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Design for Innovation Policies

Objectives and constraints

INTRODUCTION

There is now a wide agreement that the phenomena of innovation and technical change are complex, important for economic development and social welfare, and insufficiently understood by economic theory. This has motivated an increasing number of economists -- especially those who like themselves to innovate -- to search for a better theoretical understanding of these phenomena.

As elsewhere in economics, one can search either for a positive theory, helping a passive observer to describe the phenomena as they are and predict what they will be, or for a normative theory, helping an active decision-maker to achieve given desirable results, or at least avoid undesirable ones. To be sure, as a good normative theory always requires much of positive knowledge, the two kinds of theories are closely related. Nevertheless, they also substantially differ. As is well known, all theories must simplify, choosing a limited number of aspects to study, while abstracting from everything else. The difference is in the freedom of this choice. For a positive theory, this freedom is virtually unlimited. Anything deemed interesting can be described and discussed, and any inconvenient complications can be assumed away. A normative theory, in contrast, is subject to much stricter discipline. It should not abstract from any aspect that may be decisive for the success or the failure of the decisions taken. At the same time, given the limited number of aspects to which it can pay attention, it should abstract from all that the decision-maker need not take into account, given his means and ends, however interesting this might otherwise be. In Jacob Marschak's (1963) terms, a normative theory should study what is 'payoff-relevant' and abstract from what is 'payoff-irrelevant'. As in policy analysis, 'payoff' is understood to be a suitably defined 'social

welfare', we can also speak of 'welfare-relevant' and 'welfare-irrelevant' aspects.

So far, most of the search for a better understanding of innovation and technical change has been directed towards positive theories. Only recently, serious efforts to arrive at normative policy implications have been made.[1] As these efforts are often directly based on descriptive studies and essays, they may be suspected of not being disciplined enough: perhaps they spent too much time on classifying and discussing welfare-irrelevant aspects, while forgetting some important welfare-relevant ones. To avoid this suspicion, this paper starts from the other end: it addresses innovation and technical change from the point of view of a public policy-maker. This should lead to an early discovery of which kind of knowledge he or she may find useful, and which one is, from this point of view, an intellectual luxury.

WHY POLICIES

A brief reminder of some basic truths may be useful. As is well known, both practical experience and theoretical analysis have shown that markets as co-ordination devices of economic activities suffer from a long list of imperfections. The primary purpose of policies has been to cure or alleviate such imperfections.

What both practical experience and theoretical analysis have also shown, however, is that policies suffer from imperfections of their own, which may sometimes be more serious than the market ones. A careful comparative analysis, which abstracts from no welfare-relevant aspect of importance, is needed to find out which market imperfections are worth curing by policies and which ones are better left alone.[2]

Ideally, if a society could start from zero, the recommended mix of market solutions and government policies would simply be determined as a result of such analysis. In the world with history, however, the situation is more complicated. As serious policy errors were actually committed and cannot be easily undone, many today's economic problems -- of which the failed socialist economies offer striking examples -- are consequences of such errors. An additional purpose of today's policies must therefore be to repair the damages caused by past policies.

The usefulness of this reminder is above all in warning against two common fallacies in policy analysis. One is what Demsetz (1969) termed

'nirvana fallacy', which is to see only market imperfections, but not the policy ones. Consequently, the discovery of any market imperfection automatically leads to recommendation of curative policies, even if their imperfections were even more damaging. To be sure, the traditional chapters of economics have already become aware of this fallacy -- e.g., the social losses caused by wrongly calculated Pigouvian taxes and subsidies, or by wrongly timed stabilisation policies have increasingly been taken into account. As the following discussion will show, however, many of the new studies of innovation and technical change are still somewhat naive on this point.

The other fallacy, which can be termed 'market-can-do-all' fallacy, is common among advocates of market solutions. This is to underestimate market imperfections and the need for a minimum of politically taken economic decisions. Some underestimate the basic long-term need for policies providing markets with favourable institutional rules and alleviating the most serious market failures. More subtly, some underestimate the additional need for policies in an actual imperfect situation, to repair the past policy errors and reach an efficient long-term solution -- however little need for policies this might eventually have.[3]

THE SPECIAL CASE OF INNOVATION POLICIES

To comprehend all important aspects of innovation and technical change, one must leave the simplified world of standard economics. As most students of these phenomena now agree, at least two standard simplifying assumptions must be dropped. One is the assumption that all markets, all firms, and all technologies are once for all given; let me call it 'the constant structure assumption'. The other is the Optimisation Postulate -- the very basis of all neo-classical economics -- assuming all agents to be perfectly competent optimisers. By dropping these assumption, one enters the world of evolutionary economics where structures evolve and economic competence is scarce. It is above all Schumpeter (1934, 1942), Alchian (1950), Winter (1971), and Nelson and Winter (1982) that showed the way to this world.

To arrive at useful policy advice, however, one must go even further. The main limitation of most of today's evolutionary economics is to study only standard capitalist markets, without examining with equal care institutional alternatives. Among other things, this limitation induced Schumpeter (1942) to commit his famous error. After having examined

how structures are created and destroyed by capitalism, he jumped to the conclusion that it could successfully be replaced by socialism, without any serious scrutiny of how the evolution of structures would then continue.

As I theoretically show in Pelikan (1985, 1987, 1988), and as the subsequent events made possible empirically to corroborate, the fatal weakness of all forms of socialism is precisely in their ways of dealing with this evolution. The crucial consequence of all forms of social ownership of capital turns out to be that experiments with new technological and organisational ideas are more severely restricted, whereas obsolete and inefficient production structures are more leniently allowed to survive, compared to what tradable private ownership is able to achieve. The parallel effect of social ownership of capital on the allocation of scarce competence is that crucial economic decisions are more likely to be taken with inadequate competence, whereas exceptionally high relevant competence is more likely to be prevented from succeeding.

In sum, as long as evolutionary analysis does not include careful comparison of institutional alternatives, and thus become able to compare market imperfections with policy imperfections, its policy advice can be seriously misleading.

ELEMENTS OF EVOLUTIONARY POLICY ANALYSIS

To search for policy analysis that would not be misleading, let me return to why policies and see what new elements are added by evolutionary reasoning. As opposed to some evolutionary economists who reject all of standard economics, evolutionary economics is seen here as an extension, rather than negation, of the standard one. In particular, the basic procedure of standard policy analysis -- from discoveries of market imperfection to search for curative policies, including the recently added check for possible policy imperfections -- is seen to be best also for evolutionary policy analysis. While evolutionary economics adds important new elements to all stages of this procedure, there does not seem to be any other sensible procedure to follow.

The new elements can conveniently be divided into four categories: policy objectives, market imperfections, policy instruments, and policy imperfections. To be sure, the ultimate policy objective -- to maximise

social welfare, whatever this is agreed upon to mean -- remains the same. The intermediate policy objectives, however, through which the way to the ultimate objective is supposed to lead, are significantly modified. In standard analysis, under the constant structure assumption, the main intermediate objective is static allocative efficiency. In evolutionary analysis, in contrast, a much greater importance is ascribed to the efficiency with which structures evolve -- in other words, the efficiency with which technological and organisational innovations are generated and adopted, scarce competence allocated, and the population of firms and industries correspondingly adjusted. This is the efficiency that Marris and Mueller (1980) term 'adaptive', and Eliasson (1985) and Pelikan (1988) term 'Schumpeterian'. The importance of this efficiency was indeed first indicated by Schumpeter (1942), in his famous argument that market competition does much more for social welfare by forcing firms to innovate or to disappear, than by setting prices however close to a statically efficient equilibrium.[4]

For policy analysis, this implies above all a substantial change of the usual view of social losses. As evolution of new technologies and new organisational forms cannot proceed without costly trials and errors, much of what appears to static analysis as waste turns out to be the necessary price to pay for creation of novelty (Pelikan, 1989). In average, many mistaken technological ideas and many unsuccessful reorganisations or takeovers must be tried and paid for before a new superior technology and a new superior organisational form can be found. As there are a priori many different beliefs about the respective merits of different technical and organisational solutions, duplication of research efforts, of which only a minority will succeed, is the only way towards progress.

Surprisingly, some evolutionary economists still seem to miss this point. Preserving the static view of social losses, they sometimes consider unification of research efforts to be an important policy objective. To be sure, some duplication may have unnecessarily high costs that better information exchanges could decrease. In general, however, much of duplication is necessary because of the basically experimental nature of evolutionary processes; to try to co-ordinate all research and development by a unique plan is likely to prevent some interesting experiments and, as a result, lock the entire innovation process on an inferior path to what it otherwise would be.

Among the market imperfections that are pointed out by evolutionary analysis, perhaps the most important ones are (i) underinvestment in

research and development because of spillover effects, (ii) lack of information for the co-ordination of research and investment, (iii) locking on suboptimal technological solutions because of path-dependency, and (iv) short-sighted elimination of future winners.

In fact, (i) was already disclosed by standard analysis, in the famous article by Arrow (1962). The above-mentioned duplication of research efforts -- and more precisely, only the excessive part of it -- is the main manifestation of (ii). David (1985), using the QWERTY example, interestingly described (iii); its theoretical basis is perhaps best explained by Arthur (1990). Imperfection (iv) was initially considered to justify protection of infant industries, and then again in the 70's and 80's to justify selective industrial policies, intended to help future winners in temporary difficulties.

The policy instruments among which cures for market imperfections can be sought remain much the same as in static analysis. To recall, the instruments are of two main kinds: changes of general institutional rules -- such as patent law or antitrust law -- and intervention by specific measures.[5] These may involve allocation of resources, such as selective subsidies, or information exchanges, such as co-ordination, planning, and elaboration of various reports. Direct government control through ownership of universities, research institutes, and firms in general is also included in specific measures.[6]

What evolutionary analysis adds is attention to the long-term effects of different policies on the evolution of structures, claimed to be more important than the usually studied effects on resource-allocation within a given structure. This may sometimes reverse the resulting policy advice. For example, some selective subsidies may improve resource-allocation in the short run, and thus be recommended by static analysis. Evolutionary analysis may nevertheless advise against them, if they promote the development of subsidy-seeking behaviour to the detriment of the demand-meeting one, and thus spoil the population of firms in the long run. On the other hand, some policies facilitating restructuring of firms and industries may appear costly in the short run, and thus be rejected by standard analysis -- and yet recommended by the evolutionary one, if they result in a more productive and better demand-adapted industrial structure, yielding high social gains in the long run.

THE GOVERNMENT COMPETENCE CONSTRAINT

Among the new elements that evolutionary economics adds to policy analysis, perhaps the most important one -- and apparently also the most neglected one, even by evolutionary economists themselves -- is the competence constraint on government policies that results from the politico-administrative evolution of the government and its policy-making agencies. Many serious policy imperfections can directly be traced to this constraint.

To explain this constraint, the notion of a competence-difficulty gap, defined by Heiner (1983), is a convenient starting point. To recall, this notion compares, for any decision problem, the difficulty of the problem and the competence available for solving it. As Heiner points out, it is important, if costly errors are to be avoided, to prevent the difficulty from becoming higher than what the available competence can successfully handle. To achieve this, he considers the use of institutional rules as a way of limiting the difficulty. Such rules can simplifying decision problems by a priori excluding some alternatives as inadmissible, and thus substantially reducing the choice to be made. An alternative or complementary way, which is in fact central to evolutionary analysis, is to try to increase the competence by providing for competition and selection. This may succeed, of course, only if at least some members of the given population have the competence needed and will actually enter the competition.

The main implication for policy analysis is that all policies must be checked for the difficulty of conducting them as well as the relevant competence that government agencies can be expected to acquire and maintain. As will become clear in a moment, it is precisely for evolutionary reasons that government is subject to a severe constraint in acquiring and maintaining such competence. The scope of policies that the government can safely conduct, without policy errors causing high expected losses, is then correspondingly limited.

That the government competence constraint has been largely neglected in evolutionary economics may seem surprising. Namely, this constraint is a straightforward consequence of two premises upon which all evolutionary economists seem to agree: that economic agents are not perfect optimisers, and that evolutionary selection affects the competence that will be allocated to specific decision tasks. The neglect, however, is only a logical consequence of the above-mentioned lack of comparative analysis in evolutionary economics. As noted, evolutionary economics

has been preoccupied with market selection and allocation of profit maximising competence -- as studied by Alchian (1950), Friedman (1953), and Winter (1971) -- while leaving aside the politico-administrative selection within government agencies, and the corresponding allocation of competence for the conduct of policies.[7] As I show in Pelikan (1985, 1987, 1988), the crucial difference between the two is that in politico-administrative selection, inadequate competence is more likely to survive whereas excellence is less likely to be admitted and allowed to succeed, than in market selection.

This supports my earlier point about the need for careful comparison of institutional alternatives. The specificity of the politico-administrative selection within government agencies, and the resulting competence constraints, must carefully be taken into account by any policy analysis in general, and by analysis of innovation policies in particular. These often involve highly sophisticated decisions, which makes the final outcomes heavily depend on the competence employed. Policy instruments that can yield high social gains when handled with exceptionally high relevant competence also can, without such competence, cause high social losses.

Evolutionary analysis thus interestingly develops the model of government in economic theory. To recall, the initial naive model assumed government to be a benevolent and perfectly competent maximiser of social welfare. Public Choice puts in doubt the benevolence, by pointing out that politicians and government bureaucrats are likely to have somewhat more selfish objective functions, but does not question their competence for maximising it.. Now, evolutionary analysis, while willing to accord the government the benefit of the doubt as to its good intentions, shows that the very nature of its evolution severely constrains its relevant competence.

To avoid misunderstanding, let me emphasise that this constraint is far from implying any simplistic conclusion of the 'market is always better' variety. All it does is to warn against the use of too sophisticated policies, requiring exceptionally high relevant competence, if costly policy errors are to be avoided. Although the set of recommendable policies will thus substantially be restricted, it may still be far from empty. There may still be important policies, including innovation ones, that are better conducted with relatively low competence than not conducted at all. Now the question is, what such policies are and how they can be found.

A SIMPLE DIAGNOSTIC PROCEDURE

There is a simple commonsense procedure that can order the search for such policies and make sure that no welfare-relevant aspect will be forgotten.[8] Much like in a detective story, the procedure follows trails from what is seen to be macroeconomic underperformance, or failure, to hidden microeconomic causes, expressed in terms of what specific agents do wrong. The next step is to identify the factors that make the agents do so. The search for policies is then clearly exposed as the search for what public policy-makers can do to modify these factors, and thus induce the agents to do something better. An important point to keep in mind is that -- precisely like in a good detective story -- no one is above suspicion: the agents doing the wrong things may include the policy-makers themselves.

Let me expose the procedure in more detail. Consider a case of what is generally seen as underperformance of the economy -- such as underinvestment in research and development, or low returns on the investment actually made, or a market locked on an inferior technological norm. First, identify the agents, say {a}, whose actions are the immediate causes of the failures, by doing too much of x and/or too little of y -- e.g., by investing too little, or by investing in the wrong projects.

The second step is to find out why agents {a} do so. There are three basic hypothesis, of which more than one may be true:

(i)   incorrect incentives,
(ii) incomplete or incorrect information,
(iii) insufficient competence, with which even correct information vis-à-vis correct incentives is used in an incorrect way.

Note that standard economics was initially limited to (i), during the last 20 years included (ii), but, because of its subscription to the Optimisation Postulate, still largely ignores the possibility of (iii). For a good understanding of (iii), the Postulate must indeed be dropped and competence-allocation must be studied as an evolutionary process, as outlined in the previous section.

The third step is to identify the underlying causes for whichever hypothesis turns out to be true. In many cases, this step leads to other agents, say {b} -- possibly overlapping with {a} -- which wrongly

motivate and/or inform and/or do the job-design and assignment for, agents {a}. In these cases, the procedure goes back to the second step, in order to examine the same three hypotheses for why {b} do so. Their underlying causes may lead to what is done by yet other agents, say {c} - - possibly overlapping with both {a} and {b} -- and so on. Some agents may be locked in vicious loops of the prisoners dilemma varieties, wrongly motivating and/or informing each other. That all groups of suspected agents may contain policy-makers themselves should carefully be kept in mind.

An important difference from a detective story is that no person is to be found guilty. All the suspects are to be supplied with alleviating circumstances, excusing them for whatever wrongs they may be doing. It is only those circumstances, not persons, that are to be considered as possible targets for changes by policies.

There are three ways in which a trail, after having identified and excused one or several groups of suspect agents, may end by identifying circumstances for which no agents are directly responsible. First, a trail may end in exogenous circumstances located outside the economy considered, in nature or other economies. For instance, incompleteness of information may be due to the fact that nature does not make more of it available to any agent of the economy -- thus causing what Koopmans (1957) called 'primary uncertainty'. In this case, no policy can help; aspiration must be limited to the best social use of the incomplete information which at least one agent of the economy can effectively obtain.

Second, a trail involving (iii) may end in exogenous causes located in the given population -- namely, the abilities of the individuals actually available. There may be tasks which are so difficult that none of these individuals can assume it without committing socially costly errors. In this case, no selection of agents, however ingenious, can efficiently assign these tasks. Attention of policy analysis must then be turned to why such unreasonably difficult tasks have been included in the economy's organisational design.[9]

In some cases, however, the absence of highly competent individuals in the given population may not be entirely exogenous, and thus constitute a matter for policies --e.g., if the absence is due to a poor education system, which neglects the selection and education of special talents, or to disincentives for highly competent individuals to remain in the country.

Third -- and this is where the search for curative policies can start -- a trail may end in the prevailing institutional rules, by finding some of them deficient. They can be too restrictive or, on the contrary, too permissive. They may prevent some of the suspected agents from doing "better" -- e.g., by outright prohibition or by punitive tax rules -- or, on the contrary, not prevent from "misbehaving" -- such as engaging in predatory competition, or withholding important information from other agents. The search for policies is thus provided with the first concrete question: how to redesign institutional rules to avoid both kinds of deficiencies.

Additional concrete questions are provided when deficient institutional rules are found to concern policy-makers themselves. It is indeed important to realise that institutional rules are also needed to determine the scope for policies by particular measures -- e.g., to what extent the government can allocate credit or subsidies, or engage in collecting and spreading information. Such rules, then, can also be deficient by being too permissive or too restrictive. They are too permissive if they allow for policies which are too sophisticated or involve a conflict of interests -- in other words, policies that policy-makers cannot reliably handle, without committing socially costly errors, given their incentives, information, and competence. On the other hand, they are too restrictive if some policies could help, but are not institutionally allowed. The additional questions are, which policies by particular measures could potentially help, and which of them could reliably be conducted by actual policy-makers.

Trails involving (iii) are particularly interesting for evolutionary analysis. In their case, the institutional rules that are found deficient are often the ones about competition and selection. The design and assignment of the top decision tasks -- such as those of effective capital owners and managers, which then include designing and assigning of most of other tasks -- cannot avoid trials and errors. As follows from the above discussion, deficient institutional rules may distort competition and selection in such a way that some high competence is prevented from entry, while mediocrity is protected from exit and its errors from correction. This is what typically happens when market competition and selection is replaced by politico-administrative ones. Moreover, this is also likely to happen when market competition and selection are hindered by institutionalised protection of incumbent private producers -- be it on the product markets or on the market for corporate control.

WHICH INNOVATION POLICIES CAN BE RECOMMENDED?

The usefulness of the diagnostic procedure is limited to identifying the microbehaviours and their underlying causes that are responsible for some observed macro-failures. There is still a long way from such identification, which is a matter of pure deduction, to specific policies, which must be a matter of design.[10] A few general principles for such a design can nevertheless be stated. For convenience, let me denote policies by general rules as R-policies, and those by particular measures as R-policies.[11]

1) Institutional rules that are found deficient -- too restrictive or too permissive -- constitute a clear matter for reforms of R-policy.

2) The insufficient or wrong motivation, or information, or selection of agents, or design of their decision tasks may tentatively be considered as a matter for P-policies. Tentative design of such policies begins by formulating the superior incentives, information, selection, and design that the policies should ideally supply. Immediately, however, careful checks must be made of the motivation (cf. Public Choice), the information (cf. Hayek), and the competence (cf. Pelikan) of the government agencies by which the policies would be conducted. The point is to find out how far from the ideal the actual policies may be expected to be. Only those P-policies that can even then be proved to do more good than harm can be retained.

3) As noted, all groups may also be found to contain government policy-makers, authors of mistaken P-policies. This case indicates two alternative directions for the design:

- a reform of the government sector which could guarantee that the conduct of these P-policies will sufficiently be improved, or

- a reform of R-policy which would stop government from conducting these P-policies and rely instead, possibly after a suitable reform of the relevant institutional rules, on the private sector and competitive markets.

A few general features of the resulting design for innovation policies can be found in Pelikan (1988). Independently, but in a good agreement with my results, Fölster (1991) points to several more detailed features. What specific innovation policies can be recommended, however, is still a largely open question and I see it as an excellent subject for discussion at the present workshop.

NOTES

1   See, e.g., Stolper (1991), or Fölster (1991). In Pelikan (1985, 1987, 1988), I suggests some normative conclusions concerning the fundamental choice of economic system. A highly interesting study focusing on innovation policies is Fölster (1991).

2   An interesting attempt at such analysis is in Wolf (1987).

3   The victims of this subtle form of 'market-can-do-all' fallacy include Hayek's attacks against social constructivism (see, e.g., Hayek 1967). That he knows better, however, becomes clear in Hayek (1979), where he implicitly indulges in social constructivism himself.

4   The importance of this efficiency is also emphasised by North (1990).

5   This classification corresponds to the distinction made in German ordo-liberalism between 'Ordnungspolitik' and 'Prozesspolitik'.

6   An interesting classification of innovation policies is in Fölster (1991).

7   Among the rare studies where this kind of selection has been addressed is Forte (1982).

8   I summarise here the procedure I first developed for my course on Comparative Economic Systems in Paris, 1978-79. For its more detailed description, see Chiappori (1980).

9   Cf. the point made by Armen Alchian (1950) that selection can work only on the actually tried alternatives. Note also that the standard Optimisation Postulate ignores the possibility of too difficult decision tasks: however difficult their decision problems might be, economic agents are always assumed to find optimal solutions.

10   Cf. Herbert Simon (1969) on the difference between a natural, deductive science and the sciences of the artificial (engineering, construction).

11   Cf. also the earlier mentioned distinction between 'Ordnungspolitik' and 'Processpolitik'.

REFERENCES

Alchian, A.A. (1950), "Uncertainty, evolution and economic theory", Journal of Political Economy 58: 211-222.

Arrow, K. (1962), "Economic Welfare and the Allocation of Resources for Innovation", in The Rate and Direction of Inventive Activity: Economic and social factors, NBER, Princetown University Press,

Arthur, W.B. (1990), "Positive Feedbacks in the Economy", Scientific American, pp 80-85,

Chiappori, P.A. (1980), Une méthode d'analyse des dysfonctions économiques, Ph.D. Thesis at the University of Paris I.

David, P.A. (1985), "Clio and the Economics of QWERTY", American Economic Review, 75; pp 332-37,

Demsetz, H. (1969), "Information and Efficiency: Another viewpoint", Jornal of Law and Economics, 12; pp 1-22,

Eliasson, G. (1985), "The Firm and Financial Market in the Swedish Micro-to-Macro Model - Theory, model and verification, The Industrial Institute for Economic and Social Research, Stockholm,

Friedman, M. (1953), Essays in Positive Economics, University of Chicago Press: Chicago,

Forte, F. (1982), "The law of Selection in the Public Economy as Compared to the Market Economy", Public Finance, 27; pp 224-245,

Fölster, S. (1991), The Art of Encouraging Invention: A New Approach to Government Innovation Policy, Stockholm: Industriens Utredningnsinstitut and Almqvist & Wiksell International.

Hayek, F.A. (1967), Studies in Philosophy, Politics, and Economics, The Chicago University Press: Chicago, and Routledge and Kegan: London,

Hayek, F.A. (1979), Law, Legislation, and Liberty, vol. III: The Political Order of a Free People, Routledge and Kegan: London,

Hayek, F.A. (1945), "The use of knowledge in society", American Economic Review 35: 519-30.

Heiner, R.A. (1983), "The origin of predictable behavior", American Economic Review 83: 560-595.

Koopmans T.C. (1957), Three Essays on the State of Economic Science, McGraw-Hill: New York.

Marris, R. and Mueller D.C. (1980), "The Corporation, Competition, and the Invisible Hand", Journal of Economic Literature, 18; pp 32-63,

Marschak, J. (1963), "The payoff-relevant Description of States and Acts", Econometrica, 31; pp 719-25,

Nelson, R.R. and S. Winter (1982), An Evolutionary Theory of Economic Change, Cambridge: Harvard University Press.

North, D.C. (1990), Institutions, Institutional Change and Economic Performance, Cambidge University Press: Cambridge & New York,

Pelikan, P. (1985), Private Enterprise v. Government Control: An Organizationally Dynamic Comparison, Working Paper 137, Industriens Utredningsinstitut, Stockholm.

Pelikan, P. (1987), "The formation of incentive mechanisms in different economic systems", in Incentives and Economic Systems, S. Hedlund, ed., London, Sidney: Croom and Helm.

Pelikan, P. (1988), "Can the imperfect innovation system of capitalism be outperformed?" in G. Dosi et al., ed., Technical Change and Economic Theory, Pinter Publishers: London.

Pelikan, P. (1989), "Evolution, economic competence, and the market for corporate control", Journal of Economic Behavior and Organization 12, 279-303.

Schumpeter, J.A. (1934), The Teory of Economic Development, Harvard University Press: Cambridge, Mass,

Schumpeter, J.A. (1942), Capitalism, Socialism, and Democracy, New York: Harper and Row.

Simon, H.A. (1969), The Sciences of the Artificial, Cambridge, Mass: MIT Press.

Stolper, W.F. (1991), "The theoretical Bases of Economic Policy: The Schumpeterian Perspective", Journal of Evolutionary Economics, 1; pp 189-205,

Winter, S.G. (1971), "Satisficing, selection and the innovative remnant", Quarterly Journal of Economics 85: 237-261.

Wolf, C. Jr. (1987), Markets or Goverments, MIT Press: Cambridge, Mass.