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HOW DO NEW TECHNOLOGIES FARE UNDER DIFFERENT INSTITUTIONAL RULES?

by

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Contents

INTRODUCTION 1
- Which social welfare? 2
- Institutional rules and the role of government 3
- The conventional wisdom 4

1 KNOWLEDGE AND COMPETENCE 5
- Two overlooked properties of human knowledge 5
- Economic v. technological competence 6
- If economic competence is scarce, how to allocate it? 7

2 ECONOMIC COMPETENCE OF ORGANIZATIONAL STRUCTURES 9
- The concept of organizational structure 9
- An organizational structure as an allocation of tacit competence 10
- Organizational structure determines performance 11
- Organizational structures for new technologies 13

3 ECONOMIC SELF-ORGANIZATION 15
- How do organizational structures form and reform? 15
- Modelling economic self-organization 16
- The inevitability of organizational trials and errors 18
- Entrepreneurs as catalysts of economic self-organization 19
- Economic self-organization determines performance 20

4 ECONOMIC SELF-ORGANIZATION UNDER DIFFERENT INSTITUTIONAL RULES 22
- The double influence of institutional rules on economic self-organization 22
- Organizational failures 23
- Comparing organizational failures under different institutional rules 25
- Fields of competence and fields of competition 26
- Economic competence and government 27

5 MARKETS MAY FAIL BUT PRIVATE ENTERPRISE IS NEEDED 29
- Contestable private enterprise 29
- The inferiority of central planning 30
- The inferiority of market socialism 31
- The limits of government 32

Notes 36

References 39

INTRODUCTION

Institutions and technical change have always posed difficult problems to economic theory. As to the combinination of the two - the effects of institutions on technical change - the difficulties may appear unsurmountable. Thus far, only a few authors have approached this topic. Perhaps the most important ones are Marx (1848), praising capitalism for its great help to the development of the forces of production; Schumpeter (1934, 1942), tracing the source of technical change first to the individual entrepreneur and later to the big monopolistic firm; and North and Thomas (1973), discovering in economic history a significant dependence of technical progress on the form of property rights. More recently, Rosenberg and Birdzell (1986), Eliasson (1986) and Nelson (1986) have pursued an interesting line of argument in what may be considered Schumpeterian tradition. They have argued, in somewhat different but basically parallel fashions, that the institutions of capitalism constitute a particularly powerful engine for technical change, because of the rich organizational and technological experimentation which these institutions permit. Balcerowicz (1985) presents an original variant of this argument in a broad comparative context, showing the superiority of institutions with what he calls "liberal organizational rights".

From a somewhat different angle, a comparative advantage of capitalist institutions in organizational dynamics (economic self-organization) has also appeared as a result of my recent research (Pelikan 1985, 1986 and forthcoming). One purpose of the present paper is to apply this result to the area of new technologies. In this way I will provide an additional support and a few complementary findings to the Rosenberg-Birdzell-Eliasson-Nelson line of argument, as well as to Balcerowicz's comparative analysis.

Before doing so, however, I also wish to spend some time on developing a theoretical framework which would facilitate the study of this topic, increasing the transparence, and thus the force, of the arguments produced. Two problems, neglected by mainstream theories, are considered of particular importance in this context: the allocation of tacit knowledge and economic self-organization. The framework can be regarded as an attempt to connect these problems, at least at a qualitative level, to the body of economic analysis.

A particularly clear way to conduct my inquiry is to focus on a question of policy. I will assume that, as is now often the case, government wishes to help the creation and diffusion of new technologies. The question then is: Which institutional rules, with what scope for government intervention, would be the best instruments for such a policy?

Which social welfare?

An important qualification is that in comparison with old technologies, the new ones should be not only technically superior, but moreover socially preferable - in the sense that under given resource constraints they should lead to a higher social welfare.

Although I thus accord great importance to the question of how to define social welfare, I must admit that this question cannot be answered in any universally valid way. The problem is that this question must nevertheless be accomodated. Otherwise every attempt to compare alternative institutions can be thwarted by the popular objection that such a comparison cannot be meaningful if the alternatives compared - such as capitalism and socialism - are intended to pursue alternative kinds of social welfare.

To cope with this objection, I accomodate the question of social welfare along the lines indicated by Nelson (1981). I simply admit whichever kind of social welfare might be desired - no matter which mixture of private and public consumption it implies, and no matter by which mixture of consumer sovereignty and government policies it is determined. In this way, I limit the comparison of alternative institutional rules to the sector of production, focusing on innovation in products and production processes. The thorny question of social welfare is thus avoided, and each variant of institutional rules can be assessed according to its abilities to channel production and innovation processes towards improvement of its own kind of social welfare.

This limitation of my inquiry implies that all discussion of government intervention will concern intervention in production only (e.g., industrial policy or planning). Government policies concerning income distribution, final demands, and macroeconomic stability will not be examined. A minimum of macroeconomic stability will simply be assumed. The question about the role of government will be limited as follows: How should government intervene, or abstain from intervening, in production and production

innovation, in order to efficiently pursue its own policies concerning final demands and income distribution (no matter how close to, or far from, pure market solutions those policies might be)?

Institutional rules and the role of government

A brief clarification of how the role of government will be depicted is in order. Following Hayek (1967), two broad categories of government actions can be distinguished:

- legislating and enforcing general institutional rules - such as property rights, including patent laws and antitrust laws;

- taking particular measures - such as planning, subsidizing, or direct controlling specific production units, including research and development units.

Of course, the two categories are not unrelated. Among the tasks of institutional rules is to define the scope for permissible particular measures. Different variants of institutional rules imply different species of economic systems, each with its characteristic scope for such measures.(1)

For example, consider the three often discussed species of economic systems - variants of institutional rules:

- pure private enterprise, or capitalist market system, with no scope for particular measures;

- pure government control, or socialist planning system, where particular measures run the entire production, research and development;

- mixed systems, where more or less extensive particular measures intervene in, or take over, more or less large parts of markets.

My question can now be stated more precisely: Which institutional rules, with which scope for particular measures, provide the relatively best conditions for the creation and diffusion of socially preferable new technologies?

A qualification is, however, necessary. Institutional rules - which can best be visualized as the rules of a game - consist of both written law and unwritten custom. Clearly, government can legislate and enforce the former, but hardly the latter. In fact, custom even acts as a constraint on legislation, for all laws which deviate too far from custom are costly politically as well as economically. The qualification is that the institutional rules which may prove the best for new technologies may at

the same time prove politically impracticable in certain cultures, just because of the prevailing custom. Since the present inquiry will leave aside the question of political practicability, it cannot produce any realistic policy advice. It can at most indicate the institutional rules which would be the best for new technologies in the absence of cultural and political constraints.

The conventional wisdom

There is a widespread belief that neoclassical economic theory favors capitalist markets and would, therefore, answer my question by recommending the institutional rules of private enterprise (capitalism). But the surprising truth is that this theory has on the contrary an implicit pro-government (pro-socialist) bias. (2) On the one hand, it has disclosed an impressive list of market failures. Among other things, it has shown that markets cannot optimally allocate resources for invention. (3) On the other hand, this theory made it possible to elaborate several ingenious procedures of optimal government planning. (4) The natural conclusion, then, is that whenever a market fails, government can, and should, intervene to correct the failure.

To be sure, some modern extensions of neoclassical theory - Public Choice is perhaps the best known of them - do provide pro-market arguments. (5) But these arguments are not very convincing. Narrowly focusing on the problem of individual incentives, they try to prove too much - namely, that outside markets, without being directly exposed to profit incentives, individuals cannot be motivated to be socially efficient. Although aimed at discrediting government bureacracy, these arguments implicitly put in doubt the very basis of modern capitalism - the efficiency of the large firm. (6)

My claim is that neoclassical theory, including its modern extensions, suffers from two serious limitations. One is its statical approach to organizational structures, neglecting the crucial process of economic self-organization. In Schumpeter's (1942) words: "The problem that is usually being visualized is how capitalism administers existing structures, whereas the relevant problem is how it creates and destroys them". The second limitation - which I will show as intimately related to the first one - is an oversimplified view of human knowledge. Let me begin by outlining a view of knowledge which is better suited to the problem at hand.

1 KNOWLEDGE AND COMPETENCE

Without underestimating the importance of incentives, I contend that in order to properly asses variants of institutional rules, one must focus on the question of how knowledge is used. (7) And it is precisely in the context of new technologies that the great importance of this question appears with particular clarity.

Two overlooked properties of human knowledge

Two properties of human knowledge, overlooked in conventional economics, are crucial here. One has been pointed out by Polanyi (1967), and recently received much attention in the evolutionary theory of economic change by Nelson and Winter (1982). It is the tacit character of much of the knowledge on which any human communication and decision-making must repose.

The basic observation is that in order to communicate or interpret any information (knowledge), some knowledge must always preexist - such as working knowledge of concepts, languages, and logic. Although some of such knowledge might have been communicated on an earlier occasion, that communication inevitably required some preexisting knowledge, too. The upshot is that at least some of the knowledge on which all communication and decision-making repose must ultimately be tacit - that is, tied to each of the actors involved and impossible to communicate. (8)

Note that neoclassical theory does not deal with any information (knowledge) which cannot be communicated. Altough information has become a popular subject of modern economic analysis, it is always information which is fully communicable. To be sure, it is admitted that communication may be costly, and possibly also hindered by insufficient incentives. But no unsurmountable constraints on communicability, stemming from the very nature of information processes, are recognized.

The second crucial but often overlooked property of human knowledge is the difficulty of observing, measuring, and interpersonnaly comparing its stocks. Much of human knowledge is not only tacit, but also hidden. Only the particular results of its application in particular circumstances - such as the solutions of particular problems, or the results of particular tests, contests or tournaments - can be observed and compared. (9) The frequent cases of overestimation or underestimation of one's own competence show

that one is even unable to directly measure one's own knowledge, in spite of using it freely.

While it is perfectly possible to regard knowledge as a scarce resource and a factor of production, it is important to keep in mind that because of the two above properties, it is fundamentally different from all other resources. Because it is partly tacit, it cannot be entirely transferred from one decision-maker to another, and because it is partly hidden, the true state of its stocks are not fully known even to their owners.

Economic v. technological competence

Let me now focus on the competence of different decision-makers - that is, on the knowledge contained in their ways (procedures or routines) to interpret data and to take decisions. It is this kind of knowledge which is most often tacit and hidden. As opposed to data about the state of the world, which can often be communicated, the competence of an agent to intepret and act upon such data usually cannot. Much of such competence must be learned individually from one's own experience, according to one's own talents. The talents which determine the efficacy of such learning can also be regarded as a form of competence - the competence to learn - of which most, if not all, is also tacit and hidden.

An economist needs to distinguish at least two fields of competence, according to the subject concerned. As already Frank Knight (1921) pointed out, it is essential to distinguish between economic problems, which are the subject proper of economic analysis, and technological problems, which concern the natural sciences and engineering. Although the two fields may be closely related, they never really mix. Typically, the solutions of technological problems require economic evaluation, while the solutions of economic problems are constrained by available technologies. But it is one thing to design a product or a production process in terms of physical parameters, and another thing to estimate the private and/or social costs and benefits of such a design. Consequently, one can quite sharply distinguish between economic and technological decisions, and between the corresponding economic and technological competence.

Strictly speaking - and this is a qualification of what has been said above - neoclassical theory cannot be accused of ignoring that some technological competence is tacit and hidden. The fact that some technological competence is tacit is recognized in the literature on human

capital and learning by doing. And the fact that some technological competence is hidden is recognized in the literature on job assignment. (10) But it should be emphasized that it is the allocation of only technological - and not economic - competence that this literature is about. What has been studied is the acquisition of production skills, and the assignment of jobs to workers and engineers of different qualities.

On the other hand, by assuming that all economic decision-makers are always perfectly (unboundedly) rational, neoclassical theory implies that economic competence - that is, the competence for taking optimal economic decisions - always preexists and need, therefore, never be acquired. While it is admitted that people may be of different qualities as workers or engineers, they all are assumed to be perfect as economic decision-makers - such as sellers and buyers on different markets, managers of firms, policy-makers, or planners. (11)

If economic competence is scarce, how to allocate it?

Although technologies are what the present study is about, it is their economic, and not technical, aspects that are to be examined. The question here is about the destiny of new technologies under different variants of institutional rules. And it is on the quality of economic decisions on production and investment that this destiny ultimately depends.

Consequently, the focus will be on economic competence, in particular on the competence of managers, entrepreneurs, investors, policy-makers, and planners. This competence concerns reading and interpreting economic signals, estimating future supply and demand, evaluating the probability of success of different research and production projects, designing contracts and organizations, and estimating the competence and talents of oneself and others.

As has been mentioned, economic competence corresponds to what is usually called "economic rationality". The neoclassical assumption of perfect (unbounded) rationality thus corresponds to the assumption that economic competence is never scarce.

The step I now propose to take is to recognize that not only technological competence, but also economic competence can be scarce and unequally distributed. This step implies that the rationality of economic agents is recognized as bounded, in the sense of Herbert Simon (1955, 1969). Alternatively, referring to Heiner (1983), one can also say that the

competence-difficulty gap faced by economic agents is recognized as negative. Moreover, this step also implies - and this is something which neither Simon nor Heiner have explicitly considered - that the rationality of different economic agents may be bounded in different ways and degrees or, in Heiner's terms, that different economic agents may face differently large competence-difficulty gaps.

The recognition that economic competence can be scarce and unequally distributed enlarges our view of what can be wrong with an economic system. According to conventional thinking, all system failures must ultimately be due to improper motivation of perfectly competent egoists. Even if an agent is not properly informed, the fault is ultimately seen with the motivation of the agent who could have informed him better, but did not. In contrast, the proposed view moreover admits that some failures may also be caused by properly motivated, but not so competent altruists. This means that economic systems are to be assessed not only according to how well they can cope with egoism, but also according to how well they can cope with incompetence.

If economic competence is recognized as scarce and unequally distributed, the question of its efficient allocation must be raised. This question would nearly lead back to the familiar problem of resource-allocation, if only economic competence were not such a peculiar resource to allocate. (12)

As has been said, economic competence differs from all other resources - with the exception of technological competence - by being mostly tacit and hidden. Moreover, it differs from all other resources - this time without exception - in an even more fundamental aspect. While all other resources are merely objects being allocated, economic competence is the very method of economic calculus by which the entire resource-allocation is governed.

Conventional analysis keeps the method of calculus neatly separated from the objects of allocation by the assumption of perfect rationality - that is, the assumption that all agents have abundant economic competence for which no allocation problem ever arises. But if economic competence (rationality) is now recognized as scarce and itself in need of allocation, the neat separation is destroyed. Economic competence suddenly appears on both sides of the fence. The already allocated economic competence forms the method by which further allocation of economic competence is governed.

2 ECONOMIC COMPETENCE OF ORGANIZATIONAL STRUCTURES

The question of how new technologies depend on institutional rules can now be divided into two parts: the question of how new technologies depend on economic competence, and the question of how economic competence depends on institutional rules. For coping with these questions, two concepts are essential. One of them is "organizational structure", the subject of the present section.

The concept of organizational structure

Far from being new, this is in fact one of the most familiar concepts, underlying the entire microeconomic analysis. The only problem is that it has never been given a name. To visualize it, recall that microeconomic analysis of a market economy usually begins by assuming the presence of **n** maximizing producers and consumers, interconnected by **m** markets. Alternatively, in studies of planning procedures, one usually assumes the presence of **n** maximizing socialist firms and one maximizing Central Planning Agency, interconnected by a hierarchy.

Generalizing slightly, I define "organizational structure" as a collection of certain economic agents (e.g., firms, agencies, or individuals), behaving in certain ways (e.g., maximizing or satisficing), and interconnected into a certain organizational form (e.g., a certain mixture of markets and hierarchies).

This definition of organizational structure can be applied not only to different economies, but also to different parts of an economy. For instance, a multipersonal firm or agency, which may be regarded as a single agent in the organizational structure of the economy, can also be regarded as having an internal organizational structure of its own, showing how it is composed of some smaller agents - such as divisions, departments, plants, and ultimately individuals.

My claim that conventional theory is limited by its static approach to structures can now be stated more precisely. What I mean is that this theory is limited to studies of resource-allocation within a <u>given</u> and <u>constant</u> organizational structure.

This proves to be a serious limitation which makes conventional theory blind to some important differences between variants of institutional rules. The reason, which I shall elaborate below, is that such variants may differ

less in their administration of given organizational structures - for instance, modern capitalist and socialist firms may use quite similar methods of management - than, as Schumpeter would put it, in their ways of creating and destroying structures. The argument which I will develop is that without paying attention to changes of organizational structures, it is impossible to understand how scarce economic competence will be allocated under different institutional rules. Consequently, it is also impossible to understand with which competence the creation and diffusion of new technologies will be governed.

An organizational structure as an allocation of economic competence

The following proposition is essential: Each organizational structure embodies a certain allocation of tacit economic competence which cannot be changed without changing the structure itself.

To see why this is so, recall the definition of organizational structures and the properties of tacit knowledge. Since an organizational structure is a collection of interconnected economic agents, each with his specific economic competence which cannot be transferred to anyone else, the above proposition follows.

This means that in order to change the allocation of economic competence, economic decision-makers must be replaced and/or rearranged into a different organizational form and/or learn new economic competence (within the limits of their competence to learn). Such changes often require that new markets or new firms be created, and that existing firms be reorganized or dissolved.

It is fruitful to define "economic competence" as a property of not only individuals, but organizational structures in general. This will enable us to speak, for instance, of firms, agencies, and entire economies as being more or less competent.

The competence of an organizational structure - let me denote it "organizational competence" - is simply defined as the allocation of the individual competence which the structure embodies. This means that organizational competence is made up of all the individual competence involved, but without being a simple sum of individual contributions. What also counts is the organizational form of the structure and the specific allocation of individual contributions over this form. Clearly, the economic competence employed for top economic decisions - such as those of

entrepreneurs, managers, investors, policy-makers and planners - will weigh more than the economic competence of the rank and file. When considering a given economy, employing given individuals of given competence, it is on their respective positions and interrelations that the competence of the economy will depend.

To sum up, organizational competence will depend on the organizational form, which determines the network of individual positions and interrelations, and on the selection of specific individuals for these positions.

Two implications are of particular importance. First, the same individuals can form structures of different organizational competence, if arranged into different organizational forms. Second, the same form can result in different organizational competence, it it employs different, or differently selected individuals.

It is instructive to note that the concept of economic competence can be regarded as a generalization of three familiar concepts, which conventional analysis has kept separated from each other: the rationality of individuals, the x-efficiency of firms, and the allocative efficiency of economies. This means that the economic competence of any organizational structure can be regarded as endowing the structure with certain abilities to perform.

Organizational structure determines performance

The principle that structure determines performance has been the basis of all modern science, including modern economic theory. As the above reasoning implies, this principle is also followed here: different organizational structures are recognized as embodying different economic competence, which endows them with different abilities to perform.

It is interesting to note that the main results of conventional analysis can be regarded as exposing the performance of a few simplified organizational structures. For instance, the well-known twin theorem of modern welfare economics can be regarded as showing that a structure which interconnects perfectly competent (rational) agents into perfectly competitive markets can efficiently allocate resources under the conditions of convexity, divisibility, and the absence of externalities. And similarly, the related theory of mathematical planning can be interpreted as showing that a structure which interconnects equally competent agents into an

optimal planning hierarchy can efficiently allocate resources even when some of these conditions are not fulfilled.

The performance of more realistic organizational structures, however, is still largely unpredictable by existing theories. Particularly unexplored cases are precisely the ones which are of greatest interest here: the performance, in the area of new technologies, of organizational structures containing imperfectly competent (boundedly rational) agents .

Of course, this is hardly surprising, for most economic analysis has been conducted precisely under the assumptions that all agents are rational and all technologies are given and constant. But a few partial results have nevertheless been reached when the assumption of given and constant technologies was occasionally dropped. For instance, as already mentioned, it has been shown that competitive markets cannot efficiently allocate resources for invention, but also that a non-market arrangement need not perform any better. But no generally valid answer has been given to the question of which organizational form - markets or hierarchies - performs best in promoting the creation and diffusion of new technologies.

What should now be emphasized is that this question will not be given any generally valid answer here either. My argument is precisely that no such answer can be found, if economic competence is recognized as scarce, tacit and hidden.

Note that this argument does not contradict the principle that structure determines performance. Recall that an organizational structure, as has been defined here, includes not only an easily observable organizational form - such as a market or a hierarchy - but also a much more difficult to observe allocation of tacit and hidden economic competence. Since two structures of a similar form are different and have different organizational competence, if they contain differently allocated individual competence, they also perform differently.

For instance, this explains the often observed fact that similarly looking hierarchies may differ widely in their performance. On the one hand, one can observe hierarchies which outperform markets - such as some successful, often very large, capitalist firms. Perhaps the best evidence that a hierarchy may outperform a market can be found by observing the successful cases of vertical integration. On the other hand, however, one can also observe hierarchies, possibly of a very similar organizational form as the successful ones, which fail to sufficiently coordinate and motivate its members and perform quite poorly - such as some declining

capitalist firms, most socialist firms, and all existing centrally planned economies. (13)

Organizational structures for new technologies

In the area of new technologies, there is an additional reason why no generally valid answer can be given to the question of which organizational form performs best. As shown by Freeman (1974), new technologies may be of widely different nature, and their creation and diffusion may involve a wide variety of stages - from basic research to applied production innovations - which may raise quite different problems of economic coordination. As a result, different technologies, and different stages of their creation and diffusion, may thrive best in different organizational forms.

For example, basic research is often best promoted by universities and not-for-profit research institutes with substantial government subsidies. On the other hand, the applied search for new products and new production technologies is often most effectively conducted by profit oriented firms connected to capitalist markets. Several cases can further be observed. Some new technologies may originate within the hierarchy of an existing firm (e.g., the transistor within the Bell Company), whereas for other technologies the entry of new firms may be required (e.g., Polaroid, Xerox, microcomputers). Some technologies may be easy to copy and require strict patent protection, if the incentives for creating them are not to disappear. Other technologies may be connected with so much learning by doing (tacit technological competence) that little patent protection is effectively needed. Some new technologies, for instance in agriculture, may have so strong features of a public good that not only patent protection would be strikingly wasteful, but a public policy actively supporting their creation and diffusion may be justified.

The general conclusion is that efficiency in the creation and diffusion of new technologies may require different organizational structures of a variety of forms - e.g., different mixtures of markets and hierarchies, both not-for-profit and profit oriented. To be successful, these structures must be finely adjusted - both by their form and by their allocation of specific individual competence - to different stages of the work on different technologies.

Much of the heated controversy about general merits and demerits of markets is thus revealed as futile. All one can ever show is that markets can arrange best some stages of the work on some new technologies, whereas they are inferior to some non-market organizational forms for other stages and/or other technologies.

Of course, such an eclectic answer cannot satisfy the theoretician who seeks general truths. But if the question of the best organizational form is generally undecidable, we can try to replace it by another question, equally relevant to the problem at hand, but for which a clear general answer would exist. It is to the search for such a question that I will now turn.

3 ECONOMIC SELF-ORGANIZATION

The step I now propose to take is to recognize organizational structures as endogenously variable, in contrast to conventional analysis which assumes them exogenously given and constant. The essential concept for taking this step is "economic self-organization".

How do organizational structures form and reform?

Only a minority of economists have seriously studied this question. They include Schumpeter (1942), who states it in his famous term "creative destruction", Alchian (1950) and Nelson and Winter (1982), who study it as "evolution by selection", Eliasson (1984), who speaks of "structural adaptation", and Marris and Mueller (1980), who use the term "self-organization".

While drawing on all these works, the present inquiry needs to go farther in one important respect. Thus far, changes (evolution, adaptation, self-organization) of organizational structures have been studied only under the institutional rules of capitalism. But in order to answer my initial question, it is important to consider other variants of institutional rules as well.

It seems that - besides my own tentatives in Pelikan (1985, 1986) - only Balcerowicz (1985) considered this question in a truly comparative context, but without choosing any particular term to denote the entire process of forming and reforming of organizational structures. After having tried several terms, I found "self-organization", in the sense of Marris and Mueller, the most suitable for my purposes. I only add the adjective "economic", in order to distinguish the formation of the organizational structure of an economy under given institutional rules - which is what I mean by "economic self-organization" - from the formation of the institutional rules themselves. The latter process, which might suitably be called "institutional self-organization", will not be considered here. (14)

To visualize economic self-organization in concrete terms, we may think of the formation of new markets, firms or agencies, or of take-overs, divestitures, internal reorganization, or dissolution of existing firms or agencies. In general (cf. the definition of organizational structure on p. 8), economic self-organization can be defined as the process which changes

the collection of economic agents, and/or their interconnections and/or their behavior. (15)

An additional analytical connection can now be established. Recall that each organizational structure embodies a certain allocation of economic competence. If economic self-organization is the process which changes organizational structures, it must, then, also be the process which allocates economic competence. To put it more precisely, economic self-organization allocates the individual competence of the agents involved, and produces the organizational competence of the structure formed.

Modelling economic self-organization

Unfortunately, I cannot present here an elegant and rigorous model of economic self-organization, simply because I have not yet found one. All I can do is to outline the main differences between such a model and the usual microeconomic model of an economy. As I will subsequently show, some approximative but significant propositions can nevertheless be obtained by a purely qualitative reasoning.

Recall the basic difference: the organizational structure of the economy is no longer assumed exogenously given, but recognized as endogenously variable. In other words, instead of the usual assumption that certain markets and/or hierarchies are given, markets and hierarchies must be modelled as forming, reforming, growing, transforming into each other, diminishing or dissolving.

This means that a model of economic self-organization does not assume any multipersonal economic units to be given. Instead, it starts from a collection of individuals - the society - and studies how these individuals combine and recombine into different economic units (e.g., firms and agencies). Although the individuals may be assumed to remain the same, the collection of economic units is modelled as changing. (16)

This basic difference entails several other differences. The most fundamental one is that our view of microeconomic behavior must be enlarged by a new dimension. Traditionally, economic agents have been depicted as exchanging (transacting) signals and resources along some already established channels - e.g., through existing markets or within existing hierarchies. A model of economic self-organization must depict them as moreover forming, modifying or dissolving such channels. This additional dimension of economic behavior - which I propose to call <u>associative</u> - can

be exemplified by such actions as concluding or interrupting long-term employment contracts, establishing or abandoning lasting business relations, and gaining or giving up the control of firms. In other words, associative actions are the elementary steps of which markets and hierarchies are made and unmade.

To recognize associative behavior as another dimension of economic behavior, different from the usually considered allocative behavior, is essential for a good understanding of economic self-organization. (17) Associative behavior involves its specific associative constraints - such as limited span of control and limited trust - and associative preferences - such as the liking for rituals, status, power, and selective social contacts. Such constraints and preferences influence economic behavior side by side with the traditionally considered resource constraints and consumer preferences. They can often surprise conventional analysis by leading economic self-organization towards organizational structures which grossly violate the principle of allocative efficiency.

It is instructive to note that such an enlarged view of economic behavior can no longer refer to the paradigm of mechanics, on which conventional economics has been built, but invites us to turn to the paradigm of chemistry and biochemistry. Economic agents can no longer be regarded as passively accepting their roles in a given "mechanism", but must be recognized as actively and selectively "reacting" with each other: they themselves form and reform the "mechanism" - or one should now rather say "organism" - of which they are parts.

Finally, the model must be dynamic in a rather unusual sense. Besides showing how a given organizational structure performs in resource-allocation - the usual task of economic analysis - it must also depict the fact that while resource-allocation is still going on, the organizational structure itself may change through self-organization.

One difficulty of the dynamics involved is that resource-allocation and self-organization can be strongly interrelated. On the one hand, self-organization forms the organizational structure which determines how resources will be allocated. But since self-organization, in turn, needs resources - e.g., the capital which a firm needs for entering, expanding, taking over another firm, or simply surviving - the resulting allocation of resources becomes an important constraint on further self-organization. Clearly, if a relevant paradigm were to be chosen from the natural sciences, it would have to be the one of molecular biology, and not only chemistry.

The inevitability of organizational trials and errors

One significant proposition which can be obtained by purely qualitative reasoning is that economic self-organization cannot be optimally planned in advance, but must involve experimentation consisting of organizational trials and errors.

To see why economic self-organization cannot be optimally planned, recall that much of economic competence is hidden in the sense that its stocks cannot be reliably measured, not even by their owners. Since economic self-organization involves allocation of hidden economic competence, whereas all optimal planning methods require that the stocks of all allocated resources be measurable, the first part of the proposition obviously follows.

Although the necessity of experimentation is, then, equally obvious, the notion of organizational trials and errors deserves an explanation. An example of organizational trial is a tentative arrangement of a selected group of economic decision-makers (of partly unknown competence) into a certain organizational form (of partly unknown qualities) - such as a new market or a new firm. But this is not all. In general, several levels of organizational trials must be considered. For instance, as will be discussed below, entrepreneurs are typically needed in order to initiate the formation of a market or a hierarchy. But as the competence of potential entrepreneurs is also largely hidden, some organizational trials must also concern the selection of entrepreneurs. Nor is this the end of the story. The selection of entrepreneurs typically involves investors whose competence for recognizing and sponsoring competent entrepreneurs is largely hidden as well. This means that even the selection of investors and their relationships to entrepreneurs must be subject to organizational trials.

Since no one's competence can be fully and reliably known in advance, no trial can be guaranteed successful. Given the available but largely unknown pool of economic competence on which an economy can draw, no single organizational trial can be expected to be optimal - that is, to appoint the most competent investors (or planners), who would sponsor the most competent entrepreneurs, who would initiate the formation of the best performing firms and markets.

It is instructive to note that the well-known case of evolution through random mutation and natural selection can be regarded as a particular case

of self-organization through generation of trials and elimination of errors. In economic self-organization, however, the trials may be far from random, and the selection may be far from natural. For instance, recall the influence of associative preferences, which may be far from oriented towards economic efficiency. Some inefficient parts of organizational structures may thus be tried not because of probabilistic errors, but because of systematic preferences for status, power, baroque rituals, and one's own relatives. (18)

To recapitulate the main line of my argument: To the degree that economic competence is tacit, it must be allocated through economic self-organization, and to the degree that it is hidden, its allocation must involve experimenation. Because of these two basic properties of human knowledge, which are independent of institutional rules, no highly performing organizational structure can form without experimentation with organizational trials and errors.

Entrepreneurs as catalysts of economic self-organization

There is a complementary reason why self-organization cannot be precisely planned in advance. To consider this reason is instructive, for it helps improve our understanding of the important but still poorly understood role of entrepreneurship.

Recall that economic agents have been recognized as associatively active and selective. This means that they all will contribute to economic self-organization. Consequently, any in advance elaborated plan of an organizational structure cannot be implemented precisely, but is bound to be enriched, or disturbed, by spontaneous associating and dissociating of all the agents concerned.

On the other hand, however, it should be emphasized that not all agents will contribute to economic self-organization in the same way. While most of them can limit their associative activities to accepting, modifying, or refusing some already existing proposals to associate, there must also be some initiative-taking entrepreneurs who generate such proposals, if any organizational structure is to form at all. For example, most markets and hierarchies, including the most "self-managed" cooperatives, would not begin to form without such entrepreneurs.

In a well-defined sense, entrepreneurs can thus be viewed as catalysts of economic self-organization. This view proves to be a fruitful

complement of the views of entrepreneurship by Schumpeter (1934) and Kirzner (1973). Among other things, it clearly shows why conventional analysis has difficulties with the problem of entrepreneurship. Roughly speaking, no traces of entrepreneurship can be seen when taking a static view of an already formed organizational structure, for similar reasons as no traces of catalysts can be seen when looking at an already made chemical compound.

Economic self-organization determines performance

It is now possible to consider a hopeful candidate for replacing the undecidable question of which organizational form performs best. To recall, the difficulty with this question is that organizational form is the only directly observable part of an organizational structure. Although such a structure determines performance, its form alone does not. Its performance also depends on its unobservable part - the allocation of tacit and hidden competence.

The way out of this difficulty is to consider that organizational structures are formed by economic self-organization. Consequently, economic self-organization can also be said to determine performance, via the organizational structure formed. Now if it were possible to identify some properties of economic self-organization which are decisive for the performance ultimately achieved, the difficulty would be avoided. The organizational structure would not have to be precisely known. Conclusions about performance could instead be drawn from properties of economic self-organization. The hopeful candidate is thus the question of which variant of economic self-organization leads to the best performance.

If this question were decidable - and I will shortly show that it is - we would have to recognize that successful organizational structures owe their success less to their static, observable appearance than to the entire dynamics of their genesis. This would mean, among other things, that they cannot be imitated, unless their entire evolution could be imitated as well.

For instance, this would mean - contrary to what conventional analysis implies - that successful capitalist firms cannot be imitated by socialist firms, nor by government agencies. What can be imitated is the organizational form - such as a certain form of hierarchy - but not the at least as important allocation of tacit and hidden competence. Since private enterprise and market selection imply a different variant of self-

organization than socialist planning or government organizing, this allocation, and consequently the performance, will be different.

The answer to my initial question now begins to emerge. Let me recapitulate. The organizational structure of an economy, in order to successfully deal with new technologies, should involve a complex mixture of different organizational forms, finely adjusted to a great variety of research, development and production tasks. Because tacit and hidden competence is involved, such a structure cannot be designed nor predicted by theory ("in vitro"). Instead, it must endogenously form - that is, self-organize - within the economy itself ("in vivo"). Since theory cannot say much about the properties of such a successful structure, a hopeful research strategy is to ask instead about properties of a successful variant of self-organization, able to form such a structure. It is this strategy that I will now try to follow.

4 ECONOMIC SELF-ORGANIZATION UNDER DIFFERENT INSTITUTIONAL RULES

Two questions are in order. First, it is the question of how economic self-organization is influenced by institutional rules. Note that this is but another form of the already stated question of how economic competence depends on institutional rules. Second, it is the question of how different variants of institutional rules can be assessed and compared according to their impact on economic self-organization, and on the resulting organizational competence and performance.

The double influence of institutional rules on economic self-organization

To understand the influence of institutional rules on economic self-organization, it is necessary to begin by a microeconomic inquiry about their influence on the behavior of individual agents.

To recall, institutional rules constrain the behavior of economic agents in a similar way as the rules of a game constrain the behavior of the players. Following the distinction between allocative and associative behavior, institutional rules can be divided into two corresponding categories:

- resource-allocation rules, constraining the agents in resource-allocation (e.g., in production and trade);
- self-organization rules, constraining the agents in associating and dissociating (e.g., in entries into and exits from markets, in take-overs and divestitures, and in organization and reorganization of firms).

Of course, because self-organization and resource-allocation can be strongly interrelated, the two categories of rules cannot be mutually exclusive. To the extent that self-organization involves the use of resources, it is also constrained by the resource-allocation rules - such as property rights. But the distinguishing feature of self-organization is that it not only uses resources, but moreover changes the organizational structure of the economy. It is for this additional area that the self-organization rules are specialized. They can be exemplified by antitrust law, corporate law, the laws and customs regulating entry and exit, and the laws and customs regulating the labor and stock markets - the places where most of the associating and dissociating of individual employees, managers and owners is done under the capitalist institutional rules.

In other words, economic self-organization is influenced by institutional rules of both categories. The resource-allocation rules influence it indirectly, via their responsibility for the actual allocation of resources, determining which changes of organizational structure become economically feasible. The self-organization rules influence it directly, by determining which of the economically feasible changes are moreover institutionally permissible.

The institutional rules of an economy are thus exposed as doubly responsible for the development of the economy's organizational structure, and consequently performance - much as the genetic message of an organism is responsible for the development of the organism's form and abilities.

This discloses as illegitimate the habit of conventional economics to assign an arbitrarily postulated organizational structure to given institutional rules - such as a set of perfectly competitive markets to the capitalist rules, or a hierarchy of optimal planning to the socialist rules. Although when new, institutional rules must begin with the organizational structure inherited from their predecessors, their double influence on economic self-organization makes them increasingly responsible for the subsequent states of the structure.

Organizational Failures

Let me now turn to the question of how to assess and compare the influence on economic self-organization of different variants of institutional rules. Fortunately, and somewhat surprisingly, this turns out to be an easier question than if we asked how economic self-organization actually unfolds under one variant.

The key idea is to focus on organizational failures - that is, failures specific to self-organization. They can be defined as lastingly misallocated economic competence or, alternatively, as lastingly inefficient parts of the structure formed - such as an inefficient market, the absence of a market, a poorly organized or managed firm, an incompetent policy-making agency, or a misleading method of planning. The emphasis is on "lastingly", for the experimental nature of economic self-organization makes temporarily misallocated competence (inefficient parts of structure) inevitable. It is only when such cases become lasting - such as persistently subsidized inefficient firms - that the term "organizational failure" becomes appropriate.

For a more detailed picture of organizational failures, recall that the inevitably experimental nature of economic self-organization involves generation of organizational trials and elimination of organizational errors. It proves fruitful to divide organizational failures into two corresponding categories:

- the failures occurring when the supply of organizational trials is stifled, which I propose to call absent successes;

- the failures occurring when the committed errors are not eliminated, which I propose to call surviving errors.

Surviving errors are easy to visualize. We may think, for example, of a maladapted firm or an obsolete industry which are maintained in life by government subsidies, or of the use of efficiency-damaging policy instruments or planning methods, or of an overbureaucratized, government protected monopolist, whose excessive costs and/or insensibility to demand may not even be properly perceived.

Absent successes are less easy to visualize, just because they are absent. Nevertheless, they correspond to real and serious problems, precisely in the area of new technologies. They refer to the feasible and potentially successful trials - such as new firms promoting new organizational forms and/or new technologies - which failed to be made. Although direct evidence may often be difficult to obtain, indirect evidence is sometimes sufficiently convincing - such as inventions which failed to lead to production innovations under one variant of institutional rules, while doing so successfully under another variant. (19)

At this point, it is important to recall that the present focus is on the performance of production, admitting a wide range of alternative final demands. This means that when considering markets with competing private producers on the supply side, no implication is made that the demand side should be limited to competing private consumers. It is fully admitted that government can modify final demands through various policies - such as demands for public goods, income transfers, subsidies of merit goods, and quality norms for consumer goods in general. Since the criteria of what constitutes a surviving error or an absent success must eventually depend on the final demands, they must also reflect all such modifications. The point simply is to assess each variant of institutional rules for its abilities to avoid errors and provide for successes in production and production innovation, in order to pursue efficiently its own intended kind of social welfare.

Comparing organizational failures under different institutional rules

The two categories of organizational failures lead to a simple method for comparing variants of institutional rules. The main idea is to assess the compared variants according to their relative resistance to organizational failures. If variant A proves to be relatively more resistant to organizational failures than variant B, the conclusion will be that the organizational structures formed under A will be better adjusted, and therefore perform relatively better, than the organizational structures formed under B - regardless of how maladjusted the structures under A might be according to some absolute ("nirvana") criteria. Consequently, new technologies will also fare relatively better under A than under B, in the sense that the complex mixture of various organizational forms, finely adjusted to the variety of research and development tasks, is more likely to form under A than under B.

To apply this method means that, for each of the variants compared, the rules which may be guilty of causing absent sucesses and/or surviving errors must be identified and the extent of their actual guilt assessed.

Regarding absent successes, the rules in question are the ones which directly or indirectly discourage or prevent some competent agents from trying out socially valuable projects. Examples of such rules are institutional barriers to entry, an institutionalized discrimination in the allocation of capital, or an insufficient legislation on unfair business practices which tolerates entry-impeding predatory behavior of incumbent firms.

As to surviving errors, the rules in question are the ones which secure the supply of resources to some parts of the organizational structure regardless of the actual performance (competence) of these parts. Such rules can thus perpetuate some inefficient organizational forms and/or the positions of some incompetent individuals. Examples of such rules are the rights of government to subsidize or to grant the status of monopoly to administratively selected production units.

In general, the most resistant variant of institutional rules is the one under which potentially successful trials are least hindered and the committed errors eliminated with the greatest speed and reliability. Referring to economic competence, one can also say that a resistant variant of institutional rules do not hinder superior competence in making itself socially useful, while keeping inferior competence as harmless as possible.

And it should be emphasized that the resistance of institutional rules to organizational failures should be assessed in a dynamic world, with a continuing stochastic supply of new talents and organizational innovations, as well as of new cases of senility and organizational decay.

Fields of competence and fields of competition

The connection between economic competence and economic self-organization is the key enabling this method to reach concrete results. Two simple observations are fundamental.

First, different individuals have been observed to have different talents, and thus develop diferent competence, for different fields of human activities. For instance, as has been frequently noted, a successful scientist need not have the talents of a successful businessman or politician, nor does a successfull politician need to have the talents of a successful manager or investor.

This observation can be modelled by formally dividing human competence into several fields. Besides the technological and economic fields, which have already been mentioned, attention is now also called to the political field. Political competence is defined as the competence of a successful politician and/or government bureaucrat within the prevailing political system.

Moreover, the field of economic competence can further be divided into several smaller fields - such as the competence for organizing and managing production or research units, which includes the competence for correctly estimating the technological competence of oneself and others, and the competence for investing, which includes the competence for correctly estimating the organizational and managerial competence of oneself and others.

We can thus characterize each individual by his/her particular levels of competence for different fields, but without expecting any significant correlation between these levels.

For the second observation, recall that competence is largely hidden, thus preventing direct measurement and interpersonal comparison of individual competence levels. And recall also that it is competition - in the sense of contests or tournaments - which provides the most reliable information about the relative competence of different agents.

To be sure, the results of any tournament can be but imperfectly correlated with the agents' true competence levels. But the correlation will be significantly better - and this is what the second observation is about - if the field of the competition is the same as the field of the competence to be measured, than if these fields are different. To give a trivial example: in order to learn how competent chess players different people are, better information can obviously be gained from a chess tournament than from a tournament in poetry or boxing.

Economic Competition and Government

In one form or another, economic competition takes place in any economy, whatever its institutional rules. But while the economist's attention has traditionally been focused on competition for scarce resources, the present focus is on a related, but not quite identical, dimension - competition for economic decision-making (or, as some might like to put it, competition for economic power).

Economic competition is thus disclosed as having a socially important task, ignored by conventional theory. It is to recognize and promote the most competent and talented entrepreneurs, managers and investors, and the best performing organizational forms. Alternatively - and this is a less demanding and, therefore, more powerful formulation - it is to demote the most incompetent decision-makers and to dissolve the most inept organizations.

Another common feature of all modern economies is the presence of politically selected government. And the common feature of all governments is that they are pervaded by competition for decision-making as well. Of course, different forms of government may imply different rules of such competition - for instance, the rules will not be the same in a democracy as in a dictatorship. But whatever the rules are, they primarily depend on the prevailing political, and not economic, system. This competition is in the political field and, consequently, it is above all political competence - such as the art of pleasing the voters or the leaders - which is required for success.

Since competition and government are so omnipresent, to learn about their properties is of great importance for comparing variants of institutional rules. Two elementary, but significant propositions about these properties follow from studies of economic self-organization.

First, if the economy is to achieve high performance, a necessary condition for competition is that the competition for economic decision-making must be conducted in the corresponding field of economic competence.

The basic idea is to regard economic competition as a tournament which should reveal information about the available economic competence, and an allocating device which should use such information in order to put the available competence to the best social uses. Recalling the two above-made observations, the proposition follows quite obviously.

Second - and this is a direct consequence of the first proposition - the economic competence of government agencies is inferior, probabilistically but significantly, to the economic competence of the firms which have resulted from, and are still active contestants in, economic competition.

Of course, the conjecture that government lacks economic competence has often been informally made (see, e.g., Eliasson, 1984). But the present analysis seems to be first to provide it with theoretical justification. Also, a related claim that government agencies are not socially efficient producers and investors has been made, in particular by the already mentioned theory of public choice. But this theory builds its entire argument on the assumption that all politicians and government appointees are perfectly rational (economically competent) opportunists whose only fault is that they cannot be properly motivated to pursue social objectives. In contrast, the present argument admits that at least some of them might be properly motivated, but claims that in a probabilistic but significant sense their economic competence is bound to be inferior.

The two propositions, together with the method for comparing organizational failures, make it possible to draw some simple conclusions about the fate of new technologies under different institutional rules.

5 MARKETS MAY FAIL BUT PRIVATE ENTERPRISE IS NEEDED

In essence, my thesis is that socially efficient new technologies fare relatively best under the institutional rules of a particular kind of private enterprise, which I denote as "contestable". Since the defense of private enterprise is usually connected with the defense of markets, let me emphasize once more that my argument separates the two issues. The failures of markets in many areas, and in particular in the area of new technologies, are recognized as real. The main advantage of private enterprise is seen in its superior capacities to conduct economic self-organization towards the formation of appropriate organizational structures, in which the role of markets may be more or less limited.

Contestable private enterprise

Private enterprise, or capitalism, is understood in the usual sense as the category of variants of institutional rules which provide for private ownership of capital. The qualification "contestable" refers to the subcategory of such variants which provide for open entry to, and exit from, both product and capital markets.

To avoid misunderstanding, note that the term "contestable private enterprise" is related to, but not identical with, the term "contestable market", as used by Baumol et al. (1982). The latter term refers to a rather unrealistic market where the costs of both entry and exit are zero. In contrast, the reference here is to variants of institutional rules which do not imply any institutional obstacles to entry and exit. Contestable private enterprise can thus be seen as a necessary, but not sufficient institutional condition for the formation of contestable markets.

The institutional rules of contestable private enterprise will moreover be assumed to include well-defined rules of bankrupcy, stating irrevocable conditions for exit.

My thesis is that all variants of institutional rules which do not belong to the contestable private enterprise category are inferior to at least some variants which do belong there.

In order to avoid misunderstanding, it should be emphasized that not all variants of contestable private enterprise are claimed superior. All I claim is that it is within, and not outside, this category that the superior variants - possibly very few - are located.

The inferiority of central planning

Let me use the term "central planning" to denote the vast category of variants of institutional rules which vest the rights to take specific decisions on production and/or investment and entrepreneurship with a politically organized Central Planning Agency. This category thus includes all existing as well as hypothetical variants of socialist planning.

My argument can be expressed by the proposition that all variants of central planning are less resistant to both absent successes and surviving errors - thus forming organizational structures of lower competence and performance - than at least some variants of contestable private enterprise.

To justify this proposition, note first that the economic competence of the Central Planning Agency is likely to be mediocre, because of its genesis through political rather than economic competition. Even if, at the very beginning, the most competent entrepreneurs, managers and investors of the old regime were appointed, the result could not be very good, for their competence is likely to become soon obsolete in a dynamic world with a continuous supply of new talents and new cases of senility.

Moreover, the expected mediocrity of economic competence will not remain limited to the Central Planning Agency, but will affect the entire organizational structure of the economy. For instance, also the socialist firm must be expected to be mediocre (in contrast to what neoclassical analysis of socialist planning assumes). The reasons can be discovered by examining the generation of organizational trials and the elimination of organizational errors under such institutional rules.

Regarding organizational trials, such rules centralize the rights to initiate them to the Planning Agency and its appointees. Although it must be admitted that even under these conditions some successful trials might nevertheless be generated, their total supply is significantly stifled. All potential entrepreneurs must first succeed in the political competition, where some of the competent ones will fail, or not even try, while some mediocre ones may excel. (20) A relatively high frequency of absent successes will thus result.

As to surviving errors, the rights to eliminate erroneous trials are centralized in a similar way. In contrast, under the rules of contestable private enterprise, these rights are decentralized to the directly concerned customers (private and/or public) and to economically selected investors.

The expected lack of economic competence of the Central Planning Agency and its appointees is again decisive. More errors will thus remain undiscovered, and therefore preserved, in comparison with the rules of contestable private enterprise.

Moreover, there is an important additional bias of central planning for preserving errors. Whereas private enterprise separates the trial-making entrepreneurs from the error-eliminating customers and investors, central planning centralizes both trial-making and error-eliminating to essentially the same decision-makers. The loss of decentralization is thus accompanied by the loss of double-checking. The expected low economic competence of the central decision-makers is thus likely to be even lower when it comes to recognizing their own errors.

The inferiority of market socialism

The institutional rules of market socialism are characterized here by the requirement that all production units, or at least all production units over a certain size, apply certain rules of collective decision-making and profit sharing in their internal organizational structures.

Let me first emphasize that my point is not to examine the impact of such internal rules on the performance of a given firm, as most economic analysis of market socialism has done. This impact may sometimes be quite beneficial indeed: examples of successful firms in market socialism are not impossible to find, and even under the rules of private enterprise one can find firms which have developed variants of such rules voluntarily, to their obvious advantage. Rather, the focus is again on economic self-organization and on the organizational failures which are likely to occur, if such rules are obligatory for all firms.

Market socialism need not, at least in theory, make any use of central planning, and not even of centralized entrepreneurship. It can make room for a wide variety of markets, where well-defined rules of bankruptcy can prevail. It can also keep the trial-makers reasonably well separated from the error-eliminators, thus preserving a high degree of double-checking. Consequently, its error-eliminating abilities need not be lower than those of contestable private enterprise.

It is on the side of absent successes that the decisive weakness of market socialism can be located. The supply of potentially successful trials will be stifled for at least two reasons. First, the obligatory

rules of collective decision-making and profit-sharing act as a constraint which discourages or prevents some, possibly important, trials where such rules would be unsuitable (e.g., some highly automated production units).

Second - and this is an even more substantial reason, in particular in the area of new technologies - the quantity of risk capital and/or the efficiency of its allocation will be lower than in contestable private enterprise. The rules of collective decision-making and profit-sharing being particularly unsuitable for firms (banks) specialized in supplying risk capital, such firms will be virtually prevented from appearing. Consequently, the supply of risk capital will be limited to self-financing, with the well-known efficiency losses, or to banks organized by government, likely to suffer from low economic competence.

Market socialism is thus shown to lead to a combination of a relatively good error-elimination and a relatively poor trial-generation. The effect will be that the rightly eliminated errors are less likely to be replaced by new successful trials than under the rules of private enterprise.

The conclusion which can now be drawn is that the organizational structure of a socialist market economy is more likely to stay chronically underdeveloped, causing a slower growth, a higher involuntary unemployment, and a slower technological progress, than what a suitable variant of contestable private enterprise would achieve in comparable conditions. (21)

The limits of government

To conclude the present discussion, let me now outline the answer to my initial question about the role which government should play in order to support, rather than hinder, the creation and diffusion of socially preferable new technologies.

In the area of institutional rules, this role can be summarized by simply saying that government should search for a suitable variant of contestable private enterprise in production. The general strategy of this search, as recommended by studies of economic self-organization, is to look for such institutional rules under which both absent successes and surviving errors would be minimized.

To be sure, this search is not easy and involves many technical details into which I cannot enter here. Let me just very roughly outline the three main tasks which such rules should fulfill. First, they should keep open the entry to all product as well as capital markets. The problem is not

only to minimize direct institutional obstacles to entry, but also to prevent, by suitable antitrust policy, incumbent producers and investors from endogenously creating such obstacles - e.g., through strategic, or predatory, actions against new entrants. Second, such rules should imply sufficient incentives for innovating entrepreneurs to effectively try to enter - e.g., by suitable patent laws, tax laws, and bankruptcy laws. Third, such rules should prevent the establishment of sinecures in which the supply of resources for further activities is not significantly tied to actual performance - such as various forms of institutionally protected monopolies, be they owned by government or privately.

As to intervention by particular measures, the general implication of the present analysis is that government competence for taking particular measures is most likely mediocre - even when government does its best to appoint experts with diplomas from graduate schools or laurels from past economic competition. Consequently, government is advised to be self-critical and avoid taking decisions on production, investment, research and development, whenever it is possible to channel economic competition by suitable institutional rules in such a way that more competent private agents for taking such decisions are likely to emerge.

But let me add and emphasize that this does not justify the simplistic conclusion that all particular measures should, therefore, be banned. The qualification clause "whenever it is possible..." should be carefully considered. It may indeed not always be possible to devise institutional rules for economic competition which would find the right agents and have them effectively take all particular measures needed. Therefore, second best solutions may sometimes be inevitable. This means that there may be particular measures which are better taken with relatively low competence than not taken at all.

Without attempting here to scrutinize such potentially important measures in any systematic way, let me just give two examples. One is government supplied entrepreneurship in some socially important areas where private entrepreneurs, in spite of all reasonable incentives, are slow in appearing. This means that the present analysis would not object, in such areas, against government organizing production, investment, or research units - provided that the entry to such areas remains open, and government units are exposed to the same bankruptcy laws as all other units. If such a government unit is successful - which the present analysis does not

exclude but only shows as rather unlikely - all will be well. If not, such an act of government entrepreneurship may still help in the long run: it may provoke, by its poor performance, more competent private entrepreneurs to enter and take over such a previously neglected area.

The second example of potentially helpful particular measures - which most theoretical economists should acknowledge personally - is the often discussed case of government subsidies to basic research. Of course, the corresponding government agencies are not very likely to find and appoint the most daring scientific entrepreneurs with the most exceptional foresight to decide on the specific allocation of the subsidies. As a result, misallocation of resources is likely to occur, with more subsidies going to conventional lines of research, yielding lower marginal contribution, than to emerging scientific innovators, capable to produce higher marginal contribution. Nevertheless, even the innovators will probably agree that this is a more desirable state of affairs than if no basic research were subsidized at all. (22)

A comment concerning government intervention in consumption is now in order. Throughout the entire inquiry, I have abstracted from final demands, fully focusing on the organization of production. In this way, I have also abstracted from the question of consumption incentives (the "carrots") for producers, which plays a central role in conventional analysis. Conventionally, private enterprise gets most praise for the rewards it offers to the competing producers in terms of a higher individual consumption. In contrast, the present argument praises private enterprise for its abilities to sort out competence from incompetence - or, if one prefers, excellence from mediocrity - in production and production innovation. Since even socialist or welfare societies, in order to attain their declared objectives, need to promote competence and protect themselves against incompetence, the argument seems universal: whichever final demands, production and production innovation will best be organized under the institutional rules of contestable private enterprise.

A serious objection can, however, be raised. It can be claimed that the question of incentives cannot be so cavalierly neglected. If consumption incentives were substantially weakened by too egalitarian transfers, private enterprise may be suspected of losing much of its productivity, or even of ceasing to produce and invent altogether. Since if true, this objection could seriously damage my argument, let me briefly indicate how it can be met.

The crucial distinction to make is between the general efficiency-equity trade-off which any economy must face and the different ways in which different economies may try to organize their production. What should be emphasized is that my argument does not deny the existence of the trade-off, but only claims that for any desired level of equity, private enterprise is still the relatively best way of organizing production. That less equity would result in more efficiency may be true, but is of no relevance for this argument.

To give a fair chance to private enterprise in a highly egalitarian society, one must think of an institutional arrangement in which production assets are clearly separated from consumption assets. Only the latter can be subject to egalitarian policies - e.g., through progressive consumption taxes, extensive supply of public goods, and transfers in money and vouchers for merit goods. On the other hand, the ownership of production assets must be regarded as the currency defining the decision power over production, investment and innovation. What should be clearly realized is that no modern economy can distribute this decision power in an egalitarian way. The relevant question then is whether this power will be used in a better way, given final demands, when allocated through economic competition to capitalists and by them selected managers, or through political competition to politicians and by them selected government bureaucrats.

In this way, both problems - of competence and of incentives - can be exposed as omnipresent, and their solutions by different economic systems compared in an unbiased way. Two elementary points can immediately be made. First, to the degree that people need high and differentiated consumption incentives in order to be efficient in production, private enterprise is at no comparative disadvantage. As the experience of real socialist economies has clearly shown, egalitarian incentives then fail also in socialism. All these economies have had to allow for a much higher inequality in consumption than initially intended, in order to prevent production from falling under a necessary minimum. Second, to the degree that some other motivations may also be at work - such as the feelings of achievement of a successful entrepreneur or innovator - the institutional rules of contestable private enterprise will display the advantage claimed by the present argument. They will provide more opportunities, and pose fewer institutional obstacles, to relevantly competent people with such motivations than any other type of institutional rules.

NOTES

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1 For a good intuitive understanding, one may regard the first category as a design problem and the second category as a control problem. Clearly, the design problem includes the design of control instruments. In practical policy-making, a similar classification of government actions has been applied in West Germany, distinguishing "ordnungspolitik" from "prozesspolitik".

2 The argument that conventional theory does not provide any substantial support to private enterprise is elaborated by Nelson (1981). In Pelikan (1985) I develop this argument a little further by showing that this theory in fact provides strong arguments in favor of socialist planning.

3 The classical reference is Arrow (1962).

4 The best known procedures of this kind are due to Arrow, Hurwicz, Malinvaud, Kornai and Liptak. A pedagogically excellent survey of these procedures is in Heal (1971).

5 The basic reference is Buchanan and Tollison (1972).

6 A similar criticism of these arguments is in Greffe (1981).

7 Although this formulation is similar to Hayek's (1945), it will soon become clear that I focus on different kind of knowledge than he did. Whereas he paid most attention to the knowledge (data) of "the particular circumstances of time and place", my focus is on the competence (programs, routines, rationality) with which such data are treated. Whereas modern analysis has shown that the difficulties in communicating such data need not hinder informationally decentralized socialist planning, it will soon become clear that the problem of competence is of a quite different nature, much more difficult to handle by any form of central planning.

8 An enlightening analogy is to think of a computer's hardware as necessarily preexisting to any treatment of software.

9 This points to an important role of competition, little explored by existing theory, to reveal information which could not be revealed in any other way. In a somewhat different context, this role has been examined by Nalebuff and Stiglitz (1983). I shall return to the role of competition in the allocation of tacit and hidden knowledge in a moment.

10 The basic reference on learning by doing is Arrow (1962) and on human capital Becker (1964). For the job assignment problem, a useful recent reference is Waldman (1984).

11 The reader who likes paradoxes may find it amusing to think that by the assumption of perfect rationality, economic theory is assuming itself useless. Clearly, if everyone already knew all principles of optimal economic decision-making, it would be superfluous to teach economics.

12 One can also regard the allocation of economic competence as a generalized job assignment problem, including the ultimate question, apparently leading to an infinite regression, which standard analysis carefully avoids: How to create and assign the jobs of creating and assigning other jobs?

13 The conditions under which a hierarchy is more efficient than the corresponding markets has been extensively studied by Williamson (1975, 1986). While on a general level I accept all his arguments, I propose to add one crucial qualification when specific cases are to be studied. What I propose is to recognize that no observable conditions alone can determine whether a specific hierarchy will actually be superior to specific markets or not. My claim is that besides the observable conditions under which a hierarchy is potentially superior to markets, the top of the hierarchy moreover needs much of tacit and hidden competence - for creative and ingenious solutions of many detailed but important problems which no theory can fully apprehend - if the potential superiority is also to be actualized. Among other things, this seems to be a plausible explanation of the otherwise difficult to explain fact that in similar observable conditions, some hierarchies are superior and others inferior.

14 Since institutional rules consist of written law and unwritten custom, institutional self-organization consists of political and/or cultural processes by which institutional rules of either kind are more or less radically transformed. In economic literature, it is above all Hayek (1967, 1973), North and Thomas (1973), and North (1982) who can be said to study institutional self-organization. In contrast, Schumpeter (1934, 1942) and Nelson and Winter (1982) can be said to study economic self-organization. An enlightening analogy is to compare institutional self-organization to the evolution of species (phylogeny), and economic self-organization to the development of an individual of a given species (ontogeny). An interesting contribution of this analogy is to precisely relate the two strands of economic literature which both deal with the dynamics of economic systems, while largely ignoring each other.

15 It is interesting to note that changes of behavior (learning, adaptation) can always be interpreted as internal self-organization of the system in question.

16 As opposed to traditional microeconomics, which considered the firm as the most elementary unit of production, the more modern transactional analysis decomposes the working of the entire economy into individual transaction. One may, however, criticize it for not quite keeping in mind that firms nevertheless do exist, and have their own specific behavior. The ambition of the present approach is to be able to consider units (agents) of several levels of complexity - e.g., firms as well as the individuals which constitute them.

17 The terms "associative behavior", "associative actions", "associative constraints" and "associative preferences" are introduced in Pelikan (1985). The failure to distinguish consequently the associative dimension of economic behavior from the usually considered allocative dimension seems to

be the main reason why theory has made so little progress in studies of economic self-organization. Economic literature comes closest to dealing with associative behavior in the writings on coalition formation, long-term employment contracts, and the issue of exit, voice and loyalty, as examined by Hirschman (1970). Without explicitly considering associative behavior, Balcerowicz (1985) refers to the resulting associative actions as "organizational actions", underlining their importance for the understanding of changes of organizational structures.

18 The reader who is familiar with molecular biology may find it illuminating to think of the recently discovered internal dynamics of genetic messages ("jumping genes"). In essence, it has been discovered that parts of such messages (genes, nucleic acids) have certain mutual affinities which can orient some mutations in quite specific directions. Such an orientation is, however, disconnected from any consideration for the ultimate survival potential of the organism formed. In fact, a message which is "more preferred" by its parts may very well lead to the formation of a less viable organism.

19 North and Thomas (1973) provide corroborating historical evidence of such cases.

20 Some interesting differences between selection by market competition and selection by government are examined by Forte (1982).

21 From the point of view of policy of full employment, centrally planned socialism can be seen as having a certain comparative advantage. Instead of eliminating surviving errors - such as obsolete and wasteful production units - it can purposefully dimension them so as to keep everyone busy. This point can be empirically illustrated by comparing the very high level of unemployment in Yugoslavia with the nominal full employment in the centrally planned economies of Eastern Europe, where many people are employed to do work of little or no use. On the other hand, Balcerowicz (1985) is somewhat more optimistic as to the potential of market socialism to provide for new entries. Nevertheless, even if all his suggestions were accepted and assumed to have the most favorable effects, contestable private enterprise still preserves a significant comparative advantage in this domain - which leaves the above argument intact.

22 As Cazes (1986) points out in his revealing comparison of Tocqueville, Cournot and Schumpeter, it was already Tocqueville who advocated government support to basic research as a necessary condition for avoiding decadence of a democratic society.

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