). Estimation of dynamic labour demand schedules under rational expectations, *Journal of Political Economy*, 86, 1009-1044.
- SIMON, H. A. (1957). *Models of Man*. New York, John Wiley.
- STIGLER, G. J. (1961). 'The Economics of Information', *Journal of Political Economy*, 69, 213-25.
- VERCELLI, A. (1989). *Keynes after Lucas*. Mimeo, Siena.
- VON MISES, L. (1920). 'Economic Calculation in the Socialist Commonwealth', in A. Nove and D. M. Nuti (eds), *Socialist Economics*. Penguin, Harmondsworth.
- WILLIAMSON, O. E. (1985). *The Economic Institutions of Capitalism*. The Free Press, New York.

Part VI

Institutional Change and Economic Growth