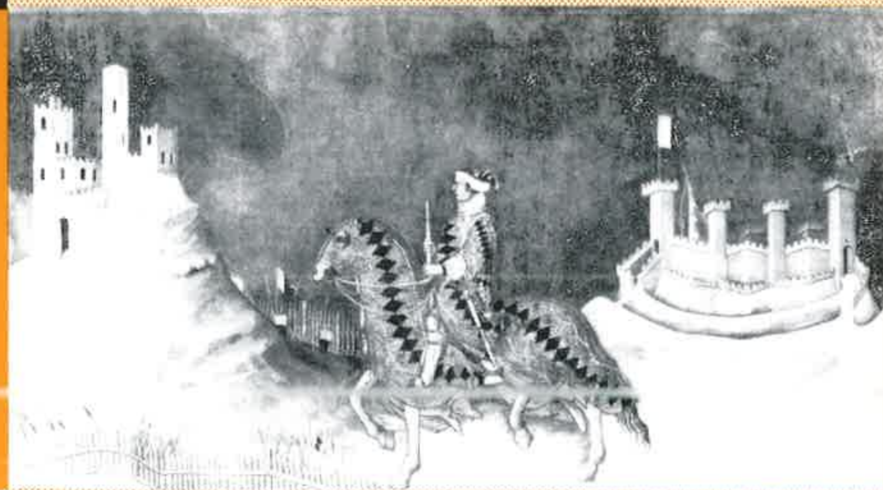
UNIVERSITÀ DEGLI STUDI DI SIENA

181

QUADERNI DEL DIPARTIMENTO
DI ECONOMIA POLITICA

CARLO ZAPPIA

THE INFORMATIONAL EFFICIENCY OF ECONOMIC SYSTEMS AND HAYEK'S PARADOX.



QUADERNI DEL DIPARTIMENTO
DI ECONOMIA POLITICA

Redazione: **Dipartimento di Economia Politica**, Piazza S. Francesco, 17 - 53100 Siena - tel.0577/298620

La Redazione ottempera agli obblighi previsti dall'Art.1 del D.L.L. 31.8.45 n.660

Le richieste di copie della presente pubblicazione dovranno essere indirizzate alla Redazione

I **Quaderni del Dipartimento di Economia Politica** dell'Università di Siena vengono pubblicati come servizio atto a favorire la tempestiva divulgazione di ricerche scientifiche originali, siano esse in forma provvisoria o definitiva. I **Quaderni** vengono regolarmente inviati a tutti gli istituti e dipartimenti italiani, a carattere economico, nonché a numerosi docenti e ricercatori universitari. Vengono altresì inviati ad enti e personalità italiane ed estere. L'accesso ai **Quaderni** è approvato dal Comitato scientifico, sentito il parere di un referee.

(Dal 1979 a tutto il 1987 la denominazione della presente Collana è stata: "**Quaderni dell'Istituto di Economia**". La numerazione progressiva rimane tuttavia la stessa).

Carlo Zappia

THE INFORMATIONAL EFFICIENCY OF ECONOMIC SYSTEMS AND HAYEK'S PARADOX

Siena, aprile 1995

Carlo Zappia, Dipartimento di Economia Politica, Università di Siena.

Introduction*

In recent years economic literature has paid much attention to the debate over socialist calculation of the 1930s between advocates of the competitive market and advocates of a market way to socialism, notably Mises and Hayek on the one side and Lange on the other side. The renewed interest in this issue can be accounted for in two ways. The first reason is that the so-called neo-Austrian school has proposed a re-assessment of the debate by arguing that both Mises' and Hayek's arguments were substantially misunderstood, not only by their adversaries, but also by the critics in general (among others, see Vaughn 1980, Murrell 1983, Lavoie 1985, and Keizer 1993). The neo-Austrian scholars have also argued that this question cannot be confined to the field of history of economics, mainly because Hayek pointed to certain shortcomings in the neoclassical explanation of the way in which the competitive economy works, shortcomings which are still present in the core of mainstream economics (for example, see Kirzner 1992, and Vaughn 1994).

The second reason is that over the last decade the comparison between different types of economic organizations has been a central theme of contributions to economic theory and institutional economics, especially as regards the analysis of the relationship between, and respective role of, the firm and the market. The reference to the debate of the 1930s is common to many of these contributions (for example, see Pagano 1992). Indeed, mainly as a result of the approach developed by Hayek, the socialist calculation debate focused on the respective efficiency of the competitive market economy and the socialist market economy in using the information dispersed throughout the system, an issue which is now dominant in economic theory [1].

This paper concentrates almost exclusively on the second of the two reasons just mentioned. To be exact, the purpose of this paper is to study the influences that these new developments may have on the appraisal of the competitive mechanism offered by market advocates.

* This paper was presented at the Associazione Italiana per la Storia del Pensiero Economico Annual Meeting (Dic 8-10, 1994, Università degli Studi, Modena) and at the European Conferences in the History of Economics Meeting (Feb 9-10, 1995, Erasmus University, Rotterdam). I wish to thank Jack Birner, Manolo Ferrante, Bruno Miconi and Rudy Van Zijp for their comments. Financial assistance from M.U.R.S.T., the Italian Ministry for University and Scientific Research, is gratefully acknowledged.

1 It is also worth mentioning that, contrary to what one might have expected, the end of the socialist era in Eastern European countries has stimulated new interest in the designing of forms of organization alternative to competitive markets (for example, see the essays in Bardhan and Roemer 1993). For a compelling restatement of the opposite position, see the last work of Hayek himself (Hayek 1988).

A clear and authoritative point on the subject has been made in a recent survey by Bowles and Gintis (1993). They emphasize that the newly developing strand of thought known as "information economics", which they call "contested exchange economics" [2], implies a definitive change in the notion of the market. In an economy in which there is imperfect and costly information and an incomplete array of markets, the impersonal nature of exchange which characterizes the Walrasian approach must be abandoned. To be more specific, many characteristics of the market process cannot be adequately handled in Walrasian economics because of its assumption that there are no costs associated with enforcing contracts stipulated both within the firms and in the market in general. In fact, Bowles and Gintis state, a correct analysis of the actual working of the competitive market cannot assume away phenomena such as markets which do not clear and rents which persist in equilibrium, both of which can be thought of as depending on the specific structure of information that is assumed.

This analysis is used by Bowles and Gintis for an assessment of the socialist controversy which differs markedly from those which can be found in the literature on the subject. It is worth quoting a relatively long passage of their argument: "Contested exchange economics may facilitate such comparative institutional analysis [the comparison between feasible alternative institutions], allowing a more illuminating discussion than the heated plan-versus-market debate of the 1930s. Friedrich Hayek and the conservatives in that debate and since have rightly accused Oskar Lange and the critics of capitalism of overstating the capacity of the state to intervene effectively in the economy. Contested exchange theory reveals an ironic complement to this charge. Capitalism's neoclassical defenders have themselves presumed an omnipotent state at least in one area: its powers and information allow the state to enforce contracts at no cost to the exchanging parties. Without this super-state, contested exchange replaces Walrasian exchange and the old defense of capitalism is as uncompelling as the old advocacy of central planning." (Bowles and Gintis 1993: 97-8).

If one takes for granted the re-assessment of the socialist calculation debate proposed by the neo-Austrians, as we are going to do in what follows, the previous statement may be considered nothing if not paradoxical. On the one hand, we are told that the reason why we should consider the claims by market socialists irrelevant is the fact, emphasized by Hayek, that the market is relatively more efficient than other mechanisms in communicating and discovering information. On the other hand, we are told that a more thorough analysis of the market's relative efficiency in disseminating information implies that the standard Walrasian approach is inadequate to accommodate a number of important phenomena present

2 As far as the purpose of this paper is concerned, the differences in emphasis that different authors wish to stress when referring to "information economics", "organization theory" or "contested exchange economics" in their analyses of these developments are irrelevant here. For a discussion of these differences, see Stiglitz and Williamson's comments on Bowles and Gintis's paper (Stiglitz 1993a and Williamson 1993). But see also footnote 6.

in the competitive capitalist economy, while Hayek is considered, at most, a wise representative of the Walrasian side. Hence a paradox eventually emerges. One of the most influential advocates of the competitive markets did not understand that his arguments against market socialism are likewise compelling even if used against the competitive market. We will refer to this paradox as "Hayek's paradox".

The focus of this paper is to show that the paradox emerges only if one assumes, like even most of the neo-Austrians do, that Hayek had no interest in the analysis of personal relationships among market participants. But on this point this paper argues that Hayek's notion of knowledge is useful not only for the analysis of decentralized mechanisms of allocation, such as the competitive market, but also for the analysis of how contracts are designed, both in the market and in organizations. To be exact, I will maintain that Hayek's theory of the way in which information is diffused and used in competitive markets does not necessarily imply that the market mechanism is an impersonal mechanism of allocation of resources, and thus allow a tentative analysis of both the co-ordination and incentive problems. The argument is divided into two parts. First, I will illustrate the reasons which contradict Bowles and Gintis's assumption that Hayek's theory of the market can be considered as a variation within the Walrasian approach. Second, and more briefly, I will discuss the logical consequences of my proposed assessment as regards Hayek's claim about the superiority of the competitive mechanism over centralized mechanisms of allocation.

The paper is structured as follows. The first section briefly reviews the points stressed by "information economics" in its analysis of the shortcomings of the Walrasian model, and examines the main features of the post-Walrasian developments. The second section focuses on Hayek's interpretation of the market mechanism, by making reference to the main issues which emerge from the socialist calculation debate. It is argued that Hayek's notion of knowledge can be applied to an analysis of the functions performed by competitive markets which is compatible with post-Walrasian developments. The third section examines a relatively neglected difference between the assessment of Hayek's thought given by the neo-Austrian school and certain insights present in the works of Hayek himself. It points out that by taking into account this difference the apparent contradictions of the paradox can be resolved. In the final section there are some concluding remarks on the present-day relevance of Hayek's advocacy of capitalism.

1. The message coming from "information economics"

The current mainstream critiques of Walrasian economics focus on the variety of problems which can arise in economic systems when information is costly and asymmetrically distributed among agents, a fact which has been substantially disregarded in the analysis that follows the general equilibrium approach of the Arrow-Debreu model (as noted, among others, by Arrow 1987).

Following the assessment recently offered by Bowles and Gintis, the most prominent argument among the new developments of microeconomic theory is that the self-interest behavior underlying neoclassical theory is "truncated" because in the representation of market exchange many (if not all) of the difficulties involved in enforcing the actual process of exchange are assumed away. They point out that, as a matter of fact, the structure of decision making plays no role in the traditional solving of maximization problems. In fact, the activity of optimization in situations of asymmetric information must entail aspects of economic behavior such as how to transmit information truthfully, how hard to work, and whether the benefits exceed the cost of defaulting on a deal, none of which constitute subject for analysis in Walrasian economics [3] (Bowles and Gintis 1993: 83-85). It is worth noting that the standard assumption of individual agents who are fully rational optimizers is maintained, a fact which probably explains why these developments became so pervasive in economic theory. But now it is every aspect of the possibly sophisticated behavior of individual agents (described by Williamson (1985: 50-53) as opportunism), which is taken into account.

In the main, Bowles and Gintis deal with three features of the Walrasian model: first, the anonymity of the market; second, the uncontested nature of claims; and third, the absence of substantive hierarchy in economic relationships. While the critical remarks concerning the first two features are generally supported by all the representatives of information economics, those concerning the absence of substantive hierarchy in economic relationships are more controversial, since their acceptance may have relevant political implications [4]. Moreover, for the purpose of this paper I need only to examine Bowles and Gintis's claim that the first two features of the Walrasian model apply to Hayek's theory as well. Hence, I will leave the third point out of discussion.

It is commonly maintained that, as far as the representation of exchange relationships is concerned, the Walrasian approach is practically empty. In the Walrasian model, given that the parties to a transaction agree on the property rights relevant to them – a point made by Coase (1960) – it does not really matter who exchanges with whom. For a main feature of the competitive market as seen from a Walrasian perspective is the anonymity of exchange relationships in the market. Neither is there any need to enforce the contracts to be signed, because the auctioneer apparently solves this problem at zero costs. Post-Walrasian economics, on the other hand, has shown that when the parties to a transaction do not share the

---

3 As it is usual in current economic theory, the term "Walrasian economics" refers to the result of the process which has given birth to a formal representation of Smith's notion of invisible hand, along the lines put forward by Walras and encapsulated in the general equilibrium model of Arrow-Debreu. Hence, there is no direct reference to the real meaning of Walras's pure economic theory in the context of the history of economic thought.

4 For example, commenting on Bowles and Gintis's emphasis on the exercise of power in organizations, Stiglitz states that "there are good economic reasons, beyond the exercise of "power" ... for the existence of hierarchical relationships" (Stiglitz 1993a: 111).

same information a typical principal-agent problem emerges. In situations of asymmetric information the actions of individual agents are not easily observable. The principal wishes the agent to undertake the appropriate action, but he cannot properly monitor the agent's behavior, so that promises by the agent to undertake the appropriate action do not suffice, if they are not supported by a credible commitment to perform that action. As a consequence, the contract to be signed cannot be the usual contingent contract of the Arrow-Debreu model; instead the agent must be offered the appropriate incentives. Similarly, when there are differently skilled agents, the contract to be drawn must induce those agents to reveal their own skill (Stiglitz 1989). Incentives become a crucial problem to be studied. In other words, because monitoring and enforcing contractual relationships is costly, the problem is how to find the optimal incentives in situations such as those involving moral hazard and adverse selection (Lazear 1989). Thus, instead of assuming away the problem of the enforcement of contracts, the strategies which implement its endogenous solution now constitute a crucial subject for analysis [5].

Out of a number of important insights into the nature of the variety of economic relationships which emerge in markets with asymmetrically informed agents, Bowles and Gintis derive one fundamental message. This is that, seen from a general perspective, the function of competitive markets is not only allocative, but also disciplinary, in that they provide a system of enforcement of claims by the parties to the transaction. The benefits out of a deal now depend either on the actions or on the quality of the other party, so that interaction upon individuals entails truly strategic behavior. This fact necessarily modifies the very notion of competitive market [6]. For example, the obvious outcome of repeated transactions is long-term commitments. But, to be sure of the continuation of an act of exchange, agents usually find it convenient to offer the other party a rent, a payment in excess of the other party's next best alternative. These rents, which are called enforcement rents, may persist in equilibrium, as has been demonstrated by analyses of the labor market and the credit market (Stiglitz 1987). As a consequence, competitive markets do not clear in equilibrium, and they no longer satisfy the usual allocative efficiency property (Bowles and Gintis 1993: 88-89). The enforcement problem requires a re-examination of the entire structure of contractual relationships. In particular, the costs related to the making and the enforcement of contracts now become relevant, because they affect the set of feasible market outcomes.

---

5 It is worth recalling, however, that the typical contract between asymmetrically informed parties which is studied in the principal-agent literature is still to be considered a kind of complete contract. This is because it unambiguously specifies each party's obligations in each conceivable contingency (Hart and Holmstrom 1987) – even if the contingencies are now defined in a way which differs from that of the Arrow-Debreu model, since they may depend on the action of the agents themselves.

6 Note that while the representatives of "information economics" and "contested exchange economics" share this remarkable viewpoint, Williamson prefers to emphasize the role of organizations in solving the problem generated by asymmetric information.

To sum up, the Walrasian view of the competitive market is characterized by two related features, that is the anonymity of exchange relationships and the exogenous enforcement of contracts, which dramatically contradict the actual process of exchange in competitive markets. The main message coming from the new developments of microeconomic theory, then, is the following: "the standard Walrasian arguments in favor of a capitalist economy are not compelling, even given the conventional assumptions about convexities and absence of externalities" (Bowles and Gintis 1993: 97). In other words, when there is private information, fully efficient outcomes are not guaranteed by the mechanism of decentralized allocation devised in the Walrasian approach. More generally, a correct explanation of essential aspects of the process of exchange is simply missing. Hence the superiority of the market mechanism of co-ordination of economic activity over centralized mechanisms remains to be proved.

As a further illustration of the importance of the results reached by these post-Walrasian developments, let us specifically examine how they handle the question of the comparison between alternative institutional settings. A two step procedure is proposed. The first step is to stress that the problem of comparing different mechanisms of resource allocation cannot be worked out, and to consider feasible institutions instead of hypothetical ideals. In other words, one should focus on the workings of the alternative mechanisms when ideal circumstances such as complete markets and perfect information do not hold. In the literature we are making reference to, Hayek is credited with pointing this clearly out during the socialist calculation debate (see Farrell 1987: 116, Milgrom and Roberts 1992, ch. 3, and Bowles and Gintis 1993: 97-8). Because informational problems are pervasive in economic life, the comparison must concern how different economic systems work when private information exists. In Hayek's view, a correct analysis of the competitive process shows that, as a matter of fact, the Walrasian auctioneer has the same role as the planner of a centralized economy, that is the role of collecting all the information in order to determine equilibrium prices. Hence the Walrasian fiction cannot be used to discriminate between the two systems (Hayek 1945). As we shall see in the following section, the way in which Hayek developed his argument accounts for the neo-Austrian assessment of the socialist calculation – which stresses that, in criticizing market socialists, Hayek clarified his critical remarks on the general equilibrium approach as well.

The second step of the comparison is to contrast the respective efficiency of different institutions in dealing with the problem of the use and diffusion of dispersed information. The outcome of the discussion so far is that the existence of dispersed information gives rise to a number of problems even in competitive markets. Markets may turn out to be highly inefficient as regards both allocative efficiency (Stiglitz 1993b) and organizational efficiency (Williamson 1985). Moreover, as a corollary of this outcome, one can envisage examples in which the welfare comparison between a decentralized mechanism of allocation (markets plus private negotiation) and a simple mechanism of centralized allocation (an inefficient bureaucrat) is ambiguous (Farrell 1987, and Illing 1992). Therefore post-Walrasian economics argues that, after posing the problem in the correct way, Hayek failed to understand the possibly indeterminate nature of its solution. Hayek's claim for the superiority of decentralized over centralized mechanisms, it is argued, cannot be supported by following this line of argument.

It is worth concluding this section by stressing a crucial aspect which has emerged. The starting point of the heterogeneous research program called information economics is that co-ordination problems cannot be solved without removing the Walrasian fiction of complete markets and the auctioneer. Once this perspective is adopted, the complex interrelation between co-ordination problems and incentive problems becomes the main subject for analysis, and even the attempt to rely only on organizations to solve problems which the market handles inefficiently turns out to be unsatisfying. In this approach, even the notion of the market itself must be revised, in order to understand the role of incentive and incomplete contracts, not only within organizations but also outside them. That the market is a co-ordination mechanism – and prices its key element – remains a cornerstone of economic reasoning. What recent advances in microeconomic theory aim to question is whether this is the only function performed by the market – and whether prices are the only means to achieve co-ordination. The socialist calculation debate of the 1930s forced economists to confront this issue for the first time in the history of economics, and we now turn our attention towards that debate.

2. Hayek's theory of the market mechanism

Hayek's theory of the market mechanism was consolidated during the debate with the advocates of a market way to socialism. As is well known, the contemporaneous emergence of his strictures against market socialism and of his theoretical insights on the market mechanism are mainly encapsulated in the three essays on the socialist calculation debate (Hayek 1935a; 1935b; 1940) and the three essays on the problem of knowledge in competitive markets (Hayek 1937; 1945; 1948).

An examination of these works reveals at least two major contributions to the debate. The first is essentially methodological: as I have remarked above, a new standard for welfare comparisons was promoted by Hayek for valuing the comparative efficiency of economic systems in terms of informational efficiency, that is in terms of how much information is aggregated and transmitted throughout the system (Hayek 1935a: 147f.; 1945: 79). The second is Hayek's own suggestion to implement this methodological assertion: he argued that, if it wants to be empirically relevant, economic theory must address the problem of the diffusion of knowledge, and went on to offer his own view of the way in which markets use information, which resulted in an alternative to the standard general equilibrium approach (Hayek 1937: 48-55; 1948: 104-6).

During the debate Hayek emphasized that the fact that the competitive mechanism is more efficient than other mechanisms of allocation does not depend on the fulfillment of certain normative standards (such as the Pareto-optimality of equilibrium allocations), but rather on its ability to create the appropriate incentives for individual agents to utilize, acquire and even discover the knowledge dispersed in the system – that is on the market ability in solving the knowledge problem [7]. Competitive markets guarantee more informational efficiency than centralized markets because they are more capable of dealing with knowledge which "never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess" (Hayek 1945: 77). Hence, the essence of the competitive mechanism consists in delegating decisions to "the man on the spot", who knows more about a specific problem, and can thus take the appropriate decision. In order to clarify this point, Hayek emphasized that while contemporary economic theory would deal mostly with scientific, or technological, knowledge, he considered that the main question to answer was how to deal with personal, fragmented knowledge (Hayek 1945: 79-81).

Once the question of knowledge is posed in this way, two implications for the relevance of the notion of equilibrium emerge. On the one hand, the co-ordination of decentralized economic activity in an intertemporal setting can be achieved almost only by chance, for the conditions for intertemporal equilibrium are too strict to be satisfied (Hayek 1937: 41-5). On the other hand, the fragmented character of knowledge, which is dispersed throughout the system, implies that much knowledge cannot be dealt with as if it was given *ex ante*. In fact, much knowledge is generated and used during the process of adjustment to equilibrium, thus reducing the interpretative usefulness of every specific equilibrium construct. In his later essays, Hayek clarified that market equilibrium is to be interpreted as a spontaneous order of the economic system, or a catallaxy. In a spontaneous order, the co-ordination of individual plans does not merely depend on the price system, but also on a number of abstract rules, such as custom and laws, which are the result of the evolution of the economic system. Furthermore, the role of alternative mechanisms of co-ordination such as contractual and organizational agreement is explicitly recognized (see Hayek 1973: ch. 2; 1976: ch. 10, and, for a comment, Moss 1994).

But the question of the superiority of the market mechanism over centralization is precisely stated by Hayek well before. The way to understand why the competitive market makes a better use of the knowledge dispersed throughout the economy, and thus better solves the problem of knowledge, is to compare the

7 The knowledge problem is defined by Hayek (1945: 77-8) as follows: "The economic problem of a society is thus not merely a problem of how to allocate 'given' resources – if 'given' is taken to mean given to a single mind which deliberately solves the problem set by these 'data'. It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know".

relative efficiency of out-of-equilibrium adjustments in the two systems. To be more specific, it is only when the problem of reaction to continuous changes in knowledge is confronted, that it is possible to assess the comparative informational efficiency of the two systems (Hayek 1940: 187-8). Hayek's idea is that, in this connection, only competitive markets are structured to solve the knowledge problem. Under conditions of dispersed knowledge, it is only during the market process that the relevant knowledge is discovered and made available by the action of decentralized agents. In a distinct application of the Austrian methodological subjectivism, Hayek contended that much of agents' valuation of their own knowledge, and of the understanding of its role in production processes, cannot be asked by a central planner, but is bound to be used and revealed during the playing out of market activity (Hayek 1945: 85) [8].

We are then led to the main question: what does it mean to pose the problem of fragmented knowledge in this way? The main theoretical argument used by Hayek against centralized economies is that knowledge is not only dispersed, but also specialized and inarticulate – that is, mostly difficult to communicate (Lavoie 1986). In Hayek's view, it is this characteristic of knowledge that is relevant for economic activity, and which makes the competitive mechanism more efficient than other possible procedures of exchange. Indeed, even if one could design the appropriate incentives for individual agents to reveal which knowledge they privately possess [9], important aspects of personal knowledge would not be transferable to a central planner. In fact, these bits of knowledge could only be used by the individual agents themselves. To support his viewpoint, Hayek mentioned Polanyi in maintaining that the 'knowledge how' to do something refers mainly to skills, or are embodied in customs and rules of behaviour, and can thus be considered tacit, or inarticulate (Hayek 1967: 43-5).

There are two different ways to understand the assumption that personal knowledge is tacit. First, tacit may mean that knowledge is unreportable to others, since it is difficult, or impossible, to represent by following formal rules. Secondly, tacit may also mean that the knowledge is actually unknown to its owner, and that he gains awareness of his previous ignorance only during the market process. In their analysis of the market process, the neo-Austrians mainly stressed the second interpretation of tacit knowledge, and disregarded the implications of the first one (see O'Driscoll and Rizzo 1985: 102-107, and Kirzner 1992: 159-61).

8 As a consequence, Hayek's argument cannot be considered as a claim for the second best efficiency of market outcomes, when the first best is precluded by informational asymmetries, as implicitly suggested by Bowles and Gintis.

9 The theme of incentives is crucial in all the discussions of the market socialists issues. Neo-Austrian authors has argued that, in Hayek's theory, the profit motive is a necessary element for efficient behavior by the agents. In what follows, I will not make use of this argument. The theory of incentive-compatible contracts can be, in principle, applied to every economic organization. Furthermore this argument is controversial if it is considered as an argument concerning personal motivation in itself (see Hayek 1948: 196). On this point see also the discussion in Bardhan and Roemer (1993: 7-9).

On the other hand, if one concentrates on the first interpretation, and asks how an individual agent can get a return on this kind of knowledge, some interesting implications of Hayek's viewpoint emerge. The most obvious implication is that only the agent who possesses the specific knowledge can use his informational advantage in the competitive process, for instance by bidding up the price of certain resources he knows he can use more profitably than they are currently being used. This aspect of the problem constitutes the fundamental critique of the mechanism of determination of shadow prices by the planner which was proposed by Lange [10]. But this kind of knowledge is also essential as regards the way transactions are designed. Only when markets spontaneously give birth to reliable institutions, such as appropriate contractual forms and customary business procedures, can individual agents profit from this kind of knowledge. Indeed, as the Arrow-Debreu model clarified, contracts contingent on aspects of economic activity which cannot be publicly observed – or verified – *ex post*, such as those envisaged by Hayek's notion of knowledge, do not exist by definition in the Walrasian approach. Hence, a formal analysis of the institutional context is essential to characterize the way in which the market mechanism works, particularly as far as the rules for exchanges to take place are concerned.

My point here is that Hayek was well aware of these implications of his notion of knowledge, and dealt with this issue on many occasions. In his 1940 essay on socialist calculation, for instance, Hayek maintained that the competitive economy is characterized by organizational structures and incentive schemes which guarantee managerial responsibility, such as the mechanism provided by take-overs in the market for corporate control, or which encourage the loyalty and hard work of the workers, such as the threat of job loss (Hayek 1940: 199-203) [11]. More important, in his 1948 essay on competition, where the main concern was the analysis of the critical assumptions on which the notion of perfect competition was based, Hayek introduced the question of "what institutional arrangements are necessary in order that the unknown person who have knowledge specially suited to a particular task are most likely to be attracted to that task". In pointing to competition as the dynamic process through which the knowledge which is fictitiously supposed in command of individual agents can be actually put at their disposal, he found it "especially remarkable ... the explicit and complete exclusion from the theory of perfect competition of all personal relationships existing between

10 In order to perform their role of efficient conveyors of dispersed information, prices must vary immediately after a previously unperceived opportunity is noticed by an entrepreneur. Hence, even if the motivational issue is not taken into account, that is even if it is assumed that socialist managers have the same personal incentives which drive private entrepreneurs, they cannot absolve the role of private entrepreneurs in making the price mechanism effective, since prices are fixed by the central authority. On this point, see in particular Lavoie (1985: 95-102) and Pagano (1992: 64-5).

11 Hayek's references to the issue of incentives in competitive markets have been commented on by Vaughn (1980), Moss (1994) and Streissler (1994), among others.

the parties" to a transaction (Hayek 1948: 96-7) [12]. A third significant example is given by Hayek's analysis of the role of organizations in competitive markets, when he stated that "to some extent every organization must rely also on rules and not only on specific command" for the same reason which holds for a spontaneous order, that is "that by guiding the actions of individuals by rules rather than specific commands it is possible to make use of knowledge which nobody possesses as a whole" (Hayek 1973: 48-9).

In my view, Hayek's remarks are not secondary statements about the need for appropriate profit incentives, the obvious complexity of market transactions and the existence of organizations. On the contrary, they serve to clarify Hayek's particular conception of how the market system works. At least two fundamental aspects of this conception must be stressed. The first one is the significance of the institutional context within which transactions take place. A great number of studies on Hayek's theory of social institutions have pointed to this issue and stressed that this is a typical Austrian statement (see Vanberg 1986, Caldwell 1988, and Vaughn 1990). In spite of this, Hayek's quest for a more thorough understanding of the function performed by competitive markets has been substantially interpreted as a secondary component of the much broader problem of the development of institutions. But, following our line of argument instead, Hayek's point emerges as a consequence of his awareness that co-ordination does not merely require an effective price system, it also requires customary rules to deal with complex transactions.

The second fundamental point is the following: the fact that in competitive markets complex transactions take place [13], is the direct consequence of the kind of knowledge in which Hayek was interested. Accordingly, the idea that the market mechanism copes with the problem of transactions in an efficient manner relies on the market ability to spontaneously generate the appropriate incentives within contractual relationships. This may also explain why, in examining how competitive systems could deal with personal knowledge, Hayek realized that even competitive prices could not completely aggregate the knowledge dispersed throughout the system. His appreciation of the market order then shifted from the precise notion of equilibrium – which no longer implies Pareto-optimality, or informational efficiency – to the more qualitative construct of spontaneous order – by means of which other conditions for market efficiency could be better pointed out.

12 Hayek's point here is strikingly modern and, one might say, similar to certain post-Walrasian statements: "In actual life the fact that our inadequate knowledge of the available commodities or services is made up for by our experience with the persons and firms supplying them – that competition is in a large measure competition for reputation or good will – is one of the most important facts which enables us to solve our daily problems" (Hayek 1948: 97).

13 The term complex transactions is used in current economic theory to distinguish transactions which may involve both monitoring costs about performances and sanctioning costs whenever performances do not conform to the contract, from transactions based on the Arrow-Debreu contingent contract.

We are then led to the following interpretation of Hayek's theory. Hayek's analysis of how co-ordination can be achieved by means of the market mechanism cannot be appreciated completely if the competitive market is interpreted only as a method of co-ordination through competition – that is a dynamic procedure through which the actions of individuals get co-ordinated both by means of the profit motive, which mobilizes the dispersed knowledge and generates new knowledge, and the price system, which disseminates it. In addition, the institutional framework in which co-ordination can be achieved should also be studied. As I have already noted, this second aspect cannot be addressed within the limits imposed by a Walrasian perspective. And, in contrast to much of conventional thinking, one of the fundamental reasons which was stressed by Hayek himself is that the market mechanism is not an impersonal mechanism, driven only by market prices [14]. To be sure, I do not want to argue that Hayek explicitly aimed at challenging the "exogenous enforcement axiom", which is peculiar to Walrasian economics, but that his theory was suited for an analysis of those aspects of exchange which are excluded from analysis by that axiom, and can be usefully taken as a basis for stimulating developments.

3. Hayek, the neo-Austrian school and the post-Walrasian developments

The diffusion of Hayek's theory of the market mechanism may be attributed more to the neo-Austrian school than to Hayek himself. Indeed neo-Austrians scholars contributed not only to developing Hayek's theory, but also to identifying many aspects of the theory which were present from the outset, but not properly understood. For example, in the historiography of the socialist calculation debate it is commonly argued that the logic put forward by Hayek during the debate might be misunderstood as neoclassical, mainly because Hayek's own identity as a non-neoclassical economist was not yet defined (see Kirzner 1992: ch. 6).

The neo-Austrian assessment of Hayek's theory has given birth to a "paradigm" [15], which is distinct from the current neoclassical paradigm. In their developments, neo-Austrian scholars have favored a market process perspective, that is an analysis of the competitive mechanism which stresses out-of-equilibrium behaviour and disequilibrium dynamics, instead of equilibrium relationships. As I have already remarked, the knowledge problem is mainly seen as connected to the

---

14 It is worth pointing out that it does not matter here if "state co-ordination" or "process co-ordination" is involved, in contrast to the emphasis put on this issue by the neo-Austrians (in particular, see Kirzner 1992: ch. 8). The institutions which favor the co-ordination of economic activity may well be thought of as spontaneously evolved (Hayek 1967: ch. 6), but the need for a direct analysis of contractual relationships is independent of the analysis of their genesis.

15 Needless to say, while in this paper I am emphasizing the Hayekian roots of the Austrian approach, one might focus on the contribution of other founders, such as Menger and Mises, as well (for example, see Lachman 1976, and Vaughn 1990).

dynamic evolution of economic systems. Even the neo-Austrians' sharply critical attitude towards the usefulness of an equilibrium construct is supported by the claim that no knowledge problem exists in Walrasian equilibrium. More generally, the neo-Austrian approach maintains that an equilibrium perspective is not useful in dealing with the knowledge problem (Thomsen 1992: ch. 3).

The neo-Austrian approach is, in fact, grounded on the critical remarks against the Walrasian model. But these remarks do not say anything about the problem raised by Bowles and Gintis as representatives of information economics. Following Bowles and Gintis's approach, the inappropriateness of the Walrasian model does not necessarily depend on its essentially static nature, but on its inability to explain the variety of contractual relationships that asymmetric information necessarily implies – even if they are examined in a static environment. To be exact, Bowles and Gintis recognize Hayek's interest in the question of the endogenous evolution of preferences and norms, which they considered to be the other main element of economic theory that has been eschewed by Walrasian economics. But they contend that the more relevant question of the endogenous enforcement of market claims was not dealt with by Hayek. Hence their interpretation is that Hayek and his followers have been silent on this subject, and their theory of the market is "entirely Walrasian" (Bowles and Gintis 1993: 99).

Our assessment of Hayek's theory of the market mechanism has pointed out that the notion of knowledge that Hayek introduced in economic theory can be useful for a perceptive analysis of the question raised by Bowles and Gintis. This point is surely in contrast to what the neo-Austrian developments might induce one to think. We do not of course intend to deny that the neo-Austrian interpretation is the most obvious outcome of Hayek's theory. Hayek himself supported this interpretation many times, as his insistence on competition as a discovery procedure and on the informational role of the price system indicates. But we have tried to show that other possible implications of Hayek's notion of knowledge have not been fully drawn, as the way in which he modelled the knowledge problem suggests.

To be more specific, it may be useful to briefly consider the way in which the organizational issue has been dealt with in the neo-Austrian literature. The most widespread attitude is to consider the role of the entrepreneur in isolation. His search for previously unperceived opportunities is considered as the *primum movens* of the market process. But there is no reference to any organizational or contractual structure that the entrepreneur might have used to implement the decisions arising from his informational advantage (Kirzner 1992: ch. 1). On the other hand, instead of deepening Hayek's insights on the subject, those authors who are aware of the necessity of a more accurate analysis of the role of firms and organizations in general, prefer to make reference to Nelson and Winter's evolutionary theory of the firm, which they substantially consider as consistent with the Austrian viewpoint (in particular see O'Driscoll and Rizzo 1985: ch. 5, and

Thomsen 1992: 108-115) [16]. It can be concluded, then, that the neo-Austrian school has not yet offered a coherent analysis of the relationships between the market and the firm [17].

The cause of the neo-Austrian disregard for this issue, and of Bowles and Gintis's interpretation, might be found in Hayek's insistence on the efficiency of the price system in mobilizing the information dispersed among the agents. If it is considered in isolation, the famous 1945 claim that "we must look at the price system as ... a mechanism for communicating information", whose most significant quality is "the economy of knowledge with which it operates, or how little the individual participants need to know in order to be able to take the right action" (Hayek 1945: 86), can easily be misinterpreted. As it has been noted on many occasions, in Hayek's theory the price system provides the link between decentralized actions and aggregate outcomes. In order to achieve co-ordination individual agents cannot act only on the basis of their personal knowledge, they also need prices as surrogates for the knowledge possessed by other agents, and dispersed in the system. It might seem that the "marvel" of the price mechanism – by means of which "in abbreviated form, by a kind of symbol, only the most essential information is passed on and passed only to those concerned (Hayek 1945: 86) – could dispense with any further analysis of the knowledge problem (as recently re-affirmed, for example, by Desai (1993: 46-7)). But Hayek emphasis on the informational role of prices does not imply that prices perform the function of efficient aggregators of information, neither that their role takes place in an institution-less environment.

Interestingly, it is the misinterpretation of Hayek's 1945 claim which explains the reason why neo-Austrian scholars have spent much time in arguing that Grossman's contribution to the economics of information cannot be considered in the spirit of Hayek, contrary to the explicit reference made by Grossman to Hayek's contribution (Grossman 1989: 1, 32-3). The neo-Austrians correctly argue that Grossman's formal representation of the role of prices as signals of existing asymmetries in information – which, in Grossman's general equilibrium model,

16 This holds notwithstanding certain clear acknowledgments of the relevance of the question. O'Driscoll and Rizzo, in particular, stress that "it is strictly impossible to imagine a 'price system' devoid of contracts and property rights". They also contend that further research is necessary to give content to the Hayekian suggestion that "competitive markets will generally rely on institutions and practices to generate information assumed in neoclassical analysis to be given by price signals only" (O'Driscoll and Rizzo 1985: 106, 236). But, at my knowledge, no tentative answer has been offered since their acknoledgements. A notable exception is Langlois (1988).

17 In the Chicago tradition of economics Hayek's theory of the market and Coase's theory of the firm are often considered as complementary arguments to an all-comprehensive explanation of the way in which a competitive economy works (for example, see Buchanan 1981). But, as Cordato (1992: 215-7) correctly stated, Hayek's insights on the role of knowledge can also be used to criticize Coase's approach, mainly because it cannot be assumed that the information which is necessary for a judge to implement the efficient solution of the bargaining problems addressed by Coase is known *ex ante*.

efficiently perform the function of completely disseminating the information throughout the economy – do not correctly represent Hayek's claim, since it cannot capture the discovery function of the price system, which is essential in Hayek's theory (for example, see Thomsen 1992) [18].

On the other hand, neo-Austrians themselves has failed in offering a convincing analysis of those other aspects which emerge from Hayek's analysis of knowledge which we have pointed out, such as the need for appropriate contractual forms, which apparently contradicts Hayek's claim in favor of the price mechanism. To be exact, the neo-Austrians are still used to discuss the role of prices in the market by comparing Hayek's argument with the usual "perfect competition argument" of mainstream economics, instead of considering the more elaborate idea of competition which emerges out of the post-Walrasian developments (for example, see Kirzner 1992: ch. 1). But, as we have just noticed in the previous section, the need for decentralized action and the role attributed to prices do not necessarily imply that agents do not conform to an institutional setting, neither that methods of centralization of the procedure of decisions, such as the firms, must be eschewed from the analysis. In interpreting Hayek there are at least two major reasons to take a different view. First, the relevance of the institutional setting to a correct understanding of the way in which the price system works is clearly stated by Hayek, as remarked also by neo-Austrians. Second, Hayek's notion of knowledge implies that the usual method of contingent Arrow-Debreu contracts cannot be used to implement exchanges based on differences in information, and demonstrates the need for a more direct analysis of those contractual relationships under which agents can take advantage of informational differences [19].

To sum up, the claim that Hayek considered the market as an impersonal mechanism of allocation, and was providing simply a kind of dynamic extension of the Walrasian model, is quite unfounded. On the other hand, most neo-Austrians have practically endorsed this interpretation, since they have not provided a satisfying treatment of the role of contracts in competitive markets – thus giving support to Bowles and Gintis's thesis.

18 The rationale of the neo-Austrian's critique is the following. In emphasizing the role of prices as signals of existing differences in knowledge, and neglecting that of discovery devices for new knowledge, Grossman assumes an equilibrium perspective. Hence his interpretation cannot account for Hayek's insistence on the disequilibrium dynamics of competition. Furthermore Grossman shows that prices in competitive markets perform the function of efficiently aggregating all the information dispersed throughout the system, thus giving birth to a new optimal standard, while Hayek is explicit in denying any optimal properties of the price mechanism. This interpretative hypothesis has been commented on many times in the neo-Austrian literature (in particular, see O'Driscoll and Rizzo 1985: 102, Kirzner 1992: ch. 8, and Thomsen 1992: 44-7).

19 Zappia (1995) is an attempt to show that certain aspects of Hayek's notion of knowledge can be analyzed by following the approach of modern contract theory. He maintains that the questions raised by incomplete markets in the Walrasian model can also be examined from a Hayekian perspective, and that, in taking that perspective, certain shortcomings of modern contract theory can be highlighted. On this point, see also Dardi (1990: 62-4).

Conclusion

This analysis has started from the consideration that it appears paradoxical to use Hayek's critical remarks against market socialists to criticize the market mechanism as well. We have argued that Hayek's theory of the market mechanism, which has been interpreted as a way to solve the so-called knowledge problem, calls for deepening understanding of the institutional setting in which as much information as possible is mobilized and diffused by means of the price system. Hence, contrary to Bowles and Gintis's viewpoint, Hayek's theory is definitely not Walrasian – not only because it originated the market process perspective emphasized by the neo-Austrian school, but also because the particular notion of knowledge on which it is based explicitly requires the arrangement of appropriate contractual forms for an actual process of market exchange to take place.

After dealing with the interpretative question regarding Hayek's role in the improvement over the Walrasian approach, the main theoretical question remains open. What is the rationale behind the claimed superiority of the competitive market over centralized mechanism of allocations?

Bowles and Gintis's point is striking: if no optimal property can be attributed to the achievable outcomes of the competitive economy, then there is no theoretical basis for arguing that mechanisms of centralized allocation cannot replicate, or even improve, those outcomes. A new generation of market socialists supports this radical viewpoint by stressing that such a view of capitalist economies, which sees markets acting in the context of non-market institutions, such as large firms and long term contracts, leaves room for the study of other non-market institutions, arguably compatible with the competitive mechanism but more egalitarian in nature (Roemer 1994: 3-6). Hayek's preference for the competitive economy, on the other hand, is not based on a Walrasian theory of the market, neither on the optimal properties of a new equilibrium construct which can account for informational differences. His argument is that the market mechanism is suited for agents to take advantage from inarticulate knowledge, while the socialist economy cannot by its very nature. Needless to say, he offered a vision more than an analytical solution.

From a practical point of view, the question is probably bound to remain open until the solutions actually adopted in the Eastern European countries have been consistently implemented. Nevertheless, from the discussion so far some theoretical implications can be drawn in a Hayekian fashion. First, the institutional setting of the capitalist economy must be seen as the result of a spontaneous evolution which has determined the rules under which exchanges take place, as the theory of spontaneous order emphasizes (Sudgen 1989). To imagine that the transition from a planned economy to a market economy is simple and fast is not sensible, even if the question is seen from the side of conscious market advocates. If this is the case, Hayek would probably accept the point stressed by many in the literature on the economies in transition, that the practicability of a sudden shift towards a market economy is doubtful, since many institutional arrangements cannot be devised from outside. Second, the solution of the knowledge problem imagined by Hayek is strictly dependent on clearly defined, and enforceable, property rights on the basis of which decentralized actions can take place. This point is still to be consistently addressed even by the new advocates of market socialism (as noted in Lavoie 1990). As we have seen, the question posed by tacit knowledge is that the owner of a specific bit of knowledge must be involved in its utilization, because this is the only way to bring it to the fore. The superiority of the market mechanism lies then in the fact that decentralization is a necessary condition for an efficient use of dispersed knowledge. If this is the case, the question to be addressed by new defenders of mechanisms of allocation alternative to the competitive market is how to satisfy this necessary condition with an array of property rights which differs from a spontaneously evolved array. And though even certain notable proposals have recently been offered (in particular, see Bardhan and Roemer 1993), a satisfying solution does not yet seem to have been arrived at.

REFERENCES

Arrow, K. J. 1987. Rationality of Self and Others in an Economic System. In R. M. Hogarth and M. W. Reder (eds.), *Rational Choice*. Chicago: The University of Chicago Press.

Bardhan, P. K. and Roemer, J. E. (eds.). 1993. *Market Socialism. The Current Debate*. New York: Oxford University Press.

Bowles, S. and Gintis, H. 1993. The Revenge of Homo Economicus: Contested Exchange and the Revival of Political Economy. *Journal of Economic Perspective*, 7: 83-102.

Buchanan, J.B. 1981. Introduction: L.S.E. Cost Theory in Retrospect. In J. B. Buchanan and G. F. Thirlby (eds.), *L.S.E. Essays on Cost*. New York: New York University Press.

Caldwell, B. 1988. Hayek's Transformation. *History of Political Economy*, 20: 513-42.

Coase, R. 1960. The Problem of Social Cost. *Journal of Law and Economics*, 3: 1-44.

Colonna, M., Hagemann, H. and Hamouda O. F. (eds.). 1994. *Capitalism, Socialism and Knowledge. The Economics of F. A. Hayek*, vol. II. Aldershot: Edward Elgar.

Cordato, R. 1992. Knowledge Problems and the Problem of Social Cost. *Journal of the History of Economic Thought*, 14: 209-24.

Dardi, M. 1990. Il mercato nell'analisi economica contemporanea. In G. Becattini (ed.), *Il pensiero economico. Temi, problemi e scuole*. Torino: UTET.

Desai, M. 1993. Equilibrium, Expectations and Knowledge. In J. Birner and R. Van Zijp (eds.), *Hayek, Co-ordination and Evolution*. London: Routledge.

Farrell, J. 1987. Information and the Coase Theorem. *Journal of Economic Perspectives*, 1, 2: 113-29.

Grossman, S. 1989. *The Informational Role of Prices*, Cambridge, MA: MIT Press.

Hart, O. and Holmstrom, B. 1987. The Theory of Contracts. In T. Bewley (ed.), *Advances in Economic Theory, Fifth World Congress*. Cambridge: Cambridge University Press.

Hayek, F. A. 1935a. Socialist Calculation I: The Nature of the Problem. In Hayek 1976a.

Hayek, F. A. 1935b. Socialist Calculation II: The State of the Debate. In Hayek 1976a.

Hayek, F. A. 1937. Economics and Knowledge. In Hayek 1976a.

Hayek, F. A. 1940. Socialist Calculation III: The Competitive 'Solution'. In Hayek 1976a.

Hayek, F. A. 1945. The Use of Knowledge in Society. In Hayek 1976a.

Hayek, F. A. 1948. The Meaning of Competition. In Hayek 1976a.

Hayek, F. A. 1967. *Studies in Philosophy, Politics and Economics*. Chicago: The University of Chicago Press.

Hayek, F. A. 1973, *Law, Legislation and Liberty*, vol. I. Chicago: The University of Chicago Press.

Hayek, F. A. 1976a [1948]. *Individualism and Economic Order*. London: Routledge and Kegan Paul.

Hayek, F. A. 1976b, *Law, Legislation and Liberty*, vol. II. Chicago: The University of Chicago Press.

Hayek, F.A. 1988. *The Fatal Conceit. The Errors of Socialism*. Edited by W.W. Bartley III. London: Routledge.

Illing, G. 1992. Private Information and Transaction Costs: The Coase Theorem Revisited. *Journal of Institutional and Theoretical Economics*, 148, 4: 558-576.

Keizer, W. 1993. Hayek's Critique of Socialism. In J. Birner and R. Van Zijp (eds.), *Hayek, Co-ordination and Evolution*. London: Routledge.

Kirzner, I. M. 1992. *The Meaning of Market Process. Essays in the Development of Modern Austrian Economics*. London: Routledge.

Lachmann, L. 1976. From Mises to Shackle: An Essay on Austrian Economics and the Kaleidic Society. *Journal of Economic Literature*, 14: 54-62.

Langlois, R. N. 1988. Economic Change and the Bounderies of the Firm. *Journal of Institutional and Theoretical Economics*, 144, 4: 635-57.

Lavoie, D. 1985. *Rivalry and Central Planning. The Socialist Calculation Debate Reconsidered*. Cambridge: Cambridge University Press.

Lavoie, D. 1986. The Market as a Procedure for Discovery and Conveyance of Inarticulate Knowledge. *Comparative Economic Studies*, 28: 1-19.

Lavoie, D. 1990. Computation, Incentives and Discovery: The Cognitive Function of Markets in Market Socialism. In J. S. Prybyla (ed.), *Privatizing and Marketizing Socialism*. The Annals of the American Academy of Political and Social Science, vol. 507.

Lazear, E. P. 1989. Incentive Contracts. In J. Eatwell, M. Milgate and P. Newman (eds.), *The New Palgrave. Allocation, Information and Markets*. New York: W. W. Norton.

Milgrom, P. and Roberts, J. 1992. *Economics, Organizations and Management*. Englewood Cliffs, N.J.: Prentice Hall.

Moss, L. S. 1994. Hayek and the Several Faces of Socialism. In M. Colonna, H. Hagemann and O. Hamouda (eds.).

Murrell, P. 1983. Did the Theory of Market Socialism Answer the Challange of Ludwig von Mises? A Reinterpretation of the Socialist Controversy. *History of Political Economy*, 15, 1: 92-105.

O'Driscoll, G. P. and Rizzo, M. J. 1985. *The Economics of Time and Ignorance*. Oxford: Basil Blackwell.

Pagano, U. 1992. Authority, Co-ordination and Disequilibrium: An Explanation of the Co-existence of Markets and Firms. *Structural Change and Economic Dynamics*, 3, 1: 53-77.

Roemer, J.E. 1994. *A Future for Socialism*. Cambridge, MA: Harvard University

Press.

Sudgen, R. 1989. Spontaneous Order. *Journal of Economic Perspectives*, 3, 4: 85-97.

Stiglitz, J. 1987. The Causes and Consequences of the Dependence of Quality on Prices. *Journal of Economic Literature*, 25, 1: 1-48.

Stiglitz, J. 1989. Principal and Agent. In J. Eatwell, M. Milgate and P. Newman (eds.), *The New Palgrave. Allocation, Information and Markets*. New York: W. W. Norton.

Stiglitz, J. 1993a. Post Walrasian and Post Marxian Economics. *Journal of Economic Perspectives*, 7, 1: 109-14.

Stiglitz, J. 1993b. Market Socialism and Neoclassical Economics. In Bardhan and Roemer.

Streissler, E. W. 1994. Hayek on Information and Socialism. In M. Colonna, H. Hagemann and O. Hamouda (eds.).

Thomsen, E. 1992. *Prices and Knowledge. A Market-Process Perspective*. London: Routledge.

Vanberg, V. 1986. Spontaneous Market Order and Social Rules: A Critical Examination of F. A. Hayek's Theory of Cultural Evolution. *Economics and Philosophy*, 2, 1: 75-100.

Vaughn, K. 1980. Economic Calculation Under Socialism: The Austrian Contribution. *Economic Inquiry*, 18: 535-54.

Vaughn, K. 1990. The Mengerian Roots of the Austrian Revival. In B. Caldwell (ed.), *Carl Menger and His Legacy in Economics*. Durham: Duke University Press.

Vaughn, K. 1994. *Austrian Economics in America. The Migration of a Tradition.* New York: Cambridge University Press.

Williamson, O. E. 1985. *The Economic Institutions of Capitalism*, New York: The Free Press.

Williamson, O. E. 1993. Contested Exchange Versus the Governance of Contractual Relations. *Journal of Economic Perspectives*, 7, 1: 103-8.

Zappia, C. 1995. Private Information, Contractual Arrangements and Hayek's Knowledge Problem. *Quaderni del Dipartimento di Economia Politica*, Università di Siena, n. 180.

Elenco dei Quaderni pubblicati

n.1 (febbraio 1979) **MASSIMO DI MATTEO**, Alcune considerazioni sui concetti di lavoro produttivo e improduttivo in Marx
n.2 (marzo 1979) **MARIA L.RUIZ**, Mercati oligopolistici e scambi internazionali di manufatti. Alcune ipotesi e un'applicazione all'Italia
n.3 (maggio 1979) **DOMENICO MARIO NUTI**, Le contraddizioni delle economie socialiste: una interpretazione marxista
n.4 (giugno 1979) **ALESSANDRO VERCELLI**, Equilibrio e dinamica del sistema economico-semantica dei linguaggi formalizzati e modello keynesiano
n.5 (settembre 1979) **A. RONCAGLIA - M. TONVERONACHI**, Monetaristi e neokeynesiani: due scuole o una?
n.6 (dicembre 1979) **NERI SALVADORI**, Mutamento dei metodi di produzione e produzione congiunta
n.7 (gennaio 1980) **GIUSEPPE DELLA TORRE**, La struttura del sistema finanziario italiano: considerazioni in margine ad un'indagine sull'evoluzione quantitativa nel dopoguerra (1948-1978).
n.8 (gennaio 1980) **AGOSTINO D'ERCOLE**, Ruolo della moneta ed impostazione antiquantitativa in Marx: una nota
n.9 (novembre 1980) **GIULIO CIFARELLI**, The natural rate of unemployment with rational expectations hypothesis. Some problems of estimation
n.10 (dicembre 1980) **SILVANO VICARELLI**, Note su ammortamenti, rimpiazzi e tasso di crescita
n.10 bis (aprile 1981) **LIONELLO F. PUNZO**, Does the standard system exist?
n.11 (marzo 1982) **SANDRO GRONCHI**, A meaningful sufficient condition for the uniqueness of the internal rate of return
n.12 (giugno 1982) **FABIO PETRI**, Some implications of money creation in a growing economy
n.13 (settembre 1982) **RUGGERO PALADINI**, Da Cournot all'oligopolio: aspetti dei processi concorrenziali
n.14 (ottobre 1982) **SANDRO GRONCHI**, A Generalized internal rate of return depending on the cost of capital
n.15 (novembre 1982) **FABIO PETRI**, The Patinkin controversy revisited
n.16 (dicembre 1982) **MARINELLA TERRASI BALESTRIERI**, La dinamica della localizzazione industriale: aspetti teorici e analisi empirica
n.17 (gennaio 1983) **FABIO PETRI**, The connection between Say's law and the theory of the rate of interest in Ricardo
n.18 (gennaio 1983) **GIULIO CIFARELLI**, Inflation and output in Italy: a rational expectations interpretation
n.19 (gennaio 1983) **MASSIMO DI MATTEO**, Monetary conditions in a classical growth cycle
n.20 (marzo 1983) **M. DI MATTEO - M.L. RUIZ**, Effetti dell'interdipendenza tra paesi produttori di petrolio e paesi industrializzati: un'analisi macrodinamica
n.21 (marzo 1983) **ANTONIO CRISTOFARO**, La base imponibile dell'IRPEF: un'analisi empirica
n.22 (gennaio 1984) **FLAVIO CASPRINI**, L'efficienza del mercato dei cambi. Analisi teorica e verifica empirica
n.23 (febbraio 1984) **PIETRO PUCCINELLI**, Imprese e mercato nelle economie socialiste: due approcci alternativi
n.24 (febbraio 1984) **BRUNO MICONI**, Potere prezzi e distribuzione in economie mercantili caratterizzate da diverse relazioni sociali
n.25 (aprile 1984) **SANDRO GRONCHI**, On investment criteria based on the internal rate of return
n.26 (maggio 1984) **SANDRO GRONCHI**, On Karmel's criterion for optimal truncation
n.27 (giugno 1984) **SANDRO GRONCHI**, On truncation "theorems"
n.28 (ottobre 1984) **LIONELLO F. PUNZO**, La matematica di Sraffa
n.29 (dicembre 1984) **ANTONELLA STIRATI**, Women's work in economic development process
n.30 (gennaio 1985) **GIULIO CIFARELLI**, The natural rate of unemployment and rational expectation hypotheses: some empirical tests
n.31 (gennaio 1985) **SIMONETTA BOTARELLI**, Alcuni aspetti della concentrazione dei redditi nel Comune di Siena
n.32 (febbraio 1985) **FOSCO GIOVANNONI**, Alcune considerazioni metodologiche sulla riforma di un sistema tributario
n.33 (febbraio 1985) **SIMONETTA BOTARELLI**, Ineguaglianza dei redditi personali a livello comunale
n.34 (marzo 1985) **IAN STEEDMAN**, Produced inputs and tax incidence theory
n.35 (aprile 1985) **RICHARD GOODWIN**, Prelude to a reconstruction of economic theory. A critique of Sraffa
n.36 (aprile 1985) **MICHIO MORISHIMA**, Classical, neoclassical and Keynesian in the Leontief world
n.37 (aprile 1985) **SECONDO TARDITI**, Analisi delle politiche settoriali: prezzi e redditi nel settore agroalimentare
n.38 (maggio 1985) **PIETRO BOD**, Sui punti fissi di applicazioni isotoniche
n.39 (giugno 1985) **STEFANO VANNUCCI**, Schemi di gioco simmetrici e stabili e teoremi di possibilità per scelte collettive
n.40 (luglio 1985) **RICHARD GOODWIN**, The use of gradient dynamics in linear general disequilibrium theory
n.41 (agosto 1985) **M. MORISHIMA** and **T. SAWA**, Expectations and the life span of the regime.
n.42 (settembre 1985) **ALESSANDRO VERCELLI**, Keynes, Schumpeter, Marx and the structural instability of capitalism
n.43 (ottobre 1985) **ALESSANDRO VERCELLI**, Money and production in Schumpeter and Keynes: two dichotomies
n.44 (novembre 1985) **MARCO LONZI**, Aspetti matematici nella ricerca di condizioni di unicità per il Tasso Interno di Rendimento
n.45 (dicembre 1985) **NIKOLAUS K.A. LAUFER**, Theoretical foundations of a new money supply hypothesis for the FRG.
n.46 (gennaio 1986) **ENRICO ZAGHINI**, Una dimostrazione alternativa dell'esistenza di equilibri in un modello di accumulazione pura
n.47 (febbraio 1986) **ALESSANDRO VERCELLI**, Structural stability and the epistemology of change: a critical appraisal
n.48 (marzo 1986) **JOHN HICKS**, Rational behaviour: observation or assumption?
n.49 (aprile 1986) **DOMENICO MARIO NUTI**, Merger conditions and the measurement of disequilibrium in labour-managed economies
n.50 (maggio 1986) **SUSAN SENIOR NELLO**, Un'applicazione della Public Choise Theory alla questione della riforma della Politica Agricola Comune della CEE
n.51 (maggio 1986) **SERENA SORDI**, Some notes on the second version of Kalecki's Business Cycle Theory
n.52 (giugno 1986) **PIERANGELO GAREGNANI**, The classical theory of wage and the role of demand schedules in the determination of relative prices
n.53 (luglio 1986) **FRANCO BIRARDI**, Crescita, sviluppo ed evoluzione: l'affermazione dei nessi strutturali sistematici e la combinazione di scienza, tecnologia ed economica nelle prime industrializzazioni
n.54 (agosto 1986) **M. AMENDOLA - J.L. GAFFARD**, Innovation as creation of technology: a sequential model
n.55 (settembre 1986) **GIULIO CIFARELLI**, Exchange rates, market efficiency and "news". Model specification and econometric identification
n.56 (settembre 1986) **ALESSANDRO VERCELLI**, Technological flexibility, financial fragility and the recent revival of Schumpeterian entrepreneurship
n.57 (ottobre 1986) **FABIO PETRI**, The meaning of the Cambridge controversies on capital theory: an attempt at communication
n.58 (ottobre 1986) **DANIELE CHECCHI**, The international coordination of counter-cyclical policies
n.59 (novembre 1986) **ALESSANDRO VERCELLI**, Probabilistic causality and economic models: Suppes, Keynes, Granger
n.60 (dicembre 1986) **LIONELLO F. PUNZO**, J. Von Neumann and K. Menger's mathematical colloquium
n.61 (dicembre 1986) **MICHAEL BACHARACH**, Three scenarios for fulfilled expectations
n.62 (gennaio 1987) **J. ESTEBAN** and **T. MILLAN**, Competitive equilibria and the core of overlapping generations economies
n.63 (gennaio 1987) **ROBERT W. CLOWER**, New directions for keynesian economics
n.64 (febbraio 1987) **MARCO P. TUCCI**, A simple introduction to flexible functional forms and consumer behaviour theory
n.65 (marzo 1987) **NICOLA DIMITRI**, Generalizations of some continuos time epidemic models

n.66 (aprile 1987) **MASSIMO DI MATTEO**, Goodwin and the Evolution of a Capitalistic Economy: An Afterthought

n.67 (maggio 1987) **MASSIMO DI MATTEO**, Early Discussions on Long Waves

n.68 (giugno 1987) **MASSIMO DI MATTEO**, Warranted, Natural, and Actual Rates of Growth: Reflections of a Perplex

n.69 (settembre 1987) **LUISA MONTUSCHI**, Inward-Looking development and import substitution in the Argentine Economy 1950-1980

n.70 (dicembre 1987) **GIANCARLO GANDOLFO** and **PIETRO CARLO PADOAN**, The Mark V version of the Italian continuos time model

n.71 (dicembre 1987) **SILVANO VICARELLI**, Impatience to consume, the utility of wealth and the rate of interest

n.72 (gennaio 1988) **OMAR CHISARI**, Worker's assets, foreign debt and the dynamics of an economy

n.73 (febbraio 1988) **STEFANO VANNUCCI**, On exactly strong-Nash-implementable power allocations

n.74 (marzo 1988) **PIER LUIGI LANDI**, Aspetti economici della società anonima della strada ferrata Empoli-Siena o Centrale Toscana fino al 1859

n.75 (aprile 1988) **FRANCO BIRARDI**, Generating the space of physical characteristics by means of elements which are discrete and limited over time (A note on innovation in chemical technologies)

n.76 (maggio 1988) **LILIA COSTABILE**, Politica monetaria, debito pubblico e tasso di interesse

n.77 (giugno 1988) **GIUSEPPE DELLA TORRE**, L'evoluzione dei sistemi finanziari nell'approccio contabile di Raymond Goldsmith.
Alcune considerazioni analitiche

n.78 (luglio 1988) **FRANCESCO FARINA**, Fattori tecnologici e transazionali nella divisione interindustriale del lavoro

n.79 (ottobre 1988) **FRANCESCO FARINA**, Gli obiettivi della Banca d'Italia e i tassi d'interesse sul debito pubblico

n.80 (novembre 1988) **GIULIO CIFARELLI**, La razionalità del tasso di cambio a termine e le "notizie": una analisi empirica

n.81 (dicembre 1988) **MAURO CAMINATI**, Cyclical growth in a long-period perspective

n.82 (gennaio 1989) **LUIGI LUINI**, Crescita esterna dell'impresa e teorie economiche

n.83 (marzo 1989) **LUIGI M. TOMASINI**, A Scheme to Allocate Wastewater Rights

n.84 (aprile 1989) **STEFANO VANNUCCI**, On Consistency Properties of some Strongly Implementable Social Choice Rules with Endogenous Agenda Formation

n.85 (maggio 1989) **AGOSTINO D'ERCOLE**, Economia e Moneta in Schumpeter

n.86 (maggio 1989) **CHARLES GOODHART**, What do Central Banks Do?

n.87 (giugno 1989) **PAOLO DEL GIOVANE**, Foreign Firms' Behavior in the United States Market during the Dollar Cycle

n.88 (giugno 1989) **GÉRARD DUMÉNIL** and **DOMINIQUE LÉVY**, The classical legacy and beyond

n.89 (luglio 1989) **RICCARDO FIORITO**, Inventory accounting and profit evaluation

n.90 (settembre 1989) **NICOLA DIMITRI**, On the robustness of the rational expectations hypothesis

n.91 (settembre 1989) **PIERMARIO PACINI**, Expectations, learning and equilibrium in a non-walrasian model: a constructive approach

n.92 (ottobre 1989) **AGOSTINO D'ERCOLE**, Sulla teoria monetaria del tasso di interesse di Schumpeter

n.93 (ottobre 1989) **UGO PAGANO**, Firms, co-ordination and disequilibrium

n.94 (novembre 1989) **UGO PAGANO**, Determinazione endogena dei diritti di proprietà in una economia di mercato

n.95 (dicembre 1989) **UGO PAGANO**, Property rights, asset specificity, and the division of labour under alternative capitalist relations

n.96 (dicembre 1989) **MICHIO MORISHIMA**, Wage differentials in Japan: 1958-1985

n.97 (gennaio 1990) **PIERPAOLO PIERANI - PIER LUIGI RIZZI**, An econometric analysis of the olive oil market in Italy

n.98 (febbraio 1990) **ENRICO GIOVANNINI**, Squilibri settoriali e dinamica macroeconomica di breve periodo: il caso dell'industria italiana

n.99 (maggio 1990) **GIULIO CIFARELLI** Sui determinanti degli errori di previsione a termine nel mercato dei cambi

n.100 (maggio 1990) **EDITED BY MASSIMO DI MATTEO** Celebrating R.M. Goodwin's 75 birthday

n.101 (maggio 1990) **OMAR O. CHISARI - JOSE' M. FANELLI** Three-gap models, optimal growth and the economic dynamics of highly indebted countries

n.102 (giugno 1990) **FRANCESCO FARINA** Italy's monetary policy inside the european monetary system

n.103 (giugno 1990) **STEFANO VANNUCCI** On the closure operators of an effectivity function

n.104 (giugno 1990) **STEFANO VANNUCCI** Struttura del mercato, giochi semplici e potenziali monopolistici

n.105 (luglio 1990) **STEFANO VANNUCCI** A note on ergodic and vmn-stable sets of abstract games

n.106 (luglio 1990) **SIMONETTA BOTARELLI** I nuovi estimi catastali: motivazioni ed effetti distributivi

n.107 (luglio 1990) **PIETRO PUCCINELLI** Impresa e mercato un approccio dinamico

n.108 (agosto 1990) **UGO PAGANO** Braverman, Harry (1920-1976)

n.109 (agosto 1990) **UGO PAGANO** Property rights equilibria and institutional stability

n.110 (settembre 1990) **STEPHAN R. EPSTEIN** Cities, regions and the late medieval crisis: Sicily and Tuscany compared

n.111 (ottobre 1990) **MAURO CAMINATI** On the stability of long-period positions: an introductory note

n.112 (ottobre 1990) **MAURO CAMINATI** Cicli endogeni in disequilibrio e congetture

n.113 (ottobre 1990) **AGOSTINO D'ERCOLE** Il concetto di integrazione finanziaria internazione, Problemi e prospettive

n.114 (ottobre 1990) **LIONELLO F. PUNZO** Hilbert's mathematical formalism and the neoclassical revolution

n.115 (ottobre 1990) **BRUNO MICONI - PIER MARIO PACINI** Price systems, bargaining theory and social relations

n.116 (ottobre 1990) **LIONELLO F. PUNZO** J.-M. Grandmont on "temporary equilibrium: money, expectations and dynamics". Some Comments.

n.117 (novembre 1990) **GIULIO CIFARELLI** Cointegration and the unbiased efficiency of the forward exchange rate

n.118 (novembre 1990) **SIMONETTA BOTARELLI** L'imposizione delle imprese minori: problemi di determinazione della base imponibile nei sistemi forfettari. Una nota

n.119 (dicembre 1990) **GIUSEPPE DELLA TORRE** Teoria economica e contabilità sociale. Il «national bureau of economic research» (1920-1945)

n.120 (dicembre 1990) **ELISABETTA CROCI ANGELINI - SECONDO TARDITI** Ec Enlargement and trade liberalization in the vegetable oils market

n.121 (dicembre 1990) **ELISABETTA CROCI ANGELINI** Costs and benefits of the common agricultural policy to the member countries

n.122 (dicembre 1990) **GIANCARLO MARINI - PASQUALE SCARAMOZZINO** Inflation expectations, price flexibility, and output variability in macro models

n.123 (dicembre 1990) **RAUL de LUZENBERGER - GIANCARLO MARINI** The sustainability of public debt: tests and indicators

n.124 (dicembre 1990) **MARCO P. TUCCI** Time-varying parameters: a critical introduction

n.125 (dicembre 1990) **GIOVANNI FERRI** Preferences and technology in the real business cycle

n.126 (dicembre 1990) **SILVANO VICARELLI** Preferenza per la liquidità e valore dell'informazione

n.127 (gennaio 1990) **FABIO CESARE BAGLIANO - GIANCARLO MARINI** On the role of monetary factors in business cycle models

n.128 (febbraio 1991) **LUIGI TOMASINI** Due modelli di controllo dell'evasione fiscale

n.129 (giugno 1991) **MASANAO AOKI - RICCARDO FIORITO** Analysis of us real GNP and unemployment interactions: state space approach

n.130 (luglio 1991) **PIERPAOLO PIERANI - PIER LUIGI RIZZI** Produttività totale dei fattori e progresso tecnico nell'agricoltura italiana: un confronto Nord-Sud

n.131 (settembre 1991) **AGOSTINO D'ERCOLE** L'integrazione finanziaria internazionale e la relazione risparmi-investimenti

n.132 (settembre 1991) **GIULIO CIFARELLI** Le fluttuazioni del dollaro negli anni ottanta. Una analisi econometrica

n.133 (novembre 1991) **STEFANO VANNUCCI** On Stable standards of behaviour

n.134 (novembre 1991) **LUIGI M. TOMASINI** Politica dei redditi e compartecipazione

n.135 (dicembre 1991) **NICOLA DIMITRI** Asymptotic consensus with partitions

n.136 (gennaio 1992) **MAURIZIO BAUSSOLA - RICCARDO FIORITO** Regional Unemployment in Italy: sources and cures n.137 (febbraio 1992) **STEFANO VANNUCCI** Implementation Theory and Ethics

n.138 (febbraio 1992) **MASSIMO DI MATTEO** Forms of trade control in an equilibrium north-south model : a comparative evaluation

n.139 (febbraio 1992) **MASSIMO DI MATTEO** E' veramente da criticare una politica export-led? Alcuni risultati usando un modello di equilibrio nord-sud

n.140 (maggio 1992) **BERNHARD BÖHM** An Introduction into environmental econimics (lecture notes)

n.141 (settembre 1992) **RICCARDO FIORITO - FLAVIO PADRINI** Unemployment components in the G7 countries

n.142 (ottobre 1992) **GIULIO CIFARELLI** Fundamentals, regime shifts and dollar behaviour in the 19805. An empirical analysis

n.143 (ottobre 1992) **FRANK HAHN** A Remark on incomplete market equilibrium

n.144 (ottobre 1992) **NICOLA DIMITRI** Generalized information structures: some theoretical and methodological issues

n.145 (ottobre 1992) **FRANCESCO FARINA** Distributive justice as a coordination problem

n.146 (ottobre 1992) **MAURIZIO FRANZINI** The role of the market in a complex institutional order

n.147 (novembre 1992) **FRANCESCO PULITINI** Le vestali del mercato. Qualche appunto sull'antitrust italiano

n.148 (novembre 1992) **VALERIA DE BONIS** On stabilisation Policy in a single currency area. An IS-LM-AS Model

n.149 (dicembre 1992) **FRANK HAHN** An Economist's view of higher education

n.150 (gennaio 1993) **GIANROCCO TUCCI** Integrazione tra efficienza ed equità-come-assenza-di invidia in un'analisi costi-benefici non tradizionale

n.151 (gennaio 1993) **BERNHARD BÖHM** An introduction into environmental economics - Reprint-

n.152 (febbraio 1993) **NICOLA DIMITRI** Learning partitions

n.153 (marzo 1993) **SERENA SORDI** Nonlinear models of the business cycle and chaos theory: a critical analysis

n.154 (maggio 1993) **UGO MARANI-RICCARDO AZZOLINI** Svalutazione e politica economica . Osservazioni sulla crisi valutaria del 1992

n.155 (giugno 1993) **CARLO ZAPPIA** The notion of private information in a modern perspective: a re-appraisal of Hayek's contribution

n.156 (settembre 1993) **FABIO PETRI** The impermanence problem in general equilibrium analyses

n.157 (ottobre 1993) **GIULIO CIFARELLI** Sistematic forward forecast errors, ex ante real interest rate differentials and ex ante real exchange rate changes. An empirical analisis

n.158 (ottobre 1993) **GIANCARLO MARINI - PASQUALE SCARAMOZZINO** Environmental externalities, disconnected generations and policy

n.159 (dicembre 1993) **UGO PAGANO** Can Economics Explain nationalism?

n.160 (gennaio 1994) **UGO PAGANO - ROBERT ROWTHORN** The Economics of self-sustaining ownership systems

n.161 (gennaio 1994) **GRACIELA CHICHILNISKY - GEOFFREY HEAL - UGO PAGANO** Property Rights and Returns to Scale: Patents, Firm and Market Failure

n.162 (marzo 1994) **ANTONELLA STIRATI** Ricardo and the Wages Fund

n.163 (marzo 1994) **STEFANO VANNUCCI** Generalized social situations and admissible implementation

n.164 (marzo 1994) **FRANCESCO FARINA** Social preferences, equity and *non-expected utility theory*

n.165 (marzo 1994) **MAURO CAMINATI** Perfect-foresight endogenous cycles with excess capacity

n.166 (marzo 1994) **ALDINO MONTI** Piccolo Stato, crescita economica, bilancia commerciale: la Scala di commercio di Bologna fra '500 e '700

n.167 (aprile 1994) **FRANK HAHN** On Growth Theory

n.168 (aprile 1994) **TOSHIHIRO HORIUCHI** The effect of firm status on banking relationships and loan syndication

n.169 (maggio 1994) **LUCA F. BELTRAMETTI** Bell inequalities In economics?

n.170 (giugno 1994) **ALBERTO DALMAZZO-GIANCARLO MARINI** Foreign debt, sanctions and investment: implications for LDCs

n.171 (luglio 1994) **NICOLA DIMITRI** On sufficient conditions for rational information processing

n.172 (settembre1994) **UGO PAGANO** Economia e Diritto

n.173 (ottobre 1994) **BANKIM CHADHA AND FABRIZIO CORICELLI** Unemployment, Investment and sectoral reallocation

n.174 (ottobre 1994) **FLAVIO PADRINI** Government discretion and time inconsistency of the taxation plan: a critical review

n.175 (ottobre 1994) **STEFANO VANNUCCI** The Arithmetic mean is mildly strategy-proof

n.176 (ottobre 1994) **STEFANO VANNUCCI** Voting for a coalition government

n.177 (novembre 1994) **RICCARDO FIORITO** Labor Market and Cyclical Fluctuations

n.178 (dicembre 1994) **ALBERTO DALMAZZO AND NICOLA DIMITRI** The expected cost of capital: private vs. public debt placements

n.179 (marzo 1995) **MASSIMO A. DE FRANCESCO** Price and capacity determination under uncertain demand and customer markets

n.180 (marzo 1995) **CARLO ZAPPIA** Private information, contractual arrangements and hayek's knowledge problem

Alla presente Collana "gialla" di quaderni il Dipartimento di Economia Politica affianca una Collana "celeste" di monografie. I numeri pubblicati a tutt'oggi sono i seguenti:

1) **GIUSEPPE DELLA TORRE**, Istituzioni creditizie ed Accumulazione del Capitale in Italia (1948-81), 1984.

2) **SANDRO GRONCHI**, Tasso Interno di Rendimento e Valutazione dei Progetti: una Analisi Teorica, 1984.

3) **ALDINO MONTI**, La Proprietà Immobiliare a Bologna in Età Napoleonica (1797-1810), 1984.

4) **GIULIO CIFARELLI**, Equilibrium and Disequilibrium Interpretations of Inflation, 1985.

5) **STEPHAN E. EPSTEIN**, Sicily and its markets: 1300-1500 economic growth and social transformation

6) **ROBERT SOLOW**, Siena Lectures on Endogenous Growth Theory, edited by Serena Sordi

7) Guida alle attività del Dipartimento di Economia Politica

Stampato nel 1995 dalla
COPISTERIA EMMECI, Via Pantaneto 132 - Siena -