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INDUSTRIAL TARGETING - Defensive or Offensive Strategies in a Neo-Schumpeterian Perspective

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This is a preliminary paper. Comments are welcome.

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INDUSTRIAL TARGETING

– Defensive or Offensive Strategies in a Neo-Schumpeterian Perspective

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Contents

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Abstract

This paper introduces an experimental economy with boundedly rational agents that compete with local, and largely incommunicable industrial knowledge, in an international market environment with more or less unbounded, commercial opportunities. Predictability of outcomes at the micro level is low, and increased specialization of industry exposes economic life of firms and whole nations to increased technological competition.

Informational requirements in the experimental economy are such that targeted industrial policies, and especially the idea of targeted protection of individual firms for international competition should remain a classroom exercise. The workable industrial policy is much more diffuse and should be oriented towards maintaining (1) a viable and broad-based innovative activity, and (2) an institutional organization of the economy such that the consequent adjustment process caused by frequent errors is socially accepted.

The competitive exposure that follows from specialization is most efficiently countered through promoting internationalization of domestic firms such that a broader portfolio of advanced specialized industrial knowledge can be created even in a small, industrial economy. Swedish manufacturing is in fact an excellent example of such a spreading of industrial risks, even though it has not really evolved as a consequence of deliberate policy.

1 The Problem, summary of method and conclusions

Two phenomena are characteristic of decision making in general, and decision making in business in particular; namely (1) what Herbert Simon (1955) called "bounded rationality" and (2) what Polanyi (1967) has referred to as "tacit knowledge". Bounded rationality simply postulates that simplified, and normally biased, or erroneous perceptions of reality necessarily underly decisions in complex situations. Hence, deliberate risktaking and frequent mistakes are necessary characteristics of economic life.

"Tacit knowledge" means that the competence to decide and take action is embodied in individuals, or teams of individuals. Advanced competence needed for many critical business decisions as a consequence cannot easily, or at all, be communicated to others. In particular it cannot be traded in bits and pieces in markets.

This paper, hence, takes three observations as starting points.

First, we observe that the commercial opportunities of modern manufacturing firms are defined internationally, while the competence to profitably exploit the international opportunity set is locally determined.

Second, the industrial nations are defined by their abundant local competence.[1] Because of their superior industrial technologies politicians of the advanced industrial nations have usually been advocates of free trade.

Third, international trade theory (from which economists derive advice on trade policies) is traditionally framed in a static time dimension, and is often based on the notion of a fixed endowment of factors of production and the absence of significant economies of scale. Even though a departure from the Walrasian tradition has began in recent years, it really has not changed the static underpinnings of theory.[2]

Diminishing relevance has induced a recent change in emphasis (Krugman 1981, Dixit 1983, 1986) away from static trade theory based on fixed comparative advantages to one based on internal economies of scale in order to explain intra-industry trade. This reformulation has shifted the conventional Stolper-Samuelson distributional results. In the new game of Chamberlinian monopolistic competition and imperfect markets, trade liberalization in manufactured goods characterized by internal economies of scale is optimal policy.

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[1] It will become clear as we go along, why industrial knowledge is not an internationally very mobile resource that can be hired in markets, except within the (international) business organization.

[2] See Dixit (1983) and below.

Even more "novel" in a trade theoretic context, however, is the notion of technological competition. Firm competitiveness now depends on its R&D spending and its ability to learn rapidly "by doing". In this "theory" R&D spending is assumed to depend on (foreign) competitors' spending on R&D and expectations about what competitors will do. Models have been built (most references go back to Spencer-Brander (1983) or Brander-Spencer (1984), or earlier versions of the published articles) that suggest that protection of domestic firms from import competition will allow them to learn from their own R&D spending and thereby establish a strong international competitive position. Such models make it possible to derive so-called industrial targeting as optimal trade policy. The government targets certain firms to be protected from import competition. This argument is very similar in content to both the "infant industry argument" and to the "socialization of innovative behavior" argument by Arrow (1962). There is a host of traditional objections to this "modern" theory of protection; product competition concerns substitutes only, R&D investments concern process improvements in a firm envisioned as a factory[1], informational requirements are impossible, foreign governments will retaliate etc. (Krugman 1984).

The main purpose of this paper, however, is not to criticise the "modern" theory of import protection. The objective is to (1) develop a comprehensive picture of dynamic market competition, which emphasizes the accumulation of industrial know-how and the growth of firms producing goods for specialized markets characterized by imperfect information and few producers - and (2) to derive the implications for trade policy.

In developing this position, however, two additional arguments against the industrial targeting proposal will be voiced. First, it rests on traditional, static assumptions about markets. Firms are

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[1] which is the least important form of R&D investment (Eliasson 1985b, c, 1986c).

assumed to be competing for some monopoly rent in at best a two period setting. This is enough to keep it a classroom exercise, and out of policy discussion. Second, the accumulation of technological know-how through R&D spending and learning by doing has been taken out of context, and been assumed to be efficient as a purely internal firm activity. The targeting argument also assumes that becoming technologically competitive is a once-and-for-all investment with a well defined pay-off. In an empirical setting characteristic of manufacturing firms, this is completely wrong. The main argument against traditional targeting that emerges from this analysis is that the total rent firms are competing for is positively dependent upon the intensity of learning through competition.

If technological know-how could be developed as efficiently in a remote, isolated R&D laboratory as it can through active participation in competitive markets, both the industrial targeting, and Arrow's "socialization of innovative behavior" arguments would have a place in the real world. In the experimental economy that I will introduce, the dynamics of market interaction removes the empirical foundation of arguments for industrial targeting. It is also significant that the notion of dynamic competition of Clark (1961) is conspicuously absent from the industrial targeting discussion.

A growing part of the industrial world is basing its economic wealth on manufacturing knowledge, accumulated during decades of trial and error in the markets. Such knowledge is closely associated with its labor force and very specialized. In such a situation the competitive position of a country becomes increasingly precarious, since its knowledge superiority in certain fields is constantly threatened by innovative, competitive entry of business units of other countries. At the same time - we conclude - the only efficient way to accumulate industrial knowledge appears to be to participate aggressively in the same market game and to exploit the economies of specialization

offered in global markets. Attempts to protect the value of old knowledge through the protection of a country's industries only slows knowledge accumulation and reduces the quality of industry. This leeds to competition based on cost efficient production of simple products, which relies on low factor prices, notably cheap labor. Once advanced, and socially spoiled industrial nations are especially badly organized for this type of competition.

(In an economic political perspective it is interesting to observe that in the first industrial nation, the deindustrialization argument has been voiced as an argument for general protection in order to save British manufacturing from going under (Singh 1977).)

The conclusion is that industrial targeting of sectors or firms, that offers protection to allow them time to develop into aggressive international competitors, not only poses impossible informational requirements and stimulates retaliation, but also generates sloppy performance. Above all, it keeps the protected firm "out of school"; the intense learning experience of market participation that is needed to become and remain a viable international competitor.

If the politicians of a nation are worried about increased foreign technological competition, the policy advice is as follows. Rather than attempting to take on impossible managerial tasks, they should stimulate a broadening of the domestic industrial knowledge base through increased internationalization of their firms. This is a form of "insurance arrangement" that makes a specialized industry less vulnerable to technological competition, by increasing the number of specialities.

Hence, the analysis of this paper comes out in favor of the old policy of free trade as the only viable long-run policy, but the underlying model, and the reasons for this support are different from those implicit in traditional, static trade theory.

2 The Experimental Market Economy

Any suggestion about international trade policy or industrial activity has to be based on a notion of the nature of the market process, and the time horizon under which objectives are to be realized. I introduce my notion in two steps, the first is a presentation of the international business opportunity set, and the second has to do with the local - in this case national - ability or competence to exploit that set efficiently. Both presentations introduce the market process, the accumulation of industrial competence, the creation of new business opportunities and economic growth as essentially an experimental, learning activity.

2.1 The International Opportunity Set

Technical advance is traditionally introduced in macro-economic theory as a shift in the production function. This measurement method has made technical change appear as something that occurs externally, and independently of the market processes, commonly at no application of costs. This notion is not only "mystic" (to quote Denison, 1979), it is of course wrong. Technically we have the problem of allocating costs for inputs to the same accounts where outputs are being recorded. If activities paid for in the public sector - like public education - make labor hours more productive in manufacturing, the manufacturing production function will shift, because costs for inputs have not been properly allocated (Eliasson 1985c). Furthermore, we have the problem of the proper pricing of factor inputs. Griliches-Jorgenson (1967) dealt with this in a general equilibrium framework and almost managed to eliminate the drift in the macro production function, called total factor productivity change.

These problems are serious economic issues for many reasons, and the theoretical glasses one chooses restrict the options for policy advice. Total factor productivity advance has been the focus of

central industrial policy ambitions in several industrial countries and hence has to be properly understood by politicians. Productivity change typically originates at the micro level, and requires a genuine understanding of micro-macro dynamics to be successfully understood and influenced by policy. Since such understanding is generally lacking, policies in most countries have been failures, or extremely costly. But in some countries, like Japan the assessement remains open. (I have seen no convincing evidence beyond an efficient macro-political control of wages and a diligent, educated and well organized work force. This is a form of general industrial policies similar to the old Swedish policy model[1] - which was also very effective in using the markets to control inflation and wages, and to facilitate structural adjustment.)

The notion that industrial policy making - to be informed - requires the central control, communication and use of impossibly large amounts of information belongs to a long tradition in economic analysis beginning at least with the Lange (1936-37) - von Hayek (1937, 1940, 1945) debate in the 30s. This information requirement, however, doesn't seem to have deterred policy ambitions unduly. The first argument of this paper is that lack of adequate information is necessarily as typical of industrial policy action, as it is for any business decision. Since the scope of policy action is much larger than any single business decision, the potential damage of mistaken decisions is much larger. There are three distinct reasons for this. The first is that basic industrial knowledge is tacit, vested with a group of people or a business organization and largely incommunicable, except within the same business organization. The second -originally a Marxian notion - is that the potential pool of knowledge (the opportunity set) is for all practical purposes unlimited. The third (discussed in the next section) is that the ability to exploit the opportunity set is local and limited. Hence, both the process of exploiting this

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[1] See Eliasson (1984a, 1986a,d).

opportunity set and of accumulating local industrial knowledge - which is the most important element of the market process - is experimental in nature and not predictable at the levels of aggregation at which policy targets, (e.g. on technology) are set.

The conclusion so far is that active experimentation is a necessary requirement for innovative activity and rapid economic growth, but it should be diffuse and restricted to the micro level of firm behavior.

I will introduce technological change and total factor productivity advance in terms of the expansion, and the exploitation of the technological opportunity set. I will then discuss the opportunities set per se, its macroeconomic consequences in terms of the micro-to-macro model developed at my institute, and the supporting empirical inquiries into the nature of microeconomic dynamics.

This analysis will not make use of the concept of shifts in a macro production function, or the notion of free access to external, infrastructural resources - notions that are related, or even the same. I will rather introduce the idea that under certain environmental conditions, and with sufficient local know-how, access to profitable business opportunities is very cheap, and the innovative activities of all actors in the market together constitute the fundamental "mover" of the opportunity set. If it can be demonstrated that the total action of all firms is the main infrastructure builder in industry, the policy problem is naturally reformulated as a concern for how to organize the right environmental conditions.

Technology per se of course plays a critical role in determining in each application the upper limit for productivity. However, as has been demonstrated in a large number of IUI studies, it is the way one particular technology is combined with other technologies and other factors of production that determines actual productivity. And large steps forward in productivity at the firm level are

always associated with changes in the organization through which factors are combined. This has been demonstrated at the local shop floor level (Eliasson 1980, 1982, Nilsson 1981, etc.) as well as at the macroeconomic level (Carlsson 1980). In fact, the way microeconomic behavior is dynamically coordinated in product, capital and labor markets has been demonstrated[1] to account for up to two extra percent of growth in output per annum over long, historic periods, or about the differences in recorded growth rates among the industrial nations since the beginning of the century. This means, first, that existing organizations of factors of production are rarely the best ways of organizing production, and second, that small improvements in technology may open up a whole new set of possible and more efficient combinations. The idea, or the knowledge to achieve new business combinations is what Schumpeter probably meant by entrepreneurship. We are not only concerned with new configurations of machines in a work shop, or with the introduction of new materials in automobile engines, but also with the introduction of entirely new business concepts, for instance emphasizing product development and marketing rather than factory production (see Eliasson 1985b).

With this expanded notion of the international opportunity set it (first) becomes enormous in scope, offering a wide range of different business combinations. The set is so large that each actor in the market can be familiar with only a small part of it,[2] indicating that the nature of innovative activity has to be experimental and that the existing set of combinations is virtually inexhaustible within practical planning horizons (Eliasson 1986c).

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[1] In the Swedish micro-to-macro model. See Carlsson (1980), Eliasson (1980).

[2] This can be interpreted as an assumption of bounded rationality, in the sense of Herbert Simon.

We also (second) conclude that innovative activity to a significant extent is imitative. The bulk of R&D spending in corporations - even R-spending - is oriented towards learning what is going on among competitors and improving upon existing solutions. Discrete jumps in technology occur, but at the application level they nevertheless appear as piecemeal advances, since they always need additional improvements in complementary technologies. Hence, dynamic competition means that new features are added to a competitor's product, adding to the total number of new combinatorial possibilities. Upgrading a low performer to a high performing technological competitor is definitely not - as presumed in the targeting literature - a once and for all R&D effort to increase process performance in the factory, that then gradually matures into efficiency under the shield of import protection. R&D investments are predominantly in own product improvements, normally aimed at not making them substitutes.

Hence (third), the international opportunity set tends to increase from intensive use. It does not only come back to life, as does the pig in the Nordic sagas - Särimner - after having been eaten the night before. It even grows in size.

With this presentation of the international opportunity set, total industrial innovative action becomes the most important industrial infrastructure builder, that makes additional, marginal innovative investments cheap, or very profitable.

The process I have just described is familiar to everybody that has been in reasonably close contact with innovative activities within manufacturing firms.

The distinctive feature of the capitalist market organization is that the competitive exploitation of the international opportunity set and the competitive entry of firms and technologies is free (Pelikan 1985). This means predictability of outcomes at the micro level is very low, and, hence, the informational requirements of industrial targeting impossible.

2.2 The Nature of Local Industrial Competence

High profitability in the innovative exploitation of the international opportunities intensifies innovative Schumpeterian competition. However, the ability to exploit the opportunity set profitably depends on local industrial competence residing in the various firms. Pinpointing the nature of that local competence is extremely difficult, as we have found in several IUI research projects.

Let me simply observe here that the competence to run large business organizations is probably the major, endogenously created factor endowment of the industrial nations.

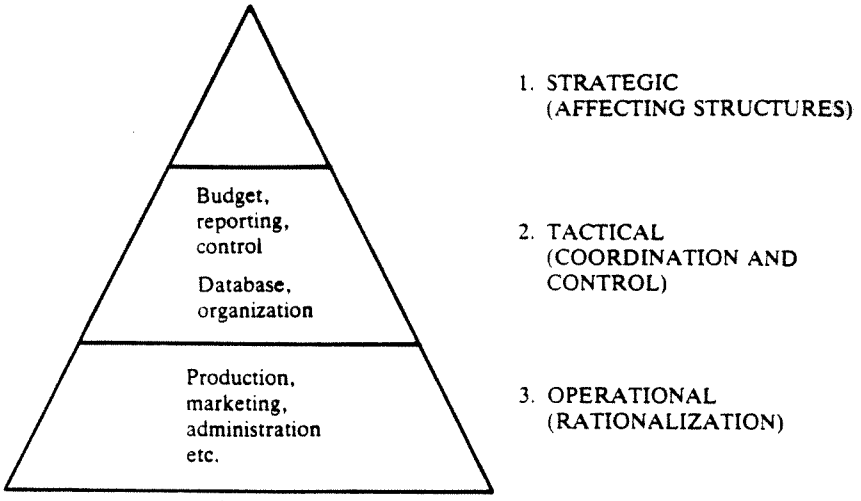
This competence can be identified very superficially in Figure 1. In this diagram three levels of competence are introduced in order of sophistication and macro economic consequences:

1. Local, factor saving (rationalization)
2. Tactical, control (coordination)
3. Strategic (structural change)

The first two levels refer to a more efficient use of existing knowledge, even though the coordination of increasingly larger and complex business organizations requires industrial competence of a kind that no country outside the industrial world really possesses.

The ultimate criterion of industrial competence, however, is the ability to adjust to new technologies being created in the international opportunity set, to combine them with existing structures into a new, viable business activity. In small or large business organizations this competence corresponds most closely to the entrepreneurial function.

Figure 1 **Levels of decision-making within a business organization**



Source: The Firm and Financial Markets in the Swedish Micro-to-Macro Model, IUI Stockholm, p. 14.

When too many firms lack this ability, a whole industrial nation may get stuck with the wrong knowledge base and experience a dismal circle of worsening relative economic performance.

This observation points to a particular aspect of industrial competence directly related to the experimental nature of the market system. Since industrial decision makers can never predict with any accuracy and reliability at their operational levels, they try, gamble or experiment. The critical competence comes into play when mistakes are to be identified and mistaken activities shut down.

We have found that the top level reorganizational ability is the most important explanation of major advances in productivity at division or firm levels. Competitive forces, but also other forces related to attitudes and incentive systems in society play a

critical role in keeping this economic process in motion. We have found that the ability to reorganize the firm early to emphasize product development and marketing has been an important determinant of success during the 70s. (See Eliasson 1985b.)

This raises the interesting problem whether large scale factory production - once the symbol of industrial competitiveness - is now a sign of industrial backwardness or whether the mature industrial countries for one reason or another are losing their competence to produce.[1]

We will come back to this issue in the next section. Before that we have to define clearly what to mean by an industrial knowledge base or industrial competitiveness.

2.3 International Competitiveness - What Is It?

For a nation (see Eliasson 1972b, p. 129 ff.) international competitiveness is best measured by the ability to sustain long-term growth in disposable real income.[2] For a firm it means the ability to sustain a high rate of return on capital. The two measures are interrelated. But they can also both be decomposed into two

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[1] It is of interest to recall that the new theory of industrial targeting is still phrased in terms of the manufacturing firm as a goods producing factory and that R&D spending is aimed at upgrading process performance, in producing substitute to the competitors products.

[2] In fact this is the same as to measure competitiveness by the return to total wealth of a nation. When seen in this perspective the ways a nation organizes and uses all its resources, including those in the public sector, become a matter of concern, since the allocation and use of all resources determine factor prices to export industries and import competing industries. Short-term factors like the trade balance are only pieces in this puzzle.

parts; one relating to relative prices, the other relating to productivity.[1]

For the firm productivity depends on its efficiency in organizing production and/or in increasing the quality of output. This technical proficiency is expressed, on the price side, in management's ability to choose the right product or to be in the right markets. For the nation as a whole, both abilities aggregate into a measure of productivity reflecting industrial skills to organize factors of production such that a great value of output in foreign currencies is achieved, and resources are created and efficiently reinvested in the economy such that rapid macroeconomic growth is generated . At the national level, however, the price problem consists in controlling domestic factor prices relative to foreign prices of output (see Eliasson 1985c). If productivity growth at the macro level stagnates, then a higher burden in maintaining competitiveness of firms falls on domestic factor price control. However, domestic factor price control, including real wage control, does not produce rapid long-term growth in disposable real income, unless matched by productivity growth. The latter can only be maintained through the continued upgrading of industrial knowledge.[2]

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[1] The Swedish micro-to-macro model developed at IUI clearly illustrates the economic significance of this definition of competitiveness. In Eliasson (1985c) the relative importance of the various measures for competitiveness has been analyzed within an international trade framework.

[2] It is interesting to observe that the endogenous parameter that was adjusted to differences in competitive pressure on similar factory production units in a large multinational firm was in fact productivity (Grufman 1982).

2.4 Learning, Technological Upgrading and Economic Growth - The Endogenous Factor Endowment

The two earlier sections have presented the competitive situation of a firm as that of a competent and aggressive experimenter on an enormous stage with many audiences. There is really no practicable limit to what can be done. Competence has three dimensions; to have a sense for what the audiences want to see, to have the technical competence to carry out the performance, and to spot and understand at an early stage when you have chosen the wrong play. The enormous opportunity set creates uncertainty in the sense that competitors can "enter" in a multitude of unpredictable ways. Competence to compete successfully can only be achieved by active participation in the international market game. Participation makes it possible to understand what competitors are doing, initiating and implementing what they have done as fast as possible and - if possible - to be ahead in the innovative game.

This holds, more or less, for all actors in the markets of industrialized countries. A key notion for successful participation is a broad knowledge of what customers need and are willing to pay for; not only consumers (in Burenstam Linder's (1961) sense) but also industrial customers.

This is the nature of the accumulation of industrial knowledge and the transfer of an industrial tradition between generations. It is obvious that comparative advantages under such circumstances become endogenous and quite unstable. Developing countries have a decisive handicap in knowledge accumulation from the outset. A nation which cuts itself off from active participation in these markets through protective measures can very rapidly slide into an evil circle, gradually destroying its industrial knowledge base.

Once competitiveness can no longer be based on superior competence to organize factory production or to develop sophisticated products,[1] cheap factors of production like raw materials or labor[2] is the only way to compete. Having entered a decline phase of economic development, the mature industrial nations appear to be the worst performers when it comes to controlling factor prices in order to achieve competitiveness.

The "tacit" nature of industrial knowledge, important aspects of it being vested with a team or a business organization, makes it wrong to treat it as a well defined, and freely movable "disembodied" resource that can be purchased in the international market at a price.

3. Deindustrialization

3.1 Is There a Deindustrialization Problem?

"Deindustrialization" has become a topic of public concern since the 70s. As a rule, worries have been focussed on the relative decline in jobs in manufacturing, notably blue-collar jobs.

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[1] In view of this argument it is interesting to observe Leamer's (1984) opposite conclusions, namely that physical and human capital reversed their roles as sources of comparative advantage between 1958 and 1975. In 1958, skilled workers were the source, in 1975, physical capital. This contradicts the results of both Ohlsson (1980), Bergholm-Jagrén (1985) and Swedenborg (1979) and of several additional IUI case studies. The problem is probably the one emphasized by Leamer himself, that a theory can only be evaluated with respect to alternative theories, and there is no comprehensive alternative theory to the Heckscher-Ohlin hyopthesis yet in sight. Deficient measures of human capital input in production is another probable source of error, and human capital - at least in the 60s and 70s, from which Leamer's data come - tend to be correlated with physical capital installations. Aggregate sector data furthermore are not so informative in this context.

[2] "Competence" then is of course just another word for a cheap factor input.

In reality the situation in industrial countries is very different. For one thing, the manufacturing firm has become a major service producer (Pousette-Lindberg 1985), to an increasing extent drawing on human capital outside the traditional pool of skilled workers. Secondly, the changing organization of manufacturing production means that a growing part of human capital service production may or may not be carried out within the manufacturing firm, or within the same country as the parent company. While a growing portion of technical services has been separated off as independent consulting firms, that are statistically classified as private services, the large manufacturing firms are taking over an increasing part of marketing activities from previously independent agents. In small advanced countries, however, marketing activities of large companies are predominantly in foreign countries. On the whole, while blue-collar jobs in industry seem to be decreasing, total employment in (Swedish) manufacturing industry, abroad and indirectly in subcontracting work, has at least been constant. The problem is not at all a decline in manufacturing size, measured by resource use, but in value added growth based on an unchanged or even growing resource base. This problem has to do with productivity and the quality of input resources, the most important quality aspect appearing to be the way resources are allocated, recombined and organized.

An inefficient organization of total industrial resources and an inability to adjust the organization ahead of the problems (cf. Figure 1), makes the industrial sector of a country vulnerable to competitive changes in other countries, where firms are more adept or more aggressive in exploiting the international opportunity set.

One important question to ask here is whether the local inability of a country to keep up in such an economic race is economical/technological in nature, or is based on an inability of the socio-political system to accomodate change.

Whatever the answer, if the ambition is to remain an advanced industrial nation, the long-term solution must be to participate openly in the international industrial market game, not to close off the economy, as has been suggested (Singh 1977, Spencer-Brander, 1983 and Krugman 1984.).

3.2 The Destruction of the Industrial Knowledge Base

Deindustrialization may be regarded as one possible phase of industrial progress. Once the analysis takes the factor endowment of an economy as endogenous, the economic security traditionally associated with, for instance, a raw material source becomes illusory. Industrial knowledge has no absolute value. Its economic value depends on the knowledge of competing firms or countries. It becomes normal to expect that in the long run economies should lose their positions as relatively advanced "industrial" nations. Over historic time spans it even becomes unclear what we should mean by "industry". Developing countries are trying to develop industrial skills through imitating (learning) skills already developed in the advanced countries. Since prices in the advanced countries are based on the absence of these skills in the underdeveloped countries, returns to capital in such industries in the advanced countries will come down and capital will flow to developing countries in proportion to their success in imitating industrial skills and knowledge.

Industrial knowledge is, however, a very complex asset, its efficiency being dependent upon the way society is organized. It can rarely be hired in a market and it takes many decades to develop.[1] Even though technology per se may be developing "successfully", other elements of the total industrial capital structure may deteriorate, resulting in industrial performance of the kind the U.K. economy is currently experiencing. As we

[1] Cf. the Norwegian transformation problem in Eliasson (1983).

concluded earlier, in an operational sense, the exact composition of the appropriate industrial knowledge is unpredictable and not communicable. It is accumulated through active participation in the market process, or through "on the job learning". Hence, a nation's problem of competitiveness cannot be solved through subsidizing "technology" (cf. Arrow 1962) or through protecting targeted firms; the requisite central knowledge base of knowing what to do is absent at the policy level. The only way of accumulating the requisite knowledge is active participation on the market game to see which actors come out on top. This is tough politically and socially even for successful actors, and really difficult for those actors who have lagged behind. But competing with low-cost production of simple products with developing nations must be even worse socially for an once advanced and wealthy industrial nation.

However, if technology is changing rapidly among the advanced nations, a new picture again develops. For one thing profit opportunities may return to the industrial nations, reversing again the flow of international capital away from the developing nations. Certain regions of the U.S. offer examples of this and the "electronics revolution" is often quoted as a technological breakthrough that will return economic initiative and high returns to the already mature industrials.

While this may have serious consequences for developing economies, the same events pose an even greater threat to the mature industrials that have been slack in attending to their industrial knowledge base, because more intensive competition now cuts in at a more advanced level, where they may earlier have been protected from competitive entry by a knowledge barrier. But blocking out such competition is suicidal in the long run because it hinders domestic producers from learning what is going on in the markets and, hence, prevents them from catching up.

4 Industrial Concentration

4.1 Inevitable or Desirable?

Economies of scale have often been emphasized as a source of industrial productivity. But it also causes concentration tendencies in industry, poses barriers to entry and in general causes a lot of analytical trouble in the theoretical structures that underlay welfare analysis.

Economies of scale in static, general equilibrium models - still the main intellectual structure of trade theory - remove standard equilibrium properties from the model. If economies of scale are the basis for comparative advantages and if economies of scale develop endogenously as a result of continuous, successful accumulation of industrial knowledge, not only problems of analysis occur. The same idea has been used as a rationale for protectionist interventionist policies. By protecting domestic markets from foreign competition, domestic economies of scale and comparative advantages in, say, chips manufacturing are said to develop. Hence, the government should target certain firms for protection until they have invested sufficiently in R&D to have accumulated the competence needed to compete successfully in world markets (see e.g. Spencer-Brander 1983, Krugman 1984, Grossman-Richardson 1985, Dixit 1986) This argument is similar to the old infant industry argument. In terms of our earlier analysis it is wrong. It too strongly rests on the notion of the firm as a factory. It neglects the fact that in the modern firm industrial knowledge is created through active participation in a competitive market process and that such knowledge is more related to products than to processes. Without active participation, and without a persistent competitive threat from others, learning does not occur. (Cf. "How IBM is fighting back", Business Week No. 17 1986, p. 86.)

U.S. antitrust policy is another form of intervention to protect small firms from the cut-throat competition of huge market leaders based on enormous economies of scale. This has never been regarded as a serious problem in small, open economies like the Swedish or Dutch economies, where large firms always have to be based in foreign markets. Even though the value added of such international firms may be large in comparison with total domestic value added in manufacturing (the value added of global Volvo is more than 10 per cent of total value added of Swedish manufacturing), it is still insignificant when compared to world automobile production and hence, unimportant from the point of view of market concentration. As U.S. domestic markets for manufactured products are being increasingly opened up to foreign competition, similar reasoning is beginning to shape also U.S. antitrust policies.

In addition, the combination of bounded rationality and the unlimited opportunity set generate enough unanticipated technological competition to check unlimited firm growth through increasing economies of scale.

The efficiency of routinized innovative activities in large business corporations, which was observed by a worried Joseph Schumpeter (1942), was believed by him to be the source of unlimited economies of scale and of concentration that would eventually merge capitalists with the political system, and destroy democracy.

Schumpeter formed his notion of the firm as a factory production process. Factory production appears to be of diminishing importance as a source of economies of scale in the advanced industrial nations. There are, however, other kinds of economies of scale that appear to matter in this context. They occur in finance, R&D and product development, and in marketing, forcing a wedge between economies of scale associated with factory size and economies of scale associated with financial size. If this distinction is not made we will observe an increasing degree of

concentration in most countries by conventional measures and interpret the tendencies erroneously.

Economies of scale in technology, notably product development, coupled with the utilization of economies of scale and market knowledge in marketing and distribution undoubtedly matter for the competitiveness of firms. These will exhibit themselves as endogenously growing comparative advantages in international trade. In the small industrial countries, market investment is measured to a large extent by the extent of foreign subsidiary operations.

4.2 Vulnerability

The increased size of specialized producers of technologically advanced products for global markets causes new types of policy problems for the small industrial nations. For one thing, firms expand their administrative system across national boundaries and reduce policy autonomy of the national authorities. Secondly, the volume of manufacturing production activity will be concentrated to relatively few, major producers of mature products, the competitiveness of which depends heavily on the constant maintenance and upgrading of their knowledge base. In principle the problem is similar to that of nations dependent on one, or a few raw material resources. If a major producer fails (cf. Table 1) the whole country will experience a significant economic problem. Dependence on a unique knowledge capital may increase international dependence in the sense that loss of a unique knowledge position might occur quite fast. On the other hand, the knowledge base of the advanced engineering firms we are talking about is broad. It can be applied to other activities. The ability of some old, large Swedish engineering firms established in the mature markets to "transform" themselves in the wake of the oil crisis in the 70s is very illustrative in this respect. Skilled labor, in particular, can be used in other firms. And engineering industries basing their competitiveness on advanced product technologies tend

to generate new industrial ideas ("the opportunity set") at a rate that one never finds in industrial environments dominated by basic industries, which build their competitive edge on cost efficient, large scale manufacturing of simple products.

While economic vulnerability of a developing nation normally falls back on a single, rich raw material resource, advanced but small industrial nations will necessarily - through specialization - grow increasingly dependent on a specialized knowledge base. In a world economy subjected to rapid technological change this is a precarious economic situation. The only means of "protection" is through a high savings ratio and an efficient insurance scheme. The most effective insurance scheme probably is increased internationalization of domestic industries to broaden the industrial knowledge base. This development has occurred endogenously in Sweden and has been in the interest of both firms and their owners, on the one hand, and the country and its inhabitants, on the other. Without its broad knowledge base multinational engineering firms based in international markets would not have been able to replace the "slack" left by contracting basic industries in the 70s as fast as they did. An alternative insurance arrangement discussed in Norway before "vulnerability was realized" through the decrease in oil prices, was the creation of a huge funding arrangement to invest the cashflow from the oil fields in the international capital market.[1] Since capital markets and insurance markets are not developed to handle huge and very long-term investments or such committments, this is really not a permanent solution.

Again both the concentration and the vulnerability problem indicate the importance for a country of having a broadly based innovative activity associated with the expansion of what we have called the international opportunity set. This has clear implications for the ways policies should be designed.

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[1] or more adequately, also to create an institutional arrangement to keep public and private consumers off the oil income. Se further Eliasson (1983).

Table 1 Concentration in Swedish industry

The 10 largest firms in Swedish manufacturing account for:	
ca 30 percent	of Swedish exports
47 percent	of total manufacturing R&D spending
more than 70 percent	of total foreign employment by Swedish manufacturing
ca 37 percent	of total manufacturing employment (directly and indirectly) in Sweden

5. Industrial Policies

5.1 Policy Targeting or Systems Care

The aim of this paper has been to modify the theory of international comparative advantage to incorporate the typical endogeneity of important, knowledge based, factor endowments. The answer to what long-term policies should be appears clear, namely to make sure the industrial knowledge endowment is continuously updated. Since the nature of the future knowledge capital is inherently unpredictable, central targeting for capital accumulation does not appear to be a workable proposition. Large scale industrial policy programs have normally ended as failures (Eliasson-Ysander 1981, Eliasson 1984a) and the proposition voiced by many to subsidize innovative activity to preserve innovative output (Arrow 1962) appears to be a contradiction in itself (Eliasson 1986c). In fact, even large scale public educational programs may no longer appear as self-evident solutions to industrial advance if subjected to careful examination (Eliasson 1986d). The open participation in the experimental market game may turn out to be the most efficient industrial learning mechanism society can organize. This is an economic systems care problem, not a targeting issue, and it is intimately associated with the ways the non-economic activities of a country are organized.

5.2 Guidance and Coordination - to Run Industrial Policies Through Large Firms

Large business corporations or even whole industrial nations, like Japan, have often been referred to as examples of successful planning machines. Even if it is true that the knowledge to run these machines is tacit and non-communicable to central bureaucracies, it should be possible - it has been argued - to combine the industrial knowledge residing in large business organizations with central political targeting, without explicitly centralizing all knowledge necessary to achieve complete overview and control (Bray 1982, Heal 1973). After all, this is exactly the method used by large business corporations to coordinate sometimes extremely heterogeneous and complex activities (Eliasson 1976). Why not inject new savings resources into these large companies to make them innovate more, but require that they meet specific social or political targets, in addition to profit objectives (Eliasson-Ysander 1981)? Such policy suggestions are based on the Schumpeterian notion of efficient routinized innovative behavior. Indeed, the bulk of innovative activity in industry even appears to be of the routine type (Eliasson-Granstrand 1982). However, the whole suggestion is nullified by the nature of the international opportunity set. To run policies through (large) firms means concentrating resources to a smaller number of actors, and hence restricting the variety of competitive, innovative entry in markets. Why should a subset of large business organizations represent the variety of all potential new market entrants, when available evidence suggests that the large organizations are the most conservative ones, and that efficiency in innovative activity rather requires the broadest possible variety of market trials.

5.3 The Creation and Maintenance of a Productive Capitalistic Market Environment

Policy conclusions are always dependent upon the theory or model one adopts to study economic processes. However, when one starts from the notion of economic processes as experimental, ruling out the possibility of efficient central information processing, the road of advice inevitably leads away from a dominant central influence on basic innovative processes in the economy. The reason is not only that economic action is too complex for deliberate policy interference to be at all informed.

Central knowledge processing becomes a misconception that is conserving and disturbing, and not informative if transformed into policy action.

Optimal long-term policy means organizing the non-economic factors such that the full potential of the economy can be exploited. This inevitably means organizing the economy to cope with change. A rule system has to be established that determines how costs and benefits associated with economic change are to be distributed, that is also accepted politically.

We concluded earlier that the factory production of simple products appears to be an economic activity subjected to intense competitive pressure in the advanced, high wage industrial nations. At the same time the organization of both the political system and the labor market of industrial nations is heavily biased towards the preservation of the "worker culture" associated with earlier industrial technologies. A steady change in that bias will have to take place if the production system is to be efficiently reorganized to cope with future competition. This is one of the non-economic obstacles to economic change.

The regional consequences of economic change, that for small nations become national problems, is another problem. Knowledge

based industries do not develop in isolated regions. A certain critical knowledge mass, only associated with large cities, possibly related to a viable research environment appears to be needed to achieve the desired, innovative industrial activity. The population of a country sets clear limits to how many such research environments that can develop. So a successful solution to the industrial transformation problem of a national economy is probably going to worsen the regional problem, or at least increase the differences in wealth and knowledge endowment between the growing industrial city regions and the rest of the country.

It would be instructive to study how different nations have developed different choices in this respect. It is also important to understand how the political choice process is organized. A general conclusion seems to be that the countries that have best recognized the experimental nature of the capitalist market process, accepted it politically, and supported its functions, have displayed the best macroeconomic growth performance over the long time spans.

The experimental nature of technological advance means that failure should be a normal and frequent phenomenon. Industrial competence is very much related to spotting and accepting failures early. It is expected that investment money be lost now and then. Mistaken installations represent relatively small losses to the economy as long as one does not insist on carrying out production in them (Eliasson-Lindberg 1981). Hence, the perhaps most efficient organizational form is the one product, one division firm that is exposed to rapid failure and exit if it is not on top of the market. The experimental attitude represents the offensive side of industrial policies.

Finally, why shouldn't public bodies, like local government or even central government be allowed to participate in the experimental market process. There are a couple of decisive reasons for not allowing that. First, public bodies as a rule command one,

huge resource, and hence can make sizable policy mistakes with devastating macroeconomic effects. However, second, the most important cause for the public authorities to abstain from experimentation is their inherent inability to spot policy mistakes early, and to close down mistaken ventures fast. This inability is what makes them good democratic institutions, but at the same time it turns them into incompetent business organizations. The defensive part of industrial policies must be to minimize the delays in the "creative destruction" process at a minimum social cost. In fact, this is a typical efficiency problem.

The moral of this paper can now be summarized. Active experimentation in the markets and a broad-based social willingness to accept the adjustment process caused by frequent decision mistakes are necessary conditions for economic growth. However, experimentation should be strictly kept at the micro agent level in order to limit the extent of single mistakes.

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