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SCHUMPETERIAN EFFICIENCY OF DIFFERENT ECONOMIC SYSTEMS

by

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> The usually visualized problem is how capitalism administers existing structures, whereas the relevant problem is how it creates and destroys them.
> (Schumpeter, 1942, ed. 1976, p. 84.)

1 INTRODUCTION

The sad state of the Czechoslovak economy after its socialization made me interested in economics for much the same reasons as a disease makes a sick person interested in medicine. Believing in the declared objectives of socialism - material welfare combined with low inequality, and solidarity combined with development of individual creativity - what I wanted to learn was which economic system could effectively work towards them, rather than, as the socialist system I could observe did, away from them.

The first thing I learned was that the marxist economics, with which my economic education inevitably began, could not help me. It did not even allow for a sufficiently clear and operational description of what an economic system is and how it works. My natural reaction then was to turn to neoclassical economics and its way of describing economic systems as resource-allocation mechanisms. At first, I was enchanted by its clarity and rigour. The problems I believed most important - those of communication and decision-making - could be clearly depicted and analyzed, rather than obscured by some poorly defined global notions, such as class interests, or the Economic Law of Socialism.

But my enchantment did not last long. Although I learned many important and interesting things, my search advanced only little. For example, it was certainly interesting to learn that, assuming optimizing agents and certain convexity conditions, both a perfectly competitive market economy and an informationally decentralized centrally planned economy could be Pareto-efficient. But such a result did not help me much. On the one hand, it is entirely inconclusive; provided suitable assumptions, diametrically opposed economic systems can be shown equally optimal. On the other hand, it leaves open the question of real economies, where such assumptions are always violated; in the real world, there are always some important functions which are not convex and some optimization abilities which are not abundant.

As many important economic decisions I could observe were clearly far from optimal, even from the viewpoint of the persons taking them, it was above all the possible scarcity of optimization abilities which I felt was essential not to assume away. My conjecture was that some of the most significant differences among economic systems could be found precisely in their ways to allocate and use these abilities. Of course, to assume all firms optimizing, always producing at the technological frontier, is doubtful even in capitalist economies. But there, at least, it is possible to argue - as Alchian (1950) and Friedman (1953) did - that thanks to market selection, only those firms which do not violate this assumption *too much* can survive. And although the question of how much is too much has been hotly debated, even the most pessimistic estimates are relatively small in comparison with how much the assumption can be violated by socialist firms and planners, safe from any market selection. Friedman's defence of the optimization postulate *as a universal methodological principle* thus appeared to me as a great disservice to his favorite cause of a free market economy; I saw it as helping to hide what might well be the crucial weakness of all socialist planning.

Eventually, it was the above quotation from Schumpeter which gave me the clue to what I now believe is the most fruitful way to learn what I wanted to know. To be sure, to follow this clue was not without problems. Schumpeter spoke there only of capitalism, whereas I needed to ask how structures are created and destroyed also by other economic systems. Moreover, when I started to work on the answer, I had to disagree with him on an important issue. Both my initial observations and subsequent theoretical reasoning went against his argument that invention and innovation could be entirely routinized and that socialism could easily take over or imitate the large successful firms, evolved in capitalism.

As a formerly highly developed country, where several industries used to belong to the world elite, Czechoslovakia provided me with some particularly striking empirical counterexamples. For instance, the Czech motorcycles, once among the best in the world, fell so much behind, that they could be sold only at extremely low prices mostly in less developed countries. Another example was that of the Bata shoe empire. Its domestic part, socialized in 1945, declined so much in comparison with its capitalist, since then entirely independent part abroad, that when in the 70's the USSR and Poland saught competence for their own shoe industries,

it was without hesitation they turned to the latter, and not to the former. And let me add a third example, which I could watch very closely, and which did much for making me interested in the capacities of different economic systems. In the 50's, as a freshly graduated engineer in electronics and a Ph.D. student in computer design, I had the sad priviledge to follow in detail the long but vain struggle of my professor Antonin Svoboda, a brilliant expert of international reputation, with the Czech planning bureacracy. The idea he struggled for - which now, with the hindsight of several decades, must be recognized as all but genial - was to give Czechoslovakia an early start in the computer industry.

Thus I could not help concluding that when speaking of socialism, Schumpeter simply forgot most of his own lesson about creative destruction, and simplified the problems of invention and innovation nearly as much as a neoclassical economist would do. But, hoping that the Schumpeterians are allowed to disagree with Schumpeter more than the Marxists with Marx, I wish to count myself as one of them. Indeed, it was by learning Schumpeter's lesson, *and by keeping it in mind even when studying other economic systems than capitalism*, that my study began to advance. Based on my 1985, 1987 and 1988a papers, this paper reports about this advance.

2 STRUCTURES

The term "structure" has been given so many different meanings that, to make any productive use of the idea of structures which are created and destroyed, it is first necessary to clarify what kind of structures these are supposed to be. To remain as close as possible to standard theory - probably the wisest strategy for any theoretical innovation - and to express what Schumpeter likely had in mind, the right meaning seems to be that of *organizational* structures, defined as follows:

> The structure of a multi-agent unit - a firm, an industry, or an economy - consists of the set of its *member-agents*, described by their *behaviors*, and of the *arrangement* which links them together.

Familiar examples are the situations studied by neoclassical welfare economics - a given set of optimizing producers and consumers arranged

into a given set of perfectly competitive markets, or, alternatively, into a given hierarchy of optimal planning. Although such situations are sometimes referred to as resource-allocation mechanisms, most often they are left without any particular name; to term them "structures" can thus hardly be disturbing.

If their creation and destruction are to be studied, however, a greater variety of structures must be considered. In particular, it must be admitted that some, and possibly all, of the agents do not have an optimizing behavior in the sense required by neoclassical welfare economics.[1] Moreover, one must also be ready to consider multilevel structures, where some complex units, each with its own internal structure, are member-agents in the structure of an even more complex unit.

A relatively simple case, on which most of the following discussion will focus, is that of a two-level structure depicting the production sector of an economy. Combining the traditional welfare economics, which consider firms and government agencies but not their individual members, with the more recent individual transaction approach, where agents are individuals but not firms and agencies, this picture is to include both: a set of firms and government agencies, each with its internal structure, arranged into the structure of the entire production sector. In many capitalist as well as socialist economies, such a structure can be visualized as a mixture of markets and hierarchies in the sense of Williamson (1975).

For instance, in a modern capitalist economy, there is usually a number of differently large firms and policy-making agencies, each with its basically hierarchical internal structure, arranged into a number of more or less competitive markets, usually complemented by some weak hierarchical links between the firms and the agencies. In a modern socialist economomy, the firms may look similar, but the policy-making and planning agencies are typically larger and more numerous. Also, the overall arrangement is likely to contain stronger hierarchical links, but is far from excluding all

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1. In one-agent decision problems, one can always say that an agent optimizes, even if he suffers from severe rationality bounds in the sense of Simon (1955). The point is - e.g., as argued by Boland (1981) - that any such bounds can always be counted among the constraints under which some optimization still takes place; any agent can simply be said to do *his best*, no matter how bounded his rationality might be. But, as I show in Pelikan (1988b), this may be far from the individual optimization which is required by the Invisible Hand, and by neoclassical welfare economics in general.

markets. In particular - as can be observed in Hungary and Yugoslavia - the product and labor markets can be developed nearly as much as in a comparable capitalist economy. It is only the markets for capital which must be strongly constrained, and those for control over firms must be entirely absent, if the economy is to remain socialist.

An important point is that each such structure implies a specific function, or behavior, which can be assessed by some performance indicators. Of course, it is not always easy to see what the behavior and the performance of a given structure will be. It may be one of the most difficult problems for analysis to find this out. For instance, the main theorem of neoclassical welfare economics - that the structure made of perfectly optimizing agents, arranged into perfectly competitive markets, performs, under certain convexity conditions, in a Pareto efficient way - can be viewed as solving only a very special case of such a problem.

But - as will become clear below - it will not be necessary to know how specific structures behave and perform, in order to draw significant conclusions about different economic systems. On the contrary, a part of the present argument will be precisely that the working of many structures cannot be predicted by theory, but can only be tested in practice.

3 SCHUMPETERIAN EFFICIENCY

In his survey of different kinds of efficiency, Eliasson (1985: 16) denotes one of them as *Schumpeterian*. He describes it as coming on top of dynamic efficiency, to be achieved through innovative behavior, and to allow a faster dynamic adjustment without instabilities. Adopting the term, I wish to provide it with a more precise meaning, connected to Schumpeter's idea of structures that are created and destroyed.

To remain in touch with standard theory, let me begin by recalling the familiar Pareto efficiency. In present terms, it denotes the ability of certain structures to produce, within a certain range of environmental conditions, a Pareto optimal allocation of resources. As standard theory studies structures assumed constant, its typical question is whether a given structure has this ability or not.

In addition, consider now processes by which structures themselves are produced; following Nelson and Winter (1982), let me call such processes

evolutionary. If we are still interested in Pareto efficiency, we must moreover become interested in at least one ability of such evolutionary processes - namely, the ability to produce Pareto-efficient structures.

To be sure - as Schumpeter makes us realize, and Nelson and Winter emphasize - standard theory does not study evolutionary processes. But it nevertheless makes a few allusions to them. One example is the familiar remark that under increasing returns competition breaks down. Clearly, this could not happen without an underlying evolutionary process which changes a competitive market into a monopolistic one, and thus produces a structure which is not Pareto efficient.

In general, it is not necessary to limit attention to Pareto efficiency. Depending on social preferences, or the policy objectives pursued, other properties of structures may also be demanded - such as the abilities to provide for growth and employment, without necessitating high income inequalities. The crucial question then is whether the structure produced will have such properties and, more fondamentally, whether the evolutionary process at work will have the ability to produce and maintain such structures. It then seems natural to honour Schumpeter by calling this ability as *Schumpeterian efficiency*.

To be more precise, one must, of course, also consider the constraints under which evolutionary processes work, for structures of some demanded properties may simply be infeasible. One can then say that an evolutionary process is Schumpeter-efficient, if it produces a structure whose properties are, in some defined sense, closest to the demanded ones, under given feasibility constraints. The main idea simply is to paraphrase the definition of a Pareto-efficient resource-allocation under given resource constraints.

Two properties of Schumpeterian efficiency should be noted. First, it is more fundamental than Pareto efficiency in the sense that a Schumpeter-efficient evolutionary process is a necessary condition for the existence of a Pareto-efficient structure. Second, it is even more remote from value judgements - that is, less value-loaded - than Pareto efficiency. Whatever social objectives might be politically chosen - including those which sacrifice Pareto efficiency for what might be regarded as higher values - one always needs a structure able to work towards them. Therefore, one always needs a Schumpeter-efficient evolutionary process, able to produce such a structure and keep it adjusted to the desired task.

4 THE EVOLUTION OF STRUCTURES

To put Schumpeterian efficiency to work as a criterion for assessing economic systems and policies, it is necessary to have a clear picture of the evolutionary processes which may or may not be Schumpeter-efficient. Recalling the two-level structure of production, visualized as a mixture of markets and hierarchies, such processes can be visualized as markets or hierarchies which form, reform, expand, merge, split, contract, or dissolve.

More precisely - recalling that a structure is defined by its member-agents, their behaviors, and their arrangement - the evolutionary processes can be defined as changing at least one of these parameters - that is, making some agents enter or exit, and/or change behavior, and/or modify their interconnections. As entries and exits can be regarded as extreme cases of modified interconnections, only two kinds of changes of structures need be considered:

(1) internal changes within agents, through which the agents change their behavior;
(2) changes in the agents' interconnections, which modify the overall arrangement of the structure.

The importance of considering structures of more than one level now clearly appears. While entries and exits of agents are empirically important phenomena, the one-level structures of neoclassical economics have difficulty in accomodating them. As Stigler (1976) makes particularly clear, neoclassical analysis makes no room for the entering agents to come from and for the exiting agents to go to. In contrast, structures of at least two levels can easily avoid this difficulty. A simple, but for the present purposes sufficient solution is to assume a given set of individuals which form a national economy. The evolutionary processes in question than consist of combining and recombining the same individuals into different configurations of firms, agencies, and markets. In such a case, one can easily allow firms and agencies to enter or exit, without requiring individuals to be born or to die.

What simplifies the work with multilevel structures is that basically the same principles recurrently apply to all levels. For instance, to change its behavior, a firm must change its internal structure, which can

happen through the same two kinds of changes: (1) internal changes within individuals - that is, individual learning - by which some of its members change their behavior,[2] and/or (2) changes in the members' interconnections - such as individual hiring, firing, promotions, or demotions, or changes in the organizational design - which modify the overall arrangement of the firm. In this way, the evolution of the two-level structure of production, using a given set of individuals, can be explained by two kinds of processes: (1) individual learning, and (2) changes of interconnections at two levels: within firms and agencies, and between firms and agencies.

Changes of interconnections deserve particular attention. They constitute a specific and in theory rarely noticed kind of economic behavior - let me term it *associative* - without which the evolution of structures could not be put on a solid microeconomic basis. Although subject to the usual resource constraints, and often pursuing the usual objectives of profit or utility maximization, associative behavior has moreover constraints and preferences of its own, which may sometimes prevail over the usual ones. Associative contraints can be exemplified by limited spans of control and limited trust, and associative preferences by likings or dislikings for partners, nepotism, the desires to lead or to follow, and the passions for empire-building. Associative constraints and preferences must be suspected as possible causes of Schumpeterian inefficiency, for they may substantially deviate the evolution of markets, and probably even more that of hierarchies, from all the usual efficiency objectives.

In economic literature, the rare occasions when associative behavior is discussed include game theoretic studies of coalition formation and the original inquiry by Hirschman (1970) into what he calls 'exit' and 'loyalty.' Otherwise, as standard theory is interested only in agents' transactions through *existing* interconnections - e.g., through *existing* markets or within

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2. If we wished to make an excursion into neurophysiology, we would discover that the same principles can further be applied to individual learning. According to modern theories of learning (cf. Changeux, 1983), to learn a new behavior means to change the corresponding neuronal structure, with the same two kinds of changes possibly involved: neurons shift their threshold of excitment - that is, change their individual behavior - and/or grow new axons and dendrites, or change the transmission coefficients of the old ones - that is, modify their interconnections.

existing hierarchies - it naturally leaves aside the question of how these are established, modified, or dissolved. To be sure, associative behavior often involves transactions through some already existing parts of the structure - such as the markets for labor and capital, through which the hiearchies of most capitalist firms are built. But standard theory then studies only the *a priori* conditions under which such transactions take place - such as the supply and demand for various kinds of labor and capital - while leaving aside their *a posteriori* impact on the structure and the future functioning of the economy.

5 TACIT ECONOMIC COMPETENCE

An important insight into the evolution of structures can be gained by viewing it as the way to allocate a peculiar scarce resource - *economic competence*. As I do with more care in Pelikan (1988b), one can define economic competence as the tacit information, inseparably tied to each agent and structure, which determines the abilities of its owner to solve economic problems. In other words, this is the information of which the ultimate optimization abilities of each agent and structure are made - such as the rationality of individuals, x-efficiency of firms, and allocative efficiency of economies. It is the basis for all economic decisionmaking and communicating, but cannot be communicated itself - much like the hardware information in a computer is the basis for all the computing and communicating the computer can perform, but without being subject to *that* computing and communicating itself.[3]

As a first approximative idea, it may be useful to regard the structure of an economy - as Barone did already in 1908 - as an enormous computer

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3. The idea that some of the essential information in a society is *tacit* was put forward by Polanyi (1962) and applied to economic analysis in particular by Nelson and Winter (1982). Optimization abilities were denoted as *competence*, and related to the difficulty of the problems to be solved, by Heiner (1983). I add the adjective *economic* to emphasize that the tacit competence in question is that for solving economic, and not technological, problems. This emphasis is important; in most economic applications, only the tacitness of technological competence is considered. In contrast - as I explain in Pelikan (1988b) - it is the allocation of tacit *economic* competence that is the crucial problem for evolutionary analysis, which standard theory cannot entirely handle.

which is to solve the problem of allocation of scarce resources to different uses in society. What I now suggest to do is to consider the computer and its parts scarce as well. The task of the evolutionary processes can then be seen as trying to build such a computer as competently as possible, and to keep it adjusted to the possibly changing character of the allocation problem, using as its parts the more or less competent individuals who happen to be available. There is only one, but major, complication. An ordinary computer is built, and the information into its hardware inserted, by an exogenous constructor. In contrast, the structure of an economy must form, and accumulate its global economic competence, endogenously, by the associative behavior of its own parts.

The example of market selection - as outlined by Alchian (1950) and Friedman (1953) and elaborated by Winter (1971) and Nelson and Winter (1982) - is a good introduction to the understanding of how such processes may work. Beginning with a set of firms whose behavior is more or less deviating from the optimization postulate - that is, which are economically more or less competent - the market selection is shown to preserve, under certain conditions, only those firms which deviate the least - that is, has the highest relevant competence - while eliminating all the others.

If a two-level structure is considered, it is the internal structures of firms, and the entrepreneurs-organizers responsible for them, which are the main subject of this kind of selection. Different individuals may try to become such entrepreneurs by organizing a firm and hiring other individuals as employees. If they are sufficiently competent for this task (and not too unlucky), the selection will approve of them; otherwise, they will go bankrupt, having to become employees in another firm, organized into another structure with another competence.

To depict such cases as a Darwinian evolution through random mutations and natural selection may be a good first step. But, as Nelson and Winter point out, this picture is not quite accurate. As human agents can observe and learn, the mutations can hardly be entirely random. Rather, they will often be purposefully directed, in a Lamarcqian fashion, to promote the features of behavior, and of the corresponding structures, proved successful by experience.

If the evolution of structures is to be studied in general, and not only in the special cases of market selection, the Darwinian picture must be revised even more. In particular, it is the internal evolution of large

hierarchies - both private and governmental - for which the revision must be particularly radical. Although even the largest hierarchy is eventually bound to become subject of some higher-level natural selection, this may take long time. During this time, it may keep evolving - to its ultimate advantage or disadvantage - through mutations which are far from random, and selection which is far from natural.

As an example, recall the set of economically more or less competent individuals who are to form a structure of production, but this time without market selection. And let us admit, as a concession to the advocates of national planning, that there exists at least one single hierarchy into which they could be arranged - perhaps similar to a large multidivisional firm - which could outperform all its possible market alternatives. The necessary condition is, however, that such a hierarchy be designed and its jobs assigned with exceptional ingenuity. In particular, the top jobs would have to be assigned to people with exceptionally high relevant competence - perhaps of the kind for which Henry Ford, Tomas Bata, or Jacob Wallenberg have become famous.

The first problem is that out of the myriads of alternative hiearchies into which the given individuals might conceivably be arranged, only an infinitesimal fraction would meet this condition. The crucial problem for the evolutionary process then is how to find the right hierarchy among the myriads of its similarly looking but poorly performing sisters, and how to keep it in such an extremely exceptional shape. But if market selection is ruled out, the evolution itself would have to be hierachical. This means that both the mutations and the selection of lower-level structures would be under strong influence of higher-level structures, starting with whatever top happened to establish itself in the very beginning.

In contrast to the usual view of Darwinian evolution as smoothing out random disturbances into a convergent adaptation process, such a hierarchical evolution is strongly path-dependent, branching into different directions under the influence of random events, especially the early ones. For instance, if the founders of a hierarchy happen to be exceptionally competent, it may outperform the market evolution by forming a highly competent structure faster and cheaper, with fewer costly trials and errors. But - and this is *a priori* more likely - if the founders are of only mediocre relevant competence, it may take the path of structures of

increasing incompetence, which only a higher-level market selection or an internal political revolt can interrupt.[4]

To view the evolution of structures as the production and allocation of scarce economic competence can bring clarity to many otherwise difficult to understand issues. In particular, it becomes clear that *the evolution of structures cannot be optimally planned in advance*. This would require that the best planning competence be *a priori* allocated to this task, for which there is no reason. On the contrary, the question of where different kinds of planning competence are and to which tasks they should be allocated is one of the crucial questions which can be answered only *a posteriori*, by the evolution itself.

The upshot is that some trials and errors - in the style of Darwinian mutations and selection, or Schumpeterian creation and destruction - can never be avoided. But in contrast to the Darwinian hypothesis - as the example of hiearchical evolution illustrates - the generation of trials need not be entirely random, nor the correction of errors entirely natural.

The point is that the biological evolution is to produce scarce competent structures, beginning in a world where supposedly there were none. In contrast, the evolution of social and economic structures begins when the design for highly competent structures - the human brains - has already been made. Human competence must thus be expected to influence this evolution by intervening in both the generation of trials and the correction of errors. But - as the present discussion tries to point out - this competence is not as abundant, nor as equally distributed, as many economists, influenced by the neoclassical optimization hypothesis, would like to believe. And it is precisely for the problem of forming efficient economic structures that this competence so often proves in short supply.

Consequently, Schumpeterian efficiency can be viewed as the efficiency with which the tacit economic competence of human brains is allocated to form competent economic structures, and thus determine the efficiency with which all other scarce resources will be allocated.

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4. For the mathematics of path-dependency, a good reference is Arthur et al. (1987). An excellent example relevant to the present discussion is given by Parkinson (1957). Without speaking of path-dependency, but with many amusing details, he describes - under the name *Injelitis* - a disease affecting an entire organization, initially caused by a single incompetent and jealous person.

6 INSTITUTIONAL RULES AND REGIMES

To discuss the Schumpeterian efficiency of different economic systems, it is first necessary to define the term *system* in a dynamic world where structures evolve. The difficulty is that we have become used to define systems precisely as structures - that is, as certain arrangements of certain parts. But if these become variable, we must find another, more fundamental invariant by which a system could be identified.

In an economic system, an excellent candidate for this role is the set of the prevailing institutional rules; following Hurwicz (1971), let me denote it as the economy's *regime* (a somewhat longer, but otherwise equally good term is that of *constitution*, as used by Buchanan, 1975).

A regime can be viewed as the rules of a game, and the economy's structure as the arrangement of the players actually playing the game. Clearly, within the limits allowed for by the rules, players can enter or exit, learn new ways of playing the game, and form and reform different coalitions, while as long as the rules do not change, the game - or the "system" - remains the same. If economic systems are defined as regimes, a system can thus remain the same while its structure can evolve.

As usual, the institutional rules constituting a regime are regarded as a mixture of formally enforced law and informally sanctioned custom. Of course, if all detailed rules were considered, we could hardly regard any regime as constant either, for both law and custom are subject to continuous modifications. Moreover, we would then have to deal with an enormous variety of regimes. As this might uselessly complicate analysis, it is often convenient to divide this variety into a more or less limited number of classes of regimes, characterizing each class by some important common rules and searching for some of its global properties.

An elementary example of such a classification - to be elaborated in more detail below - is the well-known distinction between *capitalism* as the class of regimes which allow for private ownership of capital transferrable through capital markets, and *socialism* as the class of regimes where precisely this kind of private ownership and markets is ruled out, or strongly constrained.

An interesting insight can be gained by a short excursion to biology, the most experienced science in the dynamics of complex systems. A multicellular organism is an example *par excellence* of a system which preserves

its indentity while its structure - the *phenotype* - evolves, through division, specialisation, and death of individual cells. What remains constant during all these changes is the organism's genetic message - the *genotype* - which is obeyed, pathological exceptions aside, by each of its cells. To see a formal correspondence between the couples "regime-structure" and "genotype-phenotype" is often enlightening.

Returning to economics, there is now a growing literature on the effects, and partly also on the evolution of institutional rules and regimes. As to the effects, the classical references are the works of Alchian (1959) and Demsetz (1967) on the economics of property rights, and Buchanan (1975) on the efficiency of economic constitutions. As to the evolution, the pioneering contribution is that of Hayek (1967, 1973), who discusses the broad issues of legislation and spontaneously evolved social orders, whereas Schotter (1981) offers a narrower, but more rigorous game-theoretical study of the evolution of conventions.

Although the growing literature on institutional rules feels reassuring when choosing them as the pivot for studying Schumpterian efficiency, they must be examined here for somewhat different effects than those this literature is about. Unfortunately, Schumpeter's complaint that the usually visualized problem is how existing structures are administered, and not how they are created and destroyed, is still valid even for this literature. To be sure, the usually studied effects of institutional rules on resource-allocation within a given structure remain important. But these rules must now also be considered responsible for the very evolution of this structure - much like a genotype is responsible not only for the working, but also for the very forming of the phenotype.

One consequence is that we must question the legitimity of some of the most often studied couples of regimes and structures - such as a capitalist regime and a set of perfectly competitive markets, or a socialist regime and a hierarchy of optimal planning. The present view is that once a regime is given, the structure, with the exception of its initial state, cannot be given as well. Instead, it must be regarded as an endegenous variable for which the regime is increasingly responsible, and this responsibility made subject of analysis. For instance, instead of assuming any idealized markets or hierarchies, both capitalist and socialist regimes must be examined for the kinds of markets and hierarchies which can effectively form and evolve under their respective rules.

Before turning to this resposibility of regimes, a comment on their evolution is in order. As there is little communication between the followers of Hayek and the followers of Schumpter, no one seems to notice that the two had in mind different, but in an interesting way complementary kinds of evolution. An excursion to biology proves again enlightening. We can find there two formally corresponding kinds: (1) the evolution of genotypes - or *phylogeny* - corresponding to the Hayekian evolution of regimes; and (2) the evolution of an organism's phenotype under a given genotype - or *ontogeny* - corresponding to the Schumpeterian evolution of an economy's structure under a given regime.

To be sure, the correspondence is only formal, with significant empirical differences. One is that of time proportions. Phylogeny is so much slower than ontogeny, that a phenotype usually has the time to go through its entire evolution, from conception to death, without any changes in the genotype. In constrast, regimes and structures often evolve at comparable speeds. While a structure is still in full evolution, some rules of the prevailing regime may change - e.g., a new law may be adopted or a new custom widespread - forcing the structure to continue its evolution in a more or less deflected direction. Another important difference is that economic agents may actively influence the evolution of the prevailing regime - e.g., by lobbying for a legislative change in their favor - whereas there is no such way in which the cells of an organism might try to change its genotype.

But there is also an important similarity. For its survival, a regime depends on its abilities to provide for the formation of a highly performing structure, much like the survival of a genotype depends on its abilities to form a highly performing phenotype. The upshot is that one cannot obtain a good understanding of the Hayekian evolution of regimes without examining them carefully for their respective impact on the Schumpeterian evolution of structures.

7 THE RESPONSIBILITY OF REGIMES FOR THEIR STRUCTURES

Recall from Section 5 that the evolution of structures must always contain some trials and errors. Of course - as Hayek makes sufficiently clear - probably even more trials and errors must be made during the

evolution of regimes. But as the present focus is on the evolution of structures, it is the trials and errors of this evolution which interests us here. They provide an important clue for the present inquiry by suggesting that the impact of a regime on this evolution can be divided into two branches: (1) the impact on the generation of trials which aim to change an actual structure; and (2) the impact on the correction of errors which may thus be committed.

As noted earlier, the evolution of structures need not be Darwinian in the sense that its trials need not be entirely random, nor its selection entirely natural. Now, it is the prevailing regime which can be ascribed much of the responsibility for the trials being more or less constrained or directed, and the selection more or less artificial.

Without modeling this responsibility in detail, let me sketch its main lines. Recall the image of a structure of production as a certain mixture of markets and hierarchies. The functioning and the evolution of such a structure can be visualized with the help of a sequential model, alternating two kinds of periods. During the odd ones, the structure is supposed to hold constant, functioning as a traditional resouce-allocation mechanism. The generation of trials and the correction of errors though which the structure evolves are thus seen as taking place only in the even periods. Each such period is expected to contain some of the associating, dissociating, or learning, by which the individuals involved modify the number, the arrangement, or the internal structure of the markets and hierarchies. The modified structure then becomes the resource-allocation mechanism for the following odd period.

As to the prevailing regime, during the odd periods it influences the resource-allocation by the usually studied *allocative* rules - that is, by determining the agents' rights and obligations to exchange resources, including information. During the even periods, it intervenes by its specialized *associative* rules, determining the agents' rights and obligation to associate and dissociate - such as corporate law, antitrust law, and labor law.[5]

However, the responsibility of a regime for the evolving structure cannot be entirely ascribed to the associative rules. As associative

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5. Balcerowicz (1986) suggests an extensive typology of such rules, referring to them as "organizational rights".

behavior also requires resources, it is moreover subject to the traditional resource constraints. This means that changes of structure are constrained not only by the associative rules, but also by the results of resource-allocation actually obtained. For instance, the profits and losses actually realized often determine which firms may expand, and which ones must close down. Also, a too unequal income distribution may limit the formation of new firms, partly by leaving some potentially successful entrepreneurs without the capital necessary for entry, and partly by allowing rich incumbent firms to deter potential competitors through expensive predatory behavior - unless such behavior is effectively prevented by the regime.

A regime thus bears double responsibility for the structure evolving under its rules: (1) through its allocative rules it influences the results of resource-allocation, which determine which changes of structure become economically feasible; and (2) through its associative rules it determines which of these changes are moreover institutionally permissible.

8 SCHUMPETERIAN FAILURES COMPARED

As noted, a regime's influence on the evolution of structures can also be divided into the influence on the generation of trials and the influence on the correction of errors. One can thus easily state two necessary conditions which a regime must fulfil to provide for Schumpeterian efficiency:

(1) no successful trial, improving the desired performance of the structure, should be prevented:
(2) no committed error, worsening this performance, should be left uncorrected.

But although easy to state, these conditions are difficult to test. It is even doubtful that any regime might fulfil them in an absolute sense. Rather, all regimes are suspect of some violations. For example, (1) is violated, if a regime prevents some potentially successful entrepreneurs from entry or fails to prevent some incombent firms from deterring entry; (2) is violated, if a regime allows government to protect incumbent producers - public or private - regardless of their efficiency.

Significant results can nevertheless be obtained if we do not insist on determining whether any regime is Schumpeter-efficient in an absolute sense, but only try to find out which regimes violate these conditions *relatively less* than other regimes. For this purpose, let me denote such violations as *Schumpeterian failures*, distinguishing between *absent successes* as violations of (1), and *surviving errors* as violations of (2).

To be more specific, consider that a modern economy, to take full advantage of modern technologies and internalize important externalities, may need some very large hierarchies in its structure of production. But, as mentioned in Section 5, the performance of hierarchies, and especially of the large ones, is very sensitive to the allocation of economic competence. This means that many Schumpeterian failures are likely to concentrate around the formation and the evolution of such hierarchies.

As to absent successes - to be logically deduced rather than empirically observed[6] - they can be exemplified by those of the needed hierarchies which fail to materialize because of obstacles due to the prevailing regime. As to surviving errors, they can be exemplified by those of the existing hierarchies which perform poorly, in terms of some defined social objectives, without being forced to improve or dissolve.

Much of the reason why Schumpterian failures are so difficult to avoid is that economic competence is such a peculiar scarce resource to allocate. It is not only tacit in the sense that its stocks cannot be freely transferred from one agent to another. Moreover, much of it is also *hidden* in the sense that its stocks are difficult to measure, even by their very owners - as the frequent cases of overestimation or underestimation of one's own competence amply illustrate.

One of the consequences - the impossibility of efficient allocation of economic competence by means of planning - was already noted. It is now helpful to note what efficient allocation means *are* possible. There seem to

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6. The vain struggle of Professor Svoboda for an early start of the Czech computer industry, as mentioned in Section 1, is probably as close as one can come to observe an absent success. But such observations can never be reliable; if a trial is prevented from taking place, one can never know whether it would be a success or not. Hence logical deductions must often be used to produce better evidence. If it can be shown that, because of some properties of the prevailing regime, a certain class of trials is systematically hindered or prevented, and if it is sufficiently likely that at least some of them would be successful, one can safely deduce that the regime causes absent successes.

be only two of them. One is *relevant economic competition*, where different stocks of economic competence are assessed according to their performance in the same field as they are to perform. This is in contrast with other kinds of competition - such as political or rhetorical. The intuitive idea is that the competence to play a certain game is most reliably assessed by tournaments in *that* game, and not by tournaments in other games, nor by interviews with the players about how good they think they are.

The other means is *qualified guessing*, which can yield, faster and cheaper, as good results as relevant competition, but - and this is the catch - *only if done with sufficiently high competence*. Qualified guessing can thus only help with parts of the problem of allocation of economic competence, but cannot solve the entire problem all by itself; while helping with the allocation of some economic competence, it also raises a new competence-allocation problem of its own - the one of how to allocate the scarce competence it needs itself. For instance, the guessing done by capital owners, if sufficiently competent, can accelerate and cheapen - in comparison with pure market selection through bankrupcies - the allocation of economic competence for the organization and management of firms. But the new crucial problem then is how to allocate the competence for the ownership of capital to make this guessing sufficiently competent.

Now, rather than pursuing the discussion of Schumpterian failures in such an abstract form, let me indicate some results which can be reached by studying them in two more concrete cases.

9 THE SCHUMPETERIAN LIMIT OF SOCIALIST ECONOMIC REFORMS

One of the cases where the study of Schumpeterian failures proves fruitful is that of socialist economic reforms, particularly interesting since Michail Gorbatchov's arrival at the top of the Soviet hierarchy. Before that, the Brezhnevian conservatism at home and threat of military intervention abroad set severe political limits to the extent in which such reforms could be discussed, let alone implemented. But as the new leadership in Kreml is now itself engaged in an ambitious reform program - the famous "perestroika" - the political limits have been substantially weakened. This puts forward the question of what other, possibly more substantial limits might prevent a socialist economy from curing its ills.

Of course, since the famous Socialist Controversy between von Mises (1920) and Hayek (1935) on one side, and Taylor (1929) and Lange (1936) on the other, the question of whether a socialist economy can be made efficient has been extensively debated by Western economists. For instance, the possiblity of efficient socialist planning has been rigorously proved by several neoclassical extensions of Lange and Taylor's ideas, such as Arrow and Hurwicz (1960), Malinvaud (1967), Heal (1973), Loeb and Magat (1978), and Bergson (1978). On the other hand, von Mises and Hayek's arguments that the market is always superior to any large-scale planning have also been further developed, most recently by Lavoie (1985). But in the actual discussion of socialist economic reforms, this debate is not taken too seriously. The neoclassical planning procedures are considered impractical and doubtful because of their unrealistic assumptions. And the radical attacks on all large-scale planning are considered empirically refuted, the success of large capitalist firms - often larger than an average socialist economy - being taken as a sufficiently clear empirical counterexample.

For the actual discussions, this example is of particular importance, indeed. Implicitly or openly, it is now often used as the basis for the argument that there are reasonable pragmatic solutions to all the usually discussed problems of socialist economies, fully compatible with a unified ownership of capital and a central planning of investment. It shows convincingly that reasonable internal pricing, reasonable performance indicators, reasonable individual incentives, and reasonable innovative and risk-taking activities are all practically possible within a centrally controlled eonomic system, owned in one block by a single assembly of stockholders, represented by a single board of directors.

To be sure, a reform following this example would have to abandon the marxist labor theory of value - one of the main sources of gross misallocation of capital in all existing socialist countries. Also, such a reform would have to decentralize the decisions on current output and prices, and allow for decentralized external trade to a much greater extent than what most socialist economies - Hungary and Yugoslavia being the notable exceptions - have done thus far. But as no extensive privatization of capital and no market for control over production units are required, this would still be a *socialist* reform, in the sense that the reformed regime would remain within the broad class of socialist regimes.

It is at this point that the study of Schumpeterian failures brings in an important new element, spoiling this otherwise highly robust argument. Emphasizing that the argument is only about how to administer a supposedly existing structure, it calls attention to the Schumpeterian problem of how to make such a successful structure actually form and keep successful. It is when this problem is addressed that a severe limit to the possible improvement of *any* socialist economy can be discovered. As this discovery is due to Schumpeter's methodological advice - even if he failed to make it himself - I suggest to name the limit also after him.

This Schumpeterian limit is a direct consequence of the absence of private ownership of capital and capital markets, in particular markets for control over firms. The absence proves to cause excessive Schumpeterian failures - in terms of both absent successes and surviving errors which seriously damage the structure of production - in comparison with *at least some* capitalist regimes where these kinds of ownership and markets are allowed.

To see why private ownership of capital and capital markets are so important, consider their two main institutional alternatives: (1) the ownership of capital by central and/or local political authorities, which I refer to as *government socialism*, and (2) the ownership of capital by the collectives of its actual users, which I refer to as *cooperative socialism*.[7]

Note that these alternatives are not mutually exclusive. A real regime may combine both, without escaping the logic of the argument. And it is not even necessary that the entire production be socialized; in this case, the argument is valid for the parts where private capital is prevented from competing - e.g., for most of education and medical services, and for all of employment exchange in Sweden; and for the entire industry, with the exception of some handicraft and services, in most of Eastern Europe.

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7. As the focus is here on the ownership of capital, and not on the techniques of management - and note that this is in full agreement with the traditional marxist views - the kind of socialism which is usually denoted as "self-management" or "workers' management" is not considered as a separate category. In present terms, it includes cooperative socialism, if the collectives of workers not only decide on management, but also effectively own the capital of their firm, with full rights to invest and disinvest. Moreover, it also includes a variant of government socialism, if the capital is owned by political authorities, and only current management delegated to such collectives.

As to government socialism, its Schumpeterian limit can be exposed in the following way. The fact that the owners of capital are there selected through political - and not economic - competition is the starting point. Regardless of the type of political system, this competition tends to select the best competence in other fields - such as pleasing the voters in a democracy, or the superiors in an authoritarian system - than the one required for efficient ownership of capital. Hence this kind of economic competence is likely to be misalocated. Such a misallocation will then cause a misallocation of all other economic competence, which in turn will result in a misallocation of all other scarce resources.

Note that this argument is largely independent of the system used to allocate *these* resources. This system can be largely decentralized, making an extensive use of product and labor markets, and minimizing the meddling of the central authorities in the everyday business of production units in the most reasonable way. The crucial problem which the argument points out is that even such a reasonable system is likely to fail; not only the central authorities, but also many of the production units are likely to be the wrong ones, organized in the wrong ways and/or run by the wrong people.

To justify this argument, consider the effects of government ownership of capital on the absent successes and surviving errors in the structure of production. Some of the most competent entrepreneurs will likely be prevented from trying out their projects for lack of the necessary approval of the probably less competent political authorities. And too many inefficient production units are likely to keep surviving because of their monopolistic priviledges and/or generous supply of new capital.[8]

Note that it is because of the low expected economic competence of the politically selected owners of capital that the supply of new capital to failing firms becomes the source of important Schumpeterian failures. If used with high competence, this is on the contrary the right tool to compensate for the short-sightedness of product markets, which may be themselves sources of important Schumpeterian failures - for instance, by eliminating some future winners in temporary difficulties. What is required from the owners of capital is to be able to perceive the fine differences

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8. The empirical findings of Hanson and Pavitt (1986) are in a good agreement with this theoretical argument.

between future winners and permanent losers, and also, if necessary, to help the future winners get into the right form through suitable internal restructuring, including personal changes. But - and this is the crucial point here - *capital owners with such competence are unlikely to be found and kept without capital markets with open entry, allowing for continuous economic competition in the relevant field.*[9]

As to cooperative socialism, also this form of ownership of capital can be shown to cause excessive absent sucesses and surviving errors in the structure of production. That it is likely to prevent some highly competent entrepreneurs from trying out their projects is easy to show. The collective decision-making, which this form of ownership makes obligatory, is one of the obstacles, likely to discourage some new firms from entering and some successful firms from expanding. In addition to the well-known problem of perverse incentives for growth of firms, as exposed by Ward (1958), collective decision-making has also perverse effects on the use of scarce economic competence. As successful entry and expansion of firms often require exceptional economic competence, this may fail to win the majority in any large collective, just because of its exceptionality.

Moreover, some of such trials will be hindered because of excessive scarcity and/or misallocation of risk capital. If private capital and trade in control over firms are ruled out, the capital supply is limited to loans from government banks or existing production cooperatives. But these lenders are unlikely to use the best available competence for this task - the government banks because of their evolution through politico-administrative and not economic competition, and the cooperatives because of the majority voting principle, combined with the fact that their competence may be the product of competition in all but not investment banking. The absence of private capital owners and competitive capital markets will again take its heavy toll in terms of possible economic development which fails to materialize.

The toll turns out to be even heavier when the problem of surviving errors is considered. At first sight, cooperative socialism may seem able

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9. Some interesting complementary reasons why government is more likely to bail out losers than to pick up winners are put forward by Eliasson and Ysander (1983).

to avoid this kind of Schumpeterian failures because of market selection, which it can use more extensively than government socialism. But this is not quite so. In socialism, all market selection, if allowed at all, must be limited to product markets. As noted, this selection alone may not work well; it is likely short-sighted, possibly eliminating even good firms in only temporary difficulties. Much depends, therefore, on the competence of the owners of capital to intervene. But it is precisely this competence which cannot, for the above-mentioned reasons, be expected very high. Consequently, the intervention of the socialist owners of capital is likely to increase, rather than decrease, the total of Schumpeterian failures even here. As these owners are likely poor at distinguishing future winners from permanent losers - and with the additional political motives, pointed out by Eliasson and Ysander (1983), for which all governments tend to bail out the losers - cooperative socialism must be expected to suffer from excessive surviving errors as well.[10]

10 MINIMIZING SCHUMPETERIAN FAILURES OF CAPITALISM

An important point to realize is that the Schumpeterian limit of socialism is no unqualified praise of capitalism. The above argument implies neither that capitalism must be Schumpeter-efficient, nor that *any* capitalist regime is superior to *any* socialist regime. It fully admits that Schumpeterian failures may abound also under capitalist regimes, and that some of these regimes may even do so poorly that some of the socialist ones can show relatively better results. As to the capitalism v. socialism controversy, the only safe conclusion is that the structure of production can evolve better, in the sense of Section 3, under *some* of the capitalist regimes than under *any* of the socialist ones. The broad policy implication then is that the best curative reforms for poorly performing regimes of both capitalist and socialist varieties are those which work towards the implementation of one of the superior capitalist regimes.

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10. The economic crisis of Yugoslavia, substantially deeper than the crises observable in comparable capitalist countries, appears at least partly explainable by the Schumpeterian inefficiency inherent to that particular mixture of government and cooperative socialism.

Another important point to realize is that this implication is not tied to any specific values concerning final consumption and social welfare in general. In particular, it is not tied to the values which favor private consumption and consumer sovereignty, while neglecting public goods and equity issues - contrary to what pro-capitalist arguments are usually expected to be. Recalling from Section 3 that Schumpeterian efficiency is crucial *whatever social objectives are to be pursued*, the implication is valid even if priority is given to equality and extensive consumption of public and merit goods. In other words, even if one favors socialist objectives in consumption, one should nevertheless favor a suitable capitalist regime for production. And let me add that Schumpeterian efficiency itself requires that income distribution be not too unequal; as noted, too much inequality may cause absent successes and surviving errors of comparable gravity as socialist ownership of capital.

Once the two points are realized, the crucial question is how to find out such superior capitalist regimes. Strictly speaking, this question falls into two: (1) how to determine such a regime in theory; and (2) how to implement it in practice. Of course, the second question is of more interest to political scientists, or to the students of the Hayekian evolution of regimes, than to a Schumpeterian economist. I mention it only to make clear that there is no simple connection between the regimes which the most advanced theory might recommend, and the ones which an actual society, under the prevailing cultural and political constraints, can effectively adopt.

As to the first question, which I contend a Schumpeterian theory should eventually answer better than any other economic theory, I must admit that I am still far from any precise answer myself. But as some rough indications of what the answer might be are nevertheless appearing, let me conclude this paper by outlining them.[11]

One group of indications are about the way in which the rules of a suitable capitalist regime should try to shape - and one may even say "civilize" - economic competition. The basis is the above argument that one of the main tasks of economic competition is to select and promote persons and multipersonal structures of the best relevant competence - or, at least,

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11. To do so, I draw heavily on my 1988a paper.

to demote the persons and dissolve the structures of insufficient competence.[12]

As argued, the selection of highly competent capital owners and, with their help, the selection of competently organized and managed production units are crucial. The general idea to keep in mind is that hierarchical selection may often outperform the costly trials and errors of an alternative pure market selection, but only if conducted with sufficient competence. Such competence, then, to be found and kept, requires that a minimum of market selection be kept alive. In other words, the regime should provide for a delicate evolutionary balance, allowing efficient hierarchies to grow, but only as far as they do not substantially erode the market selection which is needed to guarantee that they will continue to be efficient or that other efficient hierarchies will start to grow in their stead.

This means, in essence, that economic competition should be modeled after tournaments in organized sports, in order to discover and promote specific competence, rather than general ruthlessness. The old intuition of the U.S. antitrust legislators is thus given a somewhat unusual theoretical support. The main point - simple in principle, but raising a host of subtle problems in practice - is to keep the entry to and the exit from all markets, including capital markets, reasonably open, and the competition itself reasonably fair-play. The regime is thus to remove institutional barriers to entry and exit, as well as prevent predatory (strategic) behavior of incumbent competitors - e.g., by suitable legislation on antitrust and fair business practices.[13] Another difficult problem is to

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12. An economist whose experience is limited to capitalist market economies may easily underestimate the crucial importance of this minimum task of economic competition. However far from any ideal a real capitalist market might be, and however poorly it might promote the best available competence, it usually does a good job at demoting incompetence, thus possibly giving the false impression that incompetence is rare or harmless. One probably needs an intimate experience with a socialist economy, where markets, if used at all, are deprived of most of their competence-selection role, to realize how widespread economic incompetence may become and how enormous social losses it may cause.

13. The regime should thus provide the necessary institutional conditions for what Baumol et al. (1982) define as *contestable markets*, even if such markets may never form in the real world where the costs of entry and exit are always positive.

neutralize perverse incentives for associating - such as preferences for corporate power *per se*, or the incentives of stock-brokers to promote any mergers, whether efficient or not.

A difficult policy issue, which the criterion of Schumpeterian efficiency can be expected to clarify, is that of moderating competition. It is often argued that competition wastes resources by duplicating efforts in what a static analysis shows to be an inefficient manner. For an apparently insignificant improvement at the margin, which is often what separates the winner from the other contestants, important intra-marginal efforts may have to be made by all of them, often without producing any visible output. When an evolutionary point of view is adopted, however, the situation appears in quite a different light. To be sure, some competition may even then prove excessive and wasteful - and thus recommendable as a candidate for moderating policy mesures, such as regulation of opening hours. But much of the apparent waste may then be justified as the necessary price to pay to evolution for the formation and maintenance of efficient structures. The intramarginal efforts will often appear as the necessary price of learning. And the marginal improvements of the winners, apparently insignificant in the short run, will often prove to have highly significant cumulative effects in the long run.

Let me now turn to what the study of Schumpeterian failures indicates about the role of government in production. The basis is the above argument that the expected economic competence of government is relatively low, because of its evolution through politico-administrative, and not economic, competition. This means, as a rule, that government should be institutionally prevented from intervening in production by measures which call for high economic competence - such as owning firms, managing industrial investment, or conducting selective industrial policy.

But let me emphasize that no radical support for a pure *laissez-faire* regime comes out of this rule. The rule has important exceptions, and there is also an important area of coordination policies which need not be conducted with any extremely high competence to be socially beneficial. In contrast to the more radical anti-government arguments of the Public Choice and Neo-Austrian varieties, a quite extensive agenda for government policies may sometimes be indicated. Final consumption and macro-stabilization aside, there are several sensitive points in the evolution of production

structures where government intervention with low competence can be shown preferable to no intervention at all.

One example is antitrust policy. It is quite likely that the government agencies in charge may be of imperfect competence for this task - for instance, unable to perceive all the fine differences between increased efficiency and predatory behavior in a given industry. Yet their intervention can be justified on similar grounds for which imperfect umpires are preferred to no umpires at all in all organized sports.

Another example is government entrepreneurship in some socially demanded lines of production - such as education or health insurance - where private entrepreneurs, possibly for culturally conditioned reasons, are slow in appearing. But there is an important qualification: the entry must remain open, in order to expose the government production units to competition, *on comparable terms*, from potential private entrants. Social gains are then of one of two kinds: either such government units succeed - which is not excluded, but only considered unlikely, especially in the long run - or accelerate, by its provokingly poor performance, the entry of more competent private entrepreneurs, who may eventually take over the entire line.

A third example is government subsidizing basic reseach. One may very well admit that the subsidies are likely to be misallocated - typically, by overinvesting in conventional lines of research, or in political friends, while underinvesting in emerging scientific innovators, who may fail to be recognized because of insufficient competence of the corresponding government committees. But even the disappointed innovators will probably agree that this is a better state of affairs than if no basic research were subsidized at all.

As to the potentially beneficial coordination policies, an important example is the choice of technical norms, especially if it matters less *which* norm is chosen than that a norm *is* chosen. In fact, even if it does matter which norm is chosen, market selection need not lead to a very competent choice either. Because of the kind of path-dependence involved (cf. Arthur et al., 1987), some inferior norms - such as the QWERTY typewriter keybord, or the U.S. color television system - can emerge and become locked in, while government has a perfect alibi.

Although much analytical work remains to be done before such rough indications can yield any precise policy advice, one can safely conclude

that the study of Schumpeterian failures will lead to some significant revisions of standard policy analysis. On the one hand, at least three reasons are disclosed why some usually recommended policies may prove ill-advised: (1) low expected competence of government agencies; (2) low expected competence of other economic agents; and (3) perverse effects on the evolution of structures, outweighing the usually considered static allocative gains. On the other hand, some policies considered inefficient by standard theory can now be justified, the necessary condition being that their favorable effects on the evolution of structures outweigh their static allocative losses.

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