STRATEGIC INDUSTRIES IN A GLOBAL ECONOMY:
POLICY ISSUES FOR THE 1990s

OECD INTERNATIONAL FUTURES PROGRAMME
STRATEGIC INDUSTRIES IN A GLOBAL ECONOMY:

POLICY ISSUES FOR THE 1990s
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Foreword

OECD Forum for the Future conferences serve as a platform for debate on long-term issues that have a major bearing on the future of OECD economies and societies, and on the world economy at large. Government support to economically strategic industries (aerospace, computers, semiconductors, automobiles, etc.) is such an issue. In a highly interdependent world economy in which technological capability is a crucial factor in determining competitive advantage, many governments choose to assist their strategic industries.

However, such measures are often regarded by competitor countries as affording an unfair advantage. This has already led to a number of international disputes. And since global competition is set to intensify in the years ahead, it is to be feared that policies in support of strategic industries are likely to constitute a major source of tension in international economic relations, with important repercussions on the world system of trade, investment and technology.

It was with a view to assessing these potential dangers that a meeting was convened at the OECD headquarters in Paris on 30 October 1990 entitled “Support Policies for Strategic Industries: Systemic Risks and Emerging Issues”. The conference, which was chaired by the Secretary-General of the OECD, was attended by some twenty high-ranking government officials, leading industrialists and academics from various OECD countries.

This publication presents the papers that were used as background for the meeting, together with a substantive summary of the discussions. It is made available to the public on the responsibility of the Secretary-General.
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Support Policies for Strategic Industries:
An Introduction to the Main Issues

by

Wolfgang Michalski

OECD Secretariat, Head of the Advisory Unit to the Secretary-General

The issue of government assistance to economically strategic industries shows every sign of becoming a major bone of contention in the international political arena of the 1990s. As tariffs have gradually been negotiated away and a number of non-tariff barriers have increasingly come under scrutiny, support policies for key industrial sectors are moving to centre stage as a potential source of tension in international economic relations. While such support is considered by some to be essential for maintaining and further developing the national economy in an increasingly competitive world, it is viewed by others as a major threat to the future of the international system of trade, investment and finance.

The purpose of the OECD Forum for the Future conference was to discuss the key issues raised by such support in the context of international economic relations over the longer term. It was intended to enable participants to air their views on these matters, to obtain a better understanding of how such problems are perceived by their counterparts in other countries, and to explore areas in which further work needs to be done at the international level.

The proceedings were divided into four sessions. The first set the stage by providing an overview of the major changes that have occurred in the global economy, and by examining shifts in the general focus of policies adopted by the principal economic actors in recent years. Special attention was directed to the changing nature of international competition and to the role of key technology-intensive industries in influencing the competitive position of national economies. After reviewing the various concepts of strategic industries, the second session emphasized the domestic dimension by examining the specific measures that have been implemented to foster national competitiveness via the development of strategic industries, and the impact of such policies on the countries undertaking them.

The third session assessed the wider, systemic implications of strategic policies and the overall consequences for trade, capital movements, international investment flows and technology transfer. The final session was devoted to considering the options for averting or reducing some of the most serious systemic consequences flowing from the emerging pattern of government support to strate-
tic industries in the 1990s, and to identifying areas in which the OECD could make a useful contribution in this respect.

This paper aims to provide some guidance through a very wide-ranging debate, and highlights a number of issues proposed for discussion in each session.

1. Main economic trends and the emerging interest in strategic industries

The changes that have swept through the world economy over the last quarter-century have had a profound impact on international economic relations and on the interaction of market participants. The landscape of global economic power structures today has little in common with that of the 1960s. The United States no longer dominates world economic affairs to the same extent; Europe is demonstrating renewed dynamism as it is gradually welded into a huge unified market; Japan now figures as a major industrial and financial power; radical reforms are carrying Eastern and Central European countries towards more market-based systems; and a multitude of new, important players such as the South East Asian NIEs have made an impressive entry onto the global economic stage.

The world has shrunk as international interdependence and the globalisation of product and capital markets have progressed rapidly, bringing cultures into closer contact with one another. The driving force behind this phenomenon in the 1950s and 1960s was international trade; in the 1970s and early 1980s, it was primarily the rapid integration of financial markets. Now it is the turn of foreign direct investment and the forging of international corporate alliances to act as catalysts in the globalisation process. Extrapolations of present trends suggest that in the 1990s, transborder investment flows will grow at double the rate of trade flows.

The transformation has been no less striking in competition structures. As tariff walls have gradually diminished, non-tariff barriers in the form of voluntary export restraints, orderly market agreements, etc. have moved to the fore, thereby contributing to the surge in foreign direct investment flows and shifting the emphasis in competition strategy further toward locational decisions. This trend has been particularly marked in key economic sectors such as automobiles, semiconductors and consumer electronics, which have been increasingly characterised by the predominance of large-scale oligopolies, and in which worldwide managed trade has served to create powerful cartels.

In conjunction with these developments, there has in some cases been a noticeable convergence between the interests of multinational enterprises and those of national governments. This convergence is reflected in the fact that the struggle for market shares, especially in leading-edge sectors, now transcends competition between corporations to embrace rivalry between the different national socio-economic environments in which enterprises operate – environments which largely determine the economy’s competitiveness and which are shaped to an important degree by government policies.
Once governments perceive that comparative advantage can be created and that it is unprofitable to prop up ailing traditional industries, they are more inclined to employ industrial policies in an effort to strengthen innovative and productive capabilities in economically strategic activities and to attract valuable, internationally mobile resources. Then again, what exactly defines a “strategic” sector? There would appear to be at least some consensus that it should involve major positive externalities, large economies of scale based on learning by doing, and important upstream and downstream linkages. An industry is considered strategic if it engenders large innovative spillovers and if it provides substantial infrastructure for other firms in the same or related industries.

Agreement seems to stop there. However, common definitions might be regarded as being of only secondary importance, as long as it is felt that at national level strategic industries can be identified, and that governments ought to be involved in their promotion. It is nonetheless interesting to note that not only within the OECD but also among many non-Member countries, those support policies tend to be aimed at a relatively small number of often identical sectors.

Among the issues which were proposed for consideration were the following:
- What are the main determinants of national competitiveness today? Why do governments feel compelled to intervene in order to foster the development of key industries at national level? To what extent are the ongoing processes of globalisation and economic integration likely to intensify government involvement in economically strategic activities in the 1990s?
- Which activities have been generally regarded in the recent past as “strategic”, and why? To what extent does the concept of strategic industry vary from country to country, and how is this reflected in the particular sectoral mix that benefits from strategic government support?
- What are the driving forces behind the apparent convergence of corporate and national government interests in the struggle for world market shares?

2. The nature of support policies for strategic industries and their impact at national level

The notion of support policies for strategic industries entails the implementation of a set of complementary measures related to trade, investment, competition and technology, as well as particular applications of more general framework policies. The most controversial of these measures include:
- trade-related measures, e.g. industry-specific tariffs, quotas and orderly market agreements, strategic application of anti-dumping GATT codes, stringent rules of origin requirements, and “strategic” approaches to the development of new technical standards;
- investment-related policies, e.g. selective acceptance of foreign investment, imposition of high local content requirements, and selective provision of industrial sites;
- industrial and technology policies, e.g. strategic support to private R&D, to the restructuring of critical industries and to crucial foreign acquisitions, and discriminatory procurement policies, including national defence;
- fiscal and financial market policies, e.g. favourable tax treatment of innovative activities, tax breaks to attract firms in key sectors to specific regions, and selective measures affecting the cost of capital, the quality and quantity of investment and financial market structures;
- competition policies, e.g. exemption from the application of competition law of specific sectors or companies.

To the extent that a comprehensive assessment is at all possible, experience with support programmes for strategic industries appears to have been, at best, mixed. Examples of failures abound. Concorde was never commercially viable; the Japanese Government-supported small airliner Asuka never flew commercially; the German Government abandoned its efforts to support the creation of a domestic computer manufacturing industry. Yet there are also examples of cases that have been, in a limited sense at least, successful.

The French high-speed train, the TGV, is an outstanding illustration of leading-edge transport technology. The Dutch Government's rescue of Fokker, which the private sector was reluctant to support, seems to be paying off with the recent sales of two new lines of commercial passenger aircraft. Evidence also suggests that European governments' support of the Airbus project and the (fairly low) tariff protection afforded the Japanese 16K RAM industry in the late 1970s-early 1980s were successful in promoting entry into markets characterised by large returns to scale, high barriers to entry, and significant learning curve effects.

What is lacking in virtually all such cases, however, is substantiation of the economic or non-economic justification for such assistance programmes. On the benefit side, it is notoriously difficult to get a handle on the positive spillovers that frequently accrue to suppliers, end-users, and related industries. On the cost side, with the exception of the impact on the budget, the magnitude of the potential damage – while possibly quite considerable – remains equally fuzzy.

Government support to strategic industries can lead to inefficient allocation of resources and a conflict of self-interests, e.g. where a subsidy to one sector implies a tax on others, or where it crowds out other key innovative activities. It may lead to a propensity to develop prestige projects. It may lead to long-run shifts in entrepreneurs' innovative behaviour: private risk-taking may weaken and potential innovators may find themselves lobbying for public support in order to succeed. Moreover, once subsidies have been awarded, they can prove difficult to withdraw. Finally, the cost of government measures to rectify the distorted market signals generated by government intervention in the first place may be substantial.

This raises a number of key questions:
- How successful has the promotion of strategic industries by governments been in terms of their own national objectives: (a) with regard to the strategic industry supported; (b) with regard to the effects on upstream and downstream domestic industries; (c) with regard to the rest of the national economy? Which examples serve best to illustrate these assess-
ments? What general conclusions can be drawn as to the conditions for success or failure of state support to strategic sectors?

- To what extent does experience bear out that the specific nature of a country’s industrial structures, its education and training system, its investment costs and levels, and its macroeconomic environment are more critical to the success of key industrial activities than sector-specific policies?
- How effective are nationalistic approaches to promoting leading-edge activities likely to be in a world in which widespread international corporate alliances render the concept of the domestic firm increasingly meaningless?

3. The systemic impacts of government support to strategic industries

There is often a presumption among governments in favour of strategic industry support because the positive externalities such industries engender — technological diffusion through downstream and upstream industrial linkages, employment effects, etc. — tend to be fairly tangible and are perceived by governments as enhancing the technological capabilities of the domestic economy and, frequently, as greatly benefiting individual regions. Judged against these close-to-home advantages, evaluation of the possible implications at international level of support to key industries tends to occupy a lower position on the agenda.

It is quite conceivable that government support to leading-edge industries can in certain cases improve international welfare, although this would likely be an incidental effect rather than the prime objective of the support. For example, in medium-range wide-bodied aircraft construction, the economies of scale are so large that Boeing could have emerged as the sole producer and could have reaped considerable monopoly rents. By gaining entry into the market, Airbus may ultimately improve the welfare of everyone (except, of course, Boeing, McDonnell Douglas, and European taxpayers) by causing a reduction in aircraft prices. Support to large-scale international co-operation in such areas as information technologies and biotechnology generates diffusion of innovations and new applications whose benefits tend to extend well beyond those firms and institutions participating directly in the project.

Yet, a large question mark remains as to the less obvious — but not necessarily less weighty — negative impacts of support policies for strategic industries on the international system of trade, investment, technology, finance, and international competition. To begin with, escalation of retaliatory measures triggered by the aggressive application of strategic trade measures would have serious repercussions on trade and investment flows and, via conflict spillovers, on the international trading system more generally. Moreover, many observers believe that there is at least some risk of overcapacity in key technological sectors if governments focus support on the same activities.

In certain industries (e.g. European IT), co-operative alliances on a major scale benefiting from government support may risk strengthening already existing trends towards cartelisation, eventually fostering monopoly pricing at the cost of
the consumer. Concern has also been expressed – especially by smaller industrialised countries and LDCs – about the overall effect of restricted access to government-sponsored science and technology projects on worldwide technological progress and economic development. Finally, and perhaps the least quantifiable of all, there remains the question of the impact of government intervention in R&D and key industrial activities on the innovative behaviour of private investors and the placement of risk capital.

The following issues were proposed for discussion:
- Continuous technological change, with its various dynamic increasing returns and cumulative features, is widely considered to be the general condition of any economic system. To what extent are policy-makers confronted with trade-offs between policies which enhance static allocative efficiency (e.g. ensuring competition at domestic level) and measures which promote dynamic growth efficiency (e.g. permitting mergers between large domestic firms in key sectors to ensure competitiveness on global markets) but which possibly contribute to international policy tensions?
- Even if governments recognise the uncertainties of the cost-benefit relationship inherent in large-scale selective support to leading-edge sectors, is there not an underlying risk that they will persist in their support efforts because they perceive defence spending (United States) or “co-ordinated equilibrium” between government and business (Japan) or the promotion of large-scale co-operative programmes (Europe) as conferring such a competitive advantage on their respective rivals that they can ill afford to abandon their own programmes?
- How serious are the various future risks to the international system of trade, investment and technology outlined above? Where do participants see the most significant sources of potential conflict in the years to come?

4. Exploring the policy options for the 1990s

In addition to the specific domestic and international problems outlined above, there are a number of more general reasons for advocating an intensification and refocusing of the debate on government support to strategic industries in the future.

To begin with, in the years to come, continuing globalisation and economic integration may well sharpen the potential for international conflict over the distribution of gains from economies of scale and oligopolistic competition. Moreover, the threat of a small and progressively shrinking number of world-scale suppliers in key industrial sectors could lead governments to step up their efforts to shelter regional or large domestic markets, and promote the survival of domestic producers on grounds of national technological security.

Second, the trend among major players in strategically sensitive sectors to strengthen their competitive position, share the burden of massive R&D costs or gain access to foreign markets, via an intricate web of joint ventures, co-operative
agreements, cross-holdings, etc. has further blurred the distinction between “home” country and “host” country, and complicated any definition of national economic interest. The issue is thrown into even sharper relief by the question of membership of foreign subsidiaries in government-sponsored research programmes. Yet, what at first sight would seem to be a factor working in favour of liberalisation in government policies might – if mismanaged – backfire and provoke nationalist responses aimed at controlling foreign investment and limiting access to technology.

Finally, there is growing recognition that the social, institutional, historical and cultural environments are important for the national competitiveness of key industries – indeed for the overall economy – and this has in turn highlighted the role of national systems. There is reason to believe that some systems are more conducive than others to the emergence of particular technological paradigms, and that some national technology systems are structurally more accessible than others. To be sure, it is vital to distinguish between the historical and cultural roots which influence behaviour, tastes and institutions on the one hand, and government policies on the other, for only the latter is the appropriate domain for international policy co-ordination. Nonetheless, the concept of the determinant socio-economic environment injects a completely new and much more comprehensive dimension into policy-making, emphasizing the need to take into consideration a broader spectrum of policy domains and to implement cross-disciplinary approaches.

There is an abundance of options through which policy-makers could act to mitigate any undesirable effects of support measures for strategic industries in the future. They vary considerably, however, in the level of commitment they imply:

- reinforcing the international dialogue, e.g. identifying issues, taking stock of pertinent measures, working towards a common assessment of policies;
- agreeing on guidelines to limit certain types of government action, e.g. high local content requirements, overly restrictive application of trade laws, restrictions imposed on the right of establishment;
- strengthening international arrangements, e.g. reinforcing GATT rules, establishing multilateral surveillance of the support provided to domestic industry, strengthening arrangements for international co-operation in R&D;
- harmonizing policies which can contribute to the creation of a more effective level playing-field, e.g. harmonization of technical standards, of the protection of intellectual property rights, of competition policy and other “framework” policies related to market structure.

This raises a number of broad issues:

- Support policies for strategic industries are based primarily on policy approaches of a domestic nature. How important will it be, in order to contain international conflict in this area in the future, to extend the international dialogue and policy co-operation beyond trade policies to include competition, R&D, and domestic investment-related measures?
- The present GATT framework of multilateral open trade is a system founded first and foremost on a set of internationally agreed, legally binding rules and norms. What types of internationally accepted “rules of
the game" would help in bringing about more discipline in the area of support policies to strategic industries and safeguard the character of the international system of trade, investment and finance as a basis for a positive-sum-game?

More so than is the case with trade policies, the inclusion of domestic policies in the international policy dialogue has to take into account the specific social, institutional, historical, and cultural environment of participating countries. Can international co-operation then only be expected to be effective if conducted within a small group of countries at a more or less similar level of economic and social development (such as the Member countries of the OECD), and not in a worldwide framework?

The four contributions which follow served as background papers for the discussions in the individual sessions. They explore in much more detail many of the issues raised in this introduction. The final chapter in the report offers an assessment of the overall conference and presents some of the policy recommendations that emerged.

by

Masaru Yoshitomi

Director-General, Economic Research Institute, Economic Planning Agency, Japan

1. Introduction

Policies aimed at securing national advantage in oligopolistic industries have come to be known as strategic industrial and trade policies. There is a real issue of conflict over the division of the gains from liberalisation, integration, and globalisation of economic activities of such industries. If competition is atomistic and market shares are infinitesimal, strategy can play no role. In a real world of oligopolistic competition, however, the number of participant firms in some high-technology industry may be relatively small, and profits can be above and beyond the "normal" return. In such a world, there are powerful incentives for a national government to ensure, by undertaking unilateral measures, that its own national participants in the competition win a large share of these industrial sectors and profits in the integrated global market. In this sense, implementing such a strategic policy would be in the national interest (Krugman, 1987, pp. 117-140).

The problem is that if all countries were to pursue strategic industrial and trade policies in their own interest, the result could be to block mutually beneficial liberalisation, integration, and globalisation. The outcome would be a fragmented high-cost industry, benefiting no country.

For industries subject to increasing returns, the size of the domestic market can be an important determinant of export performance. For instance, further integration of the European market may produce strategic gains by giving European firms a better base for oligopolistic competition against US and Japanese rivals. However, such strategic gains could be secured only if the larger single market were preserved only for European firms through, say, indirect protectionist measures such as government procurement and industrial standards, or through anti-dumping regulations.

Thus, economic integration and globalisation could sharpen international conflict over the distribution of the gains from economies of scale and oligopolistic rivalry. Some industries are regarded as strategic by all governments, not only in
the static sense of oligopolistic games as suggested by a “new” trade theory, but also in terms of their dynamic potential for future growth and technological change. Such strategic industries are probably not great in number. On the other hand, there are “strategic-transformative” technologies which radically transform the products and production processes of a wide range of industrial sectors, and thus exert a profound effect on the competitiveness of national producers in a wide variety of world markets (Dosi et al., 1988). Furthermore, international competition through market mechanisms will produce a strong trend towards concentrating that kind of strategic industry in one or two countries. There is therefore a danger of an industrial policy war in which each country attempts to secure the desired few industries for itself.

Against this introduction of the basic background issue, the present paper will identify in Section 2 some novel features both of growing interdependence and of policy responses. These are (1) the relative decline of international trade in US high-technology products and associated introduction of voluntary trade restraints; (2) Europe 1992 and its external policy implications for Japanese automobiles and other high-technology products; and (3) the spin-on phenomenon or dual use of technology as a reversal of the spin-off phenomenon and associated techno-nationalism.

Based on these three features and policy responses, Section 3 raises two related issues. Firstly, what are the driving forces behind techno-globalism? Secondly, why do some governments remain ambivalent toward techno-globalism while showing keen interest in enhancing national competitiveness in strategic industries through protectionist measures?

These issues lead to Section 4, which raises the question of determinants of national competitiveness and their relationships with comparative advantage, both static and dynamic. One of the key issues involved here is a critical difference between the Schumpetarian framework of innovation and “new” international trade theories for strategic trade policies concerning the assumptions made about the nature of competition.

Since Japan’s success has certainly set or even fashioned the tone of interventionist policies aimed at advancing its own national competitive positions in strategic industries, Section 5 attempts to identify some conditions for successful development of high-tech industries.

Section 6 concludes by stressing serious limitations to a new trade theory for promoting strategic industries.

2. Novel features of growing interdependence and policy responses

As noted above, if a large country attempts to promote strategic industries, trade conflicts are bound to occur; hence, international co-ordination is called for to avoid the resulting problems (Krugman, 1987, pp. 117-140; Okuno-Fujiwara, 1988, pp. 25-43). How relevant is this international policy implication to the current high technology rivalry among the Triad, i.e. the United States, Japan and Europe?
The decade of the 1980s was characterised by three outstanding phenomena concerning strategic high-tech industries. First, the trade account of US high-tech products turned from a comfortable surplus into a deficit. As a result, various protectionist measures have been adopted by that country. Secondly, the formation of a European Single Market could emerge as a strategic trade policy. Its external trade policy has not yet been explicitly formulated. Nor is it clear how the European Commission will integrate anti-dumping, local content, and rules of origin into a single external trade policy. The recent proposal of the European Commission regarding voluntary restraints on Japanese automobiles both imported from Japan and produced by European-based Japanese enterprises is suggestive of an external policy direction for the Single Market. Thirdly, the spin-off phenomenon of technologies from military to civilian use has been partly replaced by the spin-on phenomenon in the 1980s. Japanese civilian technologies have played a key role in reversing the direction of military-civilian technology spillovers, particularly in the areas of megabyte semiconductors, high-definition television and some new materials. A brief discussion of each of these outstanding phenomena of the 1980s follows.

**US trade balance in high-tech goods**

With regard to US trade in high-tech products, a surprising fact is that the US trade account with the EC continued to generate surpluses of around $10 billion throughout the 1980s, whereas the US trade account with Japan and Asian NIEs deteriorated continuously, turning into a huge deficit of $22 billion and $9 billion, respectively, in 1987 (Table 1).

Furthermore, more than 90 per cent of the bilateral trade imbalance between the United States and Japan is accounted for by only four categories of products: automobiles, computers, VCRs and semiconductors in descending order of the size of Japan’s net surplus. In 1989, these four categories registered a $42.6 billion net surplus, as compared with the total bilateral surplus of $46 billion. The predominance of high-tech products in US-Japan bilateral trade relationships as shown by the four categories is yet another important feature (Table 2).

In sharp contrast, the overall current account imbalances of both the United States and Japan have halved in nominal terms. The US deficit has fallen from its peak of $162 billion in 1987 to an annual rate of $88 billion in the first half of 1990. The Japanese surplus has dropped from $85 billion to an annual rate of $41 billion during the same period. As a result, the ratio of external imbalances to nominal GNP has declined from 3.5 per cent to 1.8 per cent for the United States and from 4.5 per cent to 1.7 per cent for Japan. All of these changes are much larger in volume terms and, hence, in their impact on the countries’ GNP positions, output and jobs. In 1980 dollars, Japan’s current account is now in deficit. The American deficit has fallen by about two-thirds in volume terms.

Such overall external adjustments have indeed been facilitated by drastic real exchange rate changes and by much stronger domestic demand in Japan than in the United States. However, since the income elasticity is high and the price elasticity is low for exports of high-tech products, these exports have shown more resilience than non-high-tech products, resulting in greater shares of high-tech products in total Japanese exports in the face of the yen appreciation.
Policy responses to these developments are well known. For example, Japan's exports of passenger cars have been subject to voluntary export restraints (VERs) since 1981. For semiconductors, the US-Japan agreements on dynamic random access memories (DRAMs) went into effect in September 1986 (set to expire in 1991). US exports of VCRs to Japan have been virtually zero simply because the United States produces virtually no VCRs. In the computer category, supercomputers were negotiated under Super 301 in 1989-90, particularly regarding heavy academic discounts, while the number of US supercomputers purchased and installed by Japan amounted to 25 units, or 20.3 per cent of total installations in Japan in Spring 1990 (Nikkei IBM Watcher).

Managed trade with Japan in the form of either "voluntary" export restraints (say, on passenger cars) or "voluntary" import expansion (VIE, say, for semiconductors produced by "foreign" companies, including those based in Japan) has produced much the same story – that is, oligopolistic rents increasing in favour of Japanese manufacturers, and a strengthening of intervention from the Ministry of International Trade and Industry (MITI) to manage such bilateral agreements. Even in the case of the VIE on semiconductors, it can be observed that since most Japanese producers of personal computers are vertically integrated into DRAM production, vertical integration provides Japanese manufacturers with a significant cost advantage in captive components for computers and workstation products. Managed trade agreements under the vertical integration of Japanese firms have thus enabled the latter to undertake even larger R&D investments. In contrast, the sharp increases or slower decreases in the cost of DRAMs due to the Semiconductor Agreement have raised production costs of US computer producers. Similar arrangements of setting floor prices are now extended to bilateral trade of semiconductors between the EC and Japan. All in all, such managed trade arrangements have created a virtual cartelisation of Japanese manufacturers, who are now comfortable with the new situation as compared with the old one of fierce competition among themselves for perpetual innovations and for lower prices with higher quality.

The European Single Market

The European Commission's proposal on Japanese cars in a Single Market for a transitional period has highlighted the issue of nationality or national origin of multinational enterprises (MNEs). It is indeed ironical that the nationality issue has been raised precisely when traditional national boundaries have become increasingly blurred and made it difficult to determine the national identity of MNEs and their products.

Two important issues have arisen from this type of European Commission proposal. One is a tendency towards the convergence of political-economic interests between some MNEs and their governments. MNEs attempt to make use of the political interests of their own governments' national sovereignty. This is particularly so when they are in a defensive position in global competition and want to protect their markets in strategic products from foreign competition. This nationalism or regionalism is an attempt to preserve not whole value added (wages and profits) or local employment, but corporate profits of "local" or "domestic" multinational enterprises. Economists argue that there is no problem
with foreign direct investment in a host country. What is of interest is the host-
country-based production and value added. If foreign firms are better at providing
the employment, so be it. Whether the employer is a domestic or foreign firm is
almost entirely irrelevant. However, some governments apparently no longer per-
fec.tly apply this argument to strategic industries.

The second issue is a growing tendency for worldwide market share arrange-
ments in strategic products to evolve according to the national or regional origin of
MNEs. This is actually a tendency toward worldwide cartelisation of major stra-
gtic products as witnessed in the automobile and semiconductor industries.

To what extent will these two tendencies (i.e. local profit protectionism and
worldwide cartelisation) be consistent with global interdependence of trade and
technologies of MNEs and national economies? Can the growing global interde-
pendence effectively stem such tendencies? Or will joint ventures and technical
co-operation among MNEs effectively nullify local profit protectionism but
strengthen the tendency of cartelisation?

Technology-security linkage

The dual use of high technologies has raised yet another new issue of
interdependence – namely, that between the national security of a country and
civilian technologies developed by foreign countries. The former now has to rely
increasingly on the latter, as noted earlier.

A dilemma facing the US Government which has arisen from this technology-
security nexus can serve as an illustration.

The US Defense Department has acknowledged that Japan has an edge
particularly in semiconductors, a product so crucial today that it has been labeled
the new staple industry, comparable to iron and steel in the past. It has also
recognised the importance of Japan's technological contributions to the
United States' own security. Hence, US-Japan collaboration is needed and
underlined.

This technology-security linkage, however, should also be understood in the
context of the rivalry between the two industrial powers. The venture of co-
producing the FXS, the next generation of Japan's fighter planes, once enjoyed
the blessing of all. However, the US Department of Commerce and US Trade
Representative suddenly saw the venture as a Japanese plot to steal the jewels of
US technology. This was based on the suspicion that industries newly targeted by
MITI are those in which the United States still holds comparative advantages over
Japan, such as aircraft and satellites. The tolerant US attitude toward the recent
Japanese acquisition of prohibited "Star Wars" technology has also been
criticised, for similar reasons. It is thus argued that "the US should not propose
coproduction unless it will clearly get back as much in technology and value
added as it gives...Nor should it trade advanced US technology to achieve the
goal of compatible weaponry among allied forces" (Harrison and Prestowitz,
1990, pp. 56-76).

Here is the dilemma confronting the US Government. On the one hand, a
series of major studies have documented an alarming erosion in the US industrial
base, including "a decline in the overall number of defense suppliers", "accelerat-
ing import penetration and growing dependency on foreign sources for vital components and subassemblies" and "lagging productivity in key defense sectors" (Cheney, 1989, pp. 23-24). On the other hand, however, the national economic interests of the United States itself may increasingly be infringed upon by Japan, if Japan continues to enjoy a rapid dynamic evolution of comparative advantages partly helped by its access to US advanced technology.

This dilemma leads us to the issue of techno-globalism versus technonationalism.

3. Driving forces for and against techno-globalism

Forces behind techno-globalism

High R&D expenditure and longer gestation periods, coupled with the shorter product cycles of new products, have caused high-tech production costs to rise considerably. Because of this factor, and the increasing complexity of technological innovations, even large multinational enterprises – with their vast innovative capabilities and assets – are compelled to collaborate with other companies.

Another driving force behind techno-globalism is technology fusion, which will take place not only within fabrication industries such as mechatronics, but also within materials industries such as new ceramics (Kodama, 1990).

Generic technologies, which are multi- rather than uni-purpose in their application, affect both product and process innovation across a wide range of industrial sectors, particularly through their embodiment in the production of intermediate products. Furthermore, for the production of a high-technology product, a firm requires many other technologies held by other firms. The production of a large commercial aircraft, for example, requires combined technologies of not only metallurgy and engineering but also avionics and new materials. New telecommunication devices embrace optical fibres and carbon materials in addition to computer technology and electronic engineering.

A multiple-product MNE no longer competes in a single product market. Competition mainly lies in achieving the optimum combination of inputs of various technologies and human capital to produce a specific high-technology output.

From this irresistible trend towards increasingly expensive "creative destruction and fusions", co-operative arrangements concerning R&D and technology proliferated in the 1980s. In particular, joint-equity ventures and specific-purpose alliances, including cross-licensing agreements, have become popular among large firms in dynamic leading industries. Such alliances are efficiency-motivated and functionally oriented. They attempt to reap extra profits from economies of both scale and scope, and hence to capture global markets which such technological fusions and alliances will bring about (Dunning, 1990).

Prior to the 1980s, the modest levels of co-operation among companies centred on relatively non-competitive areas such as basic research and safety. Joint ventures were limited primarily to the manufacturing of products not involving collaborative R&D. Licensing had little to do with co-operative development of new technology. In sharp contrast, the 1980s witnessed a substantial increase in
transnational relationships in R&D and technology, in such industrial sectors as aerospace, biotechnology, computers, software, telecommunications, new materials, pharmaceuticals, semiconductors and machine tools. In order to satisfy these technological requirements and international collaborations, a dense network of transnational linkages has been fostered among companies through their direct investment – that is, techno-globalism.

Since enterprises continue to pursue traditional corporate goals of profitability, growth, and market share, competition among enterprises has become even more intense in the new trend of techno-globalism. Reflecting pressures from enterprises that are afraid of losing out in the intense competition and seek aid and protection, governments are apt to be the primary agent of techno-nationalism or techno-regionalism. More importantly, such techno-nationalism tends to be intensified for national security reasons, including not only narrowly defined military purposes but also broadly defined protective motives – preserving the national industrial base to enhance “national competitiveness”.

The fundamental source of the ambivalent attitude of governments

The attitude of governments towards their economic boundaries has remained ambivalent – that is, they want the benefits of international economic interdependence but not its cost. Even the protectionist policies of some developed countries in the 1980s can in no way negate the general trend toward, rather than away from, global economic interdependence.

The driving forces behind global interdependence are, as discussed above, the high costs of a series of technological advances and fusions and the global need for MNEs to compete more effectively. These are beyond governments’ control. The deeper interdependence is a fundamental source of the convergence of interest between MNEs and national governments. This convergence of interest in turn causes the participating nations to co-ordinate their economic policies and rules of the game in order to keep the international economy on the right course.

At the same time, however, governments pursued increasingly interventionist policies in the 1980s in order to maintain and advance their national competitive positions, for the following reasons.

The comparative advantage principle implies that the resource endowments of nations generally complement rather than compete with each other, although shifts of comparative advantage from one stage to another through the evolution of national resource endowments are not frictionless because of some rigidities involved in factor mobility. In a world of market imperfections, however, it is believed that technology, human capital and organisational systems, rather than natural factor endowments, determine the international competitiveness of technology-intensive, high value added industries, and hence ensure higher living standards for a nation.

All in all, governments face a dilemma: the strong driving force toward techno-globalism on the one hand, and the possibility that national government could ensure higher living standards by “creating” comparative advantage in strategic industries on the other. This dilemma explains the ambivalent attitude of national governments toward globalisation of high-technology activities.
This issue leads to a question: what determines international competitiveness and what are the conditions, if any, for successful promotion of strategic industries?

4. Competitiveness, comparative advantages and high-tech products

**General determinants of a nation’s international competitiveness**

Improvements in international competitiveness will be visible when a country’s market share in the world economy rises over time. They can be achieved not only through an improved ability to compete on prices but also through the improved ability to compete in terms of delivery, quality, and technology. Price competitiveness can be enhanced by non-inflationary monetary policy or by real depreciations of the exchange rate, as in the case of the dollar after 1985. Over the long run, sound medium-term macroeconomic policies are essential to the promotion of national price competitiveness in order to avoid inflation-induced distortion of relative prices and policy-induced cyclical volatilities. The ability to compete in delivery can improve essentially through increases in productive capital stock at macroeconomic levels, as well as through improvements in production and management systems at microeconomic levels. Strong business investment embodying technological progress should provide the key to this via enhanced flexibility of supply. The ability to compete in technology and product quality is determined essentially by cumulative R&D expenditure, the number of scientists and engineers, organisational structure of firms and workshop-level quality control. Over the medium to long run, factors related to technology and productive capacity for delivery are empirically found to have played more important roles than cost or price competitiveness (Fagerberg, 1988).

Expansion in a nation’s international trade, supported by the (thereby strengthened) international competitiveness, may also improve the growth performance of the nation. Particularly when business investment takes place in an economic environment with increasing returns, the marginal product of capital need not decline over time to the level of the discount rate. Then the strong incentive to accumulate capital may persist and long-run growth of per capita income can be maintained. This process can be further expedited by accumulation of knowledge capital. New knowledge spills over from the Schumpetarian innovation and becomes a public good through its diffusion via competition among rivals. This dynamic process creates increasing returns to scale in many areas.

Successful participation in the global economy greatly helps this growth performance. The large scale of the world economy provides great opportunities for increasing returns on R&D investment in new technologies.

**Dynamic evolution of comparative advantages**

There is a widespread notion that Japan’s success in industrial development cannot be understood by traditional economic thinking on comparative advantage. It is often claimed that Japan has “created” comparative advantages for strategic industries. “Policy measures introduced at one moment can have self-reinforcing effects over time. Japan’s promotion and protection of its semiconductor industry
in the 1970s is a significant determinant of the strength of its industry in international markets today" (Dosi, Tyson and Zysman, 1988). Dosi et al. emphasize the distinction between Ricardian or allocative efficiency on the one hand and growth or Schumpetarian efficiency on the other. They assert that there can be a real conflict between short-term Ricardian efficiency (specialising in production of, say, jute and black and white televisions) and long-term dynamic efficiency (say, specialising in high-income elasticity products such as colour televisions and word processors). They go on to claim that growth and Schumpetarian, not Ricardian, efficiency clearly determined economic policy-making in Japan, and that this distinction has made Japan’s industrial development successful.

It is indeed true that the Hecksher-Ohlin trade theory of comparative advantage is static in nature. The theory is based on the assumption of perfect competition in atomistic markets and constant returns to scale. It therefore sees no role for differences in technology across countries and thus no role for the "creation" of comparative advantage via R&D, learning by doing, etc. In short, there is no room for strategic industrial or trade policies. By contrast, competition in the high-tech sectors is fundamentally dynamic, characterised by rivalry among large firms which bring out new and improved products or cut their production costs. For this reason, it is argued, Japan’s success should reflect a Schumpetarian process and cannot be explained only with reference to the static notions of comparative advantage. In a world of imperfect competition and increasing returns to scale, government can play an important role.

The fundamental question imposed by this argument is whether there is any conflict between, on the one hand, static efficiency of resource allocation based on comparative advantage which would require elimination of monopolies and, on the other, a Schumpetarian innovation and the resultant dynamic evolution of comparative advantage.

There are two important aspects to the Schumpetarian innovation. One is that technical change is not an accidental by-product or "residual" of economic activities, but the result of deliberate efforts on the part of enterprises through R&D competition and organisational reforms. The other is that in the basic Schumpetarian framework, such innovation or new technical and organisational knowledge is at least temporarily appropriable by allowing innovative firms to establish monopoly positions. Over time, however, new technologies become public goods through imitation by rivals. Thus, the incentive for innovation depends on the expectation of the innovator that he will be rewarded with such temporary extra profits.

This Schumpetarian world is, therefore, an extremely competitive one, allowing no firms to reap any permanent monopoly profits on the basis of innovations. The result of such dynamic competition is the equally dynamic development of national resource endowments themselves in terms of increasing abundance of R&D and skilled labour inputs per unit of output, relative to other national resources. For this reason, the Schumpetarian dynamic evolution of comparative advantage is not at all inconsistent with the Hecksher-Ohlin trade theory, once one acknowledges the dynamic and endogenous creation of national resource endowments through deliberate policies at both enterprise and government levels.
In general, growth and Schumpetarian technology efficiency cannot be obtained by totally ignoring Ricardian comparative advantage. Comparative advantages are bound to evolve naturally as an economy accumulates capital and skills. In other words, economic determinants of a nation's comparative advantage evolve as the relative abundance or scarcity among endowed production resources (land, raw materials, labour, capital, skills and R&D) dynamically changes through its economic development. As econometrically demonstrated (Balassa and Noland, 1989, pp. 174-188; Grossman, 1989), Japan has registered the dynamic changes in comparative advantage from unskilled labour-intensive to capital-intensive and to R&D-intensive manufactured products over the past two decades (Tables 3 and 4).

A small but growing number of recent empirical studies attempt to analyse the interrelations between international trade and industrial organisation or market structure. These studies depart from the traditional premise by treating firms as oligopolists rather than anonymous pure competitors. Firm behaviour, both domestic and foreign, may thus be described as an oligopolistic game, and therefore market share in world trade can be an objective of international oligopolistic interactions. Such outcomes can in turn be determined by certain strategic variables such as product differentiation, R&D, and tangible investment undertaken by oligopolistic firms (Yamawaki and Audretsch, 1988, pp. 569-579).

While these studies are typically conducted under a cross-sectional approach for one specific year, more dynamic time-series approaches have been adopted in order to highlight dynamic changes in technology-trade relations across sectors over time (Owen, 1989; Owen and van der Loeff, 1989).

Both cross-sectional and time-series approaches have demonstrated that R&D expenditures and other strategic variables in trading countries (United States and Japan in Yamawaki and Audretsch, 1988; United States, Japan and France in Owen and van der Loeff, 1989) are determinants of trade shares in industries (at the 3-digit level). More importantly, not only do the R&D intensities of individual sectors relative to those of other industries diverge within a country; they also evolve differently over time. In particular, Owen and van der Loeff have found that Japanese R&D plays a more critical role than American technological investment; this accounts for Japan's relatively better trade performance, especially with respect to its market share in world trade rather than in bilateral trade with the United States. This finding is consistent with the outcome of other empirical studies, that Japanese R&D expenditures have concentrated on process innovation of product-quality improvement and cost-reduction.

The fundamental rationale for foreign direct investment (FDI) lies in the transfer of firm- and industry-specific intangible assets, such as the knowledge embodied in both new products and new production processes and managerial skills. The surge in Japanese outward FDI in manufacturing in the 1980s should be seen as a reflection of the international transfer of such intangible assets. Indeed, protectionist moves such as VERs and anti-dumping measures have accelerated Japanese FDI. Without intangible assets of technology and managerial skills, however, Japanese FDI would not be able to compete with local producers in host countries who have better knowledge of local market conditions and tastes. Therefore, the recent surge of Japanese manufacturing FDI is quite con-
sistent with the aforementioned trade performance of R&D-intensive industries, where firm-specific intangible assets have been most strongly developed.

This kind of dynamic evolution of comparative advantage differs in economic efficiency from the artificial creation of comparative advantage. The former is economically efficient, since allocative efficiency is secured via the allocation of production resources along the lines of endogenised changes in the relative proportions of production factors. In contrast, the artificial creation of comparative advantage is apt to be economically inefficient, because the actual development of domestic production factors such as capital and skilled labour may not be able to catch up with and fit into the artificially created comparative advantage. No country can afford to enjoy high growth while bearing the prolonged enormous burden of the economic inefficiency of artificially created industries. A policy question is how economic policies at both enterprise and government levels can secure Ricardian efficiency along the lines of endogenised natural evolution of comparative advantages, while "expediting" the development of comparative advantages.

5. Determinants of externalities and conditions for successful promotion of high-tech industries

Determinants of externalities

Many industries seem to have successfully reduced their production costs only after the size of industry's output itself started to expand. Nevertheless, why are only some specific industries viewed as strategic by governments (Okuno-Fujiwara, 1988)? In other words, what specific conditions will create external economies which would justify economic policies for strategic industrial promotion? Generally speaking, capital markets are highly developed in industrial countries. In addition, large companies are in a position to finance losses of new activities out of profits from their other activities. Why then should high-tech industries be promoted by governments?

Externalities can be defined as "a situation in which the private economy lacks sufficient incentives to create a potential market in some goods and the non-existence of this market results in losses in Pareto efficiency" (Heller and Starrett, quoted by Okuno-Fujiwara, 1988). The working of the price system in a competitive environment is responsible for an economy attaining a Pareto efficient allocation. In perfectly competitive markets, prices convey all the information necessary for individual agents to perform their optimal actions, thus giving rise to an efficient allocation for the economy. Therefore, the concept of pecuniary (not Marshallian) externalities is self-contradictory to perfectly competitive markets. Only imperfectly competitive markets might result in market failure, which is characterised by inadequate signalling of economic interdependence through the price system. In oligopolistic markets, knowledge of prevailing prices is hardly sufficient for individual agents to determine their optimal strategies. Economic agents must base their choice of strategies on the knowledge of parameters such as price elasticities of market demand that determine the game they are playing.
Okuno-Fujiwara examined theoretically how interdependence of industries and oligopolistic competition can condition Marshallian externalities. It was found that if a country attempts to promote an industry in order to develop its economy or to capture gains from international trade, the following two conditions have to be satisfied for a successful outcome. First, the industries to be promoted should have many related industries. Second, among related industries, there should be at least one that has economies of scale whose potential benefit is not well exploited.

**Instruments for successful promotion of high-tech industries**

If these two conditions are satisfied, what promotion policy instruments could generate favourable outcomes? There are two different sets of policies available. One set consists of traditional policy measures, such as production subsidies, export subsidy or trade protection, to exploit a sufficiently large domestic demand by domestic oligopolistic industries. The other set is the provision of pre-play communication to generate a co-ordinated equilibrium.

There is, however, always a great risk that the former set of promotion policies may result in inefficient allocation of resources and hence in conflicting outcomes, because the political reality is that protection, once provided, is often not removed. Particularly if this risk is serious, the complementary set of government policies to compensate for insufficient market signals would be much more costly to the economy where those insufficient signals are due to complicated economy-wide industrial interdependence which oligopolistic firms cannot recognise.

It is worth noting that one obvious way to resolve these externalities is vertical integration. As argued by Okuno-Fujiwara, if one industry which produces an intermediate product and can be characterised as oligopolistic due to underlying economies of scale is integrated with another industry which produces a final product from the intermediate product and is also perfectly competitive, then externalities will disappear.

To understand Japanese success in depth, it is important to recognise historical sequences of succeeding mechanisms for promoting industries — i.e. from traditional protectionist measures to exchange of information between the government and the private sector for making more consistent and co-ordinated decisions, and further to vertical integrations of the firms between intermediate and final product industries, particularly in the automotive and electrical/electronics industries. These rather accidental sequences may account for “successful” outcomes of industrial policies in Japan.

Traditional protectionist measures would have retarded domestic competition and hence prevented efficient sectoral resource allocation, and the protection of one industry would have been at the cost of others. Such deficiencies associated with protection measures were minimised to a great extent by the existence of the large number of domestic producers and their “excessive” competition for both domestic and export markets. Advance announcement that such traditional measures were to be liberalised also helped to minimise the deficiencies. Then, traditional protection measures were replaced by the exchange of information between the government and the private sector on new technologies and potential
demand in domestic and foreign markets. Government projections and co-ordination have played the role of focal point in co-ordination decisions among industrial sectors. However, when this co-ordination process was no longer able to work effectively due to the increasingly complex interdependence of technologies and industries, the vertical integration of private firms between intermediate and final product industries became a major vehicle for promoting strategic industries. Thus, traditional protection policies, coupled with tough but sheltered competition, government roles in co-ordination, and the development of industrial organisation, appear to have played – each in turn – a crucial role in promoting contemporary strategic industries. This sequence appears to be critical for successful promotion of high-tech industries in Japan (see also Okimoto, 1989).

Meeting subtle manufacturing conditions: learning by doing

What is often neglected in debates on the effectiveness of industrial policies is that such policies cannot give any concrete instruction on how to “manufacture” a specific product at factory level. An example is production of so-called dynamic random access memories (DRAMs). Two aspects of the technique of production of DRAMs are important. One is a technology fusion, in the sense that DRAM production involves the etching of circuits on silicon chips by a combination of photographic techniques and chemical baths, followed by baking. The other is the extreme sensitivity of the manufacturing process, which gives rise to a distinctive form of learning by doing. Even after having designed a semiconductor chip and having worked out the manufacturing process, the yield of usable chips will ordinarily be very low and defects are high when actual production starts. This is because in some subtle way, conditions for production are not quite right. If a chip is to be produced with minimum defect ratios, everything – including temperature, timing, density of solutions, vibration levels, and dust – must be precisely controlled in a factory. This manufacturing is a matter of learning by doing and experimenting with details over time (Baldwin and Krugman, 1987).

6. Conclusions: serious limitations of a new trade theory for promoting strategic industries

It is now widely recognised that a new theory on international trade under imperfect competition and increasing returns does not provide a blanket vindication of any single, universally applicable government intervention in strategic industries. Even Helpman and Krugman (1989), earliest advocates for a new theory, clearly admit that although neo-mercantilist policies – e.g. export subsidies to give firms a strategic advantage – can be supported under specific conditions, “slight variations on the models eliminate or even reverse their conclusions” and add that “a real world government would be unable to decide which model is most relevant”.

Ironically, new trade theory seems even to suggest new reasons why open international trade is beneficial in addition to those arising from the exploitation of comparative advantage based on differences in factor endowments. More Cournot-type competition, more contestants for contestable markets, more vari-

27
eties for variety-loving consumers: all these should result from freer trade and all should benefit consumers in the face of imperfect competition and increasing returns.

For new trade theories to be valid, the existence of imperfect competition is not enough. There must be sustained above-normal profit and no hidden forms of competition which eliminate such profits. This kind of world assumed in "new" theory is not consistent with the much more dynamic Schumpetarian world. In the real world, innovation, the reaping of temporary monopoly profits by the Schumpetarian innovator, and the subsequent diffusion of proprietary knowledge as public goods are all going on simultaneously. Schumpetarian innovation through deliberate efforts on the part of private enterprise and the resultant dynamic evolution of comparative advantage—strongly supported by the development of national resource endowments themselves—are therefore not at all inconsistent with international trade patterns based on the Ricardian trade theorem of comparative advantage. The number of domestic firms active in export markets also affects the conclusion of new trade theories. The large number of firms will not validate welfare-enhancing effects of an export subsidy due to their investing too much in capacity for production and exports. In fact, the number of domestic firms is much greater in Japan than in Europe and the United States for each category of high-technology industry.

Furthermore, firms do not compete just by altering prices and quantities as assumed in new trade theories. Strategic competition in oligopolistic industries often includes product quality, breadth of product line, after-sales service, R&D and advertising. New trade theory has not given any answers to the effect of export subsidies on these alternative instruments of corporate strategy. Industrial policies for high-tech industries cannot reach factory levels, where manufacturing conditions have to be met in an extremely subtle way to cope with the sensitivity of high-technology products to everything in a factory. This factory-level learning by doing cannot be enhanced simply by attempts to create comparative advantage through government intervention.

Just as high savings and investment and high R&D are the key to the dynamic evolution of comparative advantage at the macroeconomic level, the key to such an evolution at the microeconomic level is competition among private enterprises to sort out extremely risky undertakings in new technologies.
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Note: The definition of "high-technology manufactures" is based on DOC-3.
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<td>48.9</td>
<td>2.7</td>
<td>548</td>
<td>24.8</td>
<td>2.1</td>
<td>699</td>
<td>27.6</td>
<td>2.4</td>
<td>872</td>
<td>24.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Total (four categories)</td>
<td>1 935</td>
<td>36.7</td>
<td>7.1</td>
<td>1 844</td>
<td>4.7</td>
<td>7.1</td>
<td>2 086</td>
<td>13.1</td>
<td>7.1</td>
<td>2 888</td>
<td>29.3</td>
<td>8.6</td>
</tr>
<tr>
<td><strong>Trade balance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Automobiles</td>
<td>18 245</td>
<td>28.6</td>
<td>54.8</td>
<td>22 512</td>
<td>24.2</td>
<td>57.0</td>
<td>31 422</td>
<td>39.6</td>
<td>61.1</td>
<td>31 869</td>
<td>1.4</td>
<td>61.2</td>
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<tr>
<td>Computers</td>
<td>2 245</td>
<td>78.9</td>
<td>6.7</td>
<td>2 011</td>
<td>10.4</td>
<td>5.1</td>
<td>3 548</td>
<td>76.4</td>
<td>6.9</td>
<td>5 008</td>
<td>41.1</td>
<td>9.6</td>
</tr>
<tr>
<td>VCRs</td>
<td>4 022</td>
<td>88.9</td>
<td>12.2</td>
<td>4 700</td>
<td>16.9</td>
<td>11.9</td>
<td>5 736</td>
<td>22.0</td>
<td>11.2</td>
<td>4 343</td>
<td>24.3</td>
<td>8.3</td>
</tr>
<tr>
<td>Semi-conductors</td>
<td>980</td>
<td>158.3</td>
<td>3.0</td>
<td>476</td>
<td>51.7</td>
<td>1.2</td>
<td>401</td>
<td>15.8</td>
<td>0.8</td>
<td>623</td>
<td>55.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Total (four categories)</td>
<td>25 371</td>
<td>42.2</td>
<td>76.8</td>
<td>29 639</td>
<td>17.1</td>
<td>75.2</td>
<td>41 107</td>
<td>38.4</td>
<td>80.0</td>
<td>41 843</td>
<td>1.8</td>
<td>80.3</td>
</tr>
</tbody>
</table>

**Note:** Automobiles include trucks and parts, computers include attached instruments and parts, and VCRs include those integrated with cameras.

**Source:** Ministry of Finance trade statistics.
### Table 3. Structural transformation of Japan’s tradeables sector

<table>
<thead>
<tr>
<th></th>
<th>Share of sector's output in total tradeables output&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Share of sector's exports in total exports</th>
<th>Ratio of net exports to apparent domestic consumption&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gainers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical machinery</td>
<td>5.9</td>
<td>14.1</td>
<td>5.7</td>
</tr>
<tr>
<td>Motor vehicles</td>
<td>6.1</td>
<td>12.0</td>
<td>10.1</td>
</tr>
<tr>
<td>Ordinary machinery</td>
<td>6.5</td>
<td>9.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Precision instruments</td>
<td>0.9</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Losers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture and forestry</td>
<td>13.4</td>
<td>5.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Mining products</td>
<td>1.7</td>
<td>0.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Foods and beverages</td>
<td>15.9</td>
<td>10.5</td>
<td>3.3</td>
</tr>
<tr>
<td>Textiles</td>
<td>8.6</td>
<td>2.7</td>
<td>20.3</td>
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<tr>
<td>Primary metals</td>
<td>14.4</td>
<td>10.3</td>
<td>8.4</td>
</tr>
</tbody>
</table>

<sup>a</sup> Tradeables sector defined to include all manufacturing sectors plus agriculture and forestry products and mining products.<br>
<sup>b</sup> Apparent Domestic Consumption = Output + Imports − Exports.

Table 4. Correlation between measures of R&D intensity and measures of Japan’s revealed comparative advantage

<table>
<thead>
<tr>
<th>Correlation between:</th>
<th>13 Manufacturing sectors*</th>
<th>15 Tradeables sectors*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series (1) and (3)</td>
<td>.238</td>
<td>.643</td>
</tr>
<tr>
<td>Series (1) and (4)</td>
<td>.117</td>
<td>.580</td>
</tr>
<tr>
<td>Series (2) and (3)</td>
<td>-.324</td>
<td>.228</td>
</tr>
<tr>
<td>Series (2) and (4)</td>
<td>-.489</td>
<td>.087</td>
</tr>
</tbody>
</table>

Series:
1. Intramural expenditure on R&D as percentage of sales.
2. Number of researchers per 10,000 employees.
3. Exports as percentage of output.
4. Ratio of net exports to apparent domestic consumption.

a) The manufacturing sectors are: foods and beverages; textiles; pulp and paper; chemicals; primary metals; fabricated metals; ordinary machinery; electrical machinery; motor vehicles; precision instruments; and other manufactures.
b) Includes 13 manufacturing sectors plus agricultural, forestry and fishery products and mining products.

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Support Policies for Strategic Industries: Impact on Home Economies

by

David J. Teece

Professor of Business Administration,
Walter A. Haas School of Business,
University of California at Berkeley

1. Introduction

As nations get richer, concepts of economic development sometimes appear to become more, not less, important. This outcome, which to some economists is somewhat paradoxical, stems from the fact that a nation's relative — and not its absolute — wealth level has important implications for its power and influence in the world, and possibly the self-esteem of its citizens. In recent years there has been a "levelling up" or convergence in real per capita GNP among the industrial countries which constitute today's OECD membership (Madison, 1982).

In the debates and discussions about economic development, the role of "strategic" industries often takes centre stage. This paper gives a brief overview of the concept of strategic industries, identifies policies that have been implemented to support strategic industries, and attempts to assess whether these policies have been efficacious for the countries implementing them. It will not attempt to assess the impact of a country's industrial policies on its trading partners and others in the international system of exchange.

2. Defining a "strategic industry"

Many observers of industrial progress believe that some industries are more important than others in the economic development process. For instance, Robert Harris (1990) points out: "In an increasing number of countries, national policies are premised on the idea that telecommunications is a strategic industry, with economic characteristics that require or deserve special consideration in assessing policy alternatives". Likewise, the semiconductor, computer, biotechnology and civilian aircraft industries are commonly regarded as strategic. However, in popular discussions of the topic, the delineating aspects of a strategic
industry are rarely identified. The attitude of many observers is that they know a strategic industry when they see one.

The concept of a "strategic industry" appears to have its origins in the discussion of leading sectors in economic development. For instance, economic historians have long debated whether the textile industry of Lancashire acted as the locomotive force that powered the Industrial Revolution in Britain. More recently, Albert Hirschman has discussed the role of forward and backward linkages from key industries and their importance for economic development in poor countries. He argued that one strategy for economic development was to promote investment in sectors with strong linkages upstream and downstream. These sectors can be thought of as "strategic" in that they play a critical role in the process of economic development.

However, input/output analysis, pioneered by Leontief, casts doubt on more naïve views of strategic industries. A nation's input-output table identifies upstream and downstream linkages, but the presence of high input-output coefficients is hardly the basis for special treatment of certain industries, or of industrial policy more generally. The automobile companies purchase large volumes of steel; breweries use tremendous quantities of barley, sugar and glass. Few analysts, however, would use these linkages as the basis to justify special policies for promoting automobiles or brewing.

To be "strategic", an industry needs to provide social benefits not reflected simply by the magnitude of its value added. In a sense, strategic industries are "good" industries for a nation to have, just as a firm might think of certain businesses as being attractive, and thus good to be involved in. What then makes an industry "attractive" for a nation? And what makes value added alone an inadequate measure of an industry's attractiveness?

It would be misleading to proceed without recognising that defining a strategic or an attractive industry for a nation is something of a conundrum. Indeed, it is an endeavour that only the naïve can contemplate as straightforward. This is because there are many good reasons to believe that in a well-developed private enterprise system with the institutions of modern capitalism, banks, venture capitalists, and risk instruments in place, firms will find attractive industries and will invest commensurately with the national opportunity. The task here, however, is to identify possible exceptions or market failures - circumstances where a private enterprise system will not invest, or will underinvest - in certain activities which generate significant national wealth but reward private firms poorly. Several such classes of activity can be identified, at least in abstract terms.

First, an industry may be the source of important technological innovations, the benefits of which may not be fully appropriable to the innovating firms themselves. These benefits are likely to spill over to suppliers, to employees, and to customers (Teece, 1986). While the industry need not be domestic for customers to obtain such benefits, a domestic location is likely to enhance the spillover benefits accessible to employers, to suppliers, and to users. For instance, a vibrant semiconductor industry provides the opportunity for enhanced innovation in the computer industry. Because of the relatively tight social and industrial fabrics that exist in most countries, computer firms located in the home country may obtain the benefit of early "design ins," simply by virtue of their superior
access to information about new device introductions. Moreover, the probability that such user firms can attract skilled employees from the supplier is typically higher if the supplier industry has a domestic base.

Second, an industry may generate positive external economies of scale through the supporting infrastructure it attracts. Even the classical economists, most notably Alfred Marshall, were cognisant of this effect. Quite simply, it means that early investors in an industry help put into place the necessary infrastructure – possibly transportation and telecommunications, suppliers, consultants, etc. – that makes subsequent entry by others easier and cheaper. California's Silicon Valley is today that environment for semiconductor and computer companies. South San Francisco and Emeryville provide a supportive environment for biotechnology. Bavaria may yield similar benefits to auto companies. These externalities are often regionally concentrated and are not usually concomitant with the borders of the nation state.

These two cases of externalities – those due to spillovers from innovation and those stemming from locational synergies – are widely recognised. They suggest that strategic industries can be defined according to whether they are technologically progressive (with little protection from the standard instrument of intellectual property protection, and therefore associated with large spillovers) and whether they provide infrastructure to other firms in the same industry or in related industries. However, at least among academic economists in the United States and the United Kingdom, the consensus then stops. There are very few additional criteria that can be agreed upon. Also, while policy interventions based on externalities might undergird policies to support the innovation process, they need not be articulated as industry-specific policies. Support for "generic" technologies and activities flows more naturally from the discussion of externalities.

Some analysts have suggested definitions of strategic industries that are much more inclusive. According to Harris (1990), a strategic industry is one that has characteristics – such as scale and scope economies, learning economies, network economies – that cause it to depart from perfect competition. Inasmuch as practically all industries depart from perfect competition, such a definition is very expansive indeed. Gressor (1984, pp. 243-244) defines strategic industries as those that "in a given time and place have been the primary cause of economic growth". This can, perhaps, help one identify a strategic industry ex post, but not ex ante.

However, there seems to be agreement, particularly outside the Anglo-American academic economics community, that whatever the definition, strategic industries can somehow be identified, and governments should promote them. For instance, there seems to be almost universal agreement that the semiconductor industry is strategic and a leadership position in it is critical to economic development. Siemens Board member Anton Pieisl believes that semiconductors are "like strategic weapons. The nation or continent that aspires to be internationally independent and competitive in the information technology sector must command the entire electronic 'food chain' from semiconductors to end products". Likewise in the United States, the National Advisory Committee on Semiconductors (1989, p. 5) argues that "today's $50 billion world chip industry leverages a $750 billion global market in electronics products and 2.6 million jobs in the United States". Executives seem to equate strategic industries with attractive industries that are
technology-based and which provide components or other inputs to a set of fast-growing downstream industries.

There are ways to reconcile the divergent viewpoints that exist between the "impartialists" or "neutralists" (those who do not believe there is any conceivable case for discriminatory policies or preferences among industries by governments) and the "partialists" (who believe that the basis for industry-specific promotion policies exists). One such basis lies in the possible truncated horizons of managers and investors. If managerial time horizons are shorter than is socially optimal, this will tend to bias investment against high-technology industries. Put differently, if certain high-technology industries require investments which yield payoffs only in the distant future, and if firms are myopic for one reason or another, then a system of private markets may well cause underinvestment, which is likely to be particularly pronounced in emerging industries. Such myopia may stem from a number of causes including the use of decision rules, like discounted cash flow, which do not adequately account for the option value of investment in new technologies; it may stem from the agency problems rooted in the separation of ownership from control; it may stem from the structure of capital markets, including a cost of capital which is rigged above the socially optimal level. All of these factors are candidates to explain why governments, as a matter of sound economic policy, may wish to implement support policies for "strategic" industries.

3. **Support policies in civilian aircraft, biotechnology and semiconductors**

Governments everywhere implement policies which are designed to overturn the neutrality principle. This section examines the range of sector-specific instruments chosen; it will not address industrial policies that are not industry or sector specific. These have been examined elsewhere (e.g. Nelson, 1984). Of course, much industrial policy, such as government expenditures or subsidies for basic research and education, is not industry or sector specific. Admittedly, it is often not easy to separate such "generic" policies from industry-specific ones, because certain generic activities may impact one industry more than another. For instance, a policy to fund university research in basic chemistry is more likely to impact the chemical industry than the electronics industry, although there are some obvious exceptions.

Support policies for "strategic" industries include: non-university sector-specific support for research and development activities; industry-specific tariffs, quotas, and orderly marketing agreements; subsidies; tax relief; discriminatory procurement; direct foreign investment restrictions or incentives which are industry specific; some industry-specific health and safety regulation. The rest of this section examines several of these policies in the context of certain industries and assesses whether they have had the effect of fostering the development of the targeted industry.
Civilian aircraft

Throughout the post-World War II era, governments have been heavily involved in supporting the development, production, marketing, and sale of aircraft as well as in the operation of a largely government-owned air transport system. This involvement has covered the spectrum from mandating aircraft specifications to meet specific national airline requirements (as in the case of government-owned British European Airways in specifying the design of the Trident), to funding development (as in the case of the Conway engine, the Caravelle, Concorde, and A300 aircraft), to financing uneconomically low rates of production (for the RB-211 engine and the A300 and A310 aircraft). Government support, through ownership of or involvement in the industry, has also been directed at regional transports such as the C-212, the helicopter family of Aerospatiale, the Canadair Challenger, the British BAe146, the Bandeirante of Brazil, and the CN235 developed jointly by Nuritania of Indonesia and CASA of Spain. A variety of reasons were articulated to justify these actions, e.g. to support domestic industry, to avoid a condition of dependency, to provide employment, to stimulate technical growth, and to foster national prestige.

These programmes had limited commercial success through the 1970s. On balance, the programmes probably constitute a net drain to the economies of the countries involved². Such judgements are difficult to make, however, in part because assumptions must be made about the level of unemployment if the programme had not been sponsored, about the social and economic costs of unemployment, and about the value of skills and technology developed and diffused throughout the economies of the sponsoring nations.

There can be no doubt that government involvement has changed market outcomes in civilian aircraft. For example, Airbus A300 production began in 1972, but when deliveries began in 1977 there were only ten firm orders. No private enterprise could, or would, have been able to continue production under these circumstances. The production for inventory – made possible by government financing – provides a tremendous delivery advantage. It also provides a powerful incentive to offer below-market terms and conditions for sales financing in order to move the aircraft out of inventory. Both faster delivery and attractive financing have obvious competitive advantages.

Another way in which government involvement affects the competitive situation is in its capacity to sustain a programme over long time periods. The European governments supporting the Airbus Consortium have been seeking to establish a viable civil aircraft industry for almost thirty years, and they are now beginning to succeed. In 1980, Japan’s Ministry of International Trade and Industry (MITI) identified aerospace as one of Japan’s future industries, and the building of a capability for its aerospace technologies as one of the two most important assets for the industry’s future. This and MITI’s announced plans for Japan’s aircraft sector to be competitive with Western industry by 2010 indicate the long time horizon with which Japan’s Government approaches targeted industries. The common assumption among both US and European aircraft manufacturers is that Japan intends to play a major role sometime in the mid-1990s and beyond, and to use international joint development programmes as an avenue to building competence. Indeed, the long time intervals for design and development and the long

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aircraft lifetimes are well matched to the long time horizon that can characterise government initiatives.

The airline procurement process has always been politicised and is another aspect of support policies. It is instructive to note that British Airways and Air France were required to purchase the BAC-111, the Trident, and the Caravelle as long as these aircraft were in production. More recently, the Airbus A300 and A310 have benefited from this directed mode of procurement in France. British Airways is now private and more immune to governmental procurement pressure.

Involvement by the French Government was evident in the engine procurement decision for the Air France Airbus A310. The General Electric-SNECMA (US-French) partnership was competing vigorously with Pratt and Whitney. The specific engine involved was a version of the CF6, but GE and SNECMA had an extensive history of co-production of engines and were also currently partners in developing a new engine, the CFM 56. The question of which engine Air France should be allowed to purchase was the subject of two formal interministerial reviews. The government finally directed purchases of the GE/SNECMA engine, with its partial French content. This example not only demonstrates the impact of government involvement, but also the advantage of an international partnership for a US manufacturer.

Situations in which governments are involved in purchase negotiations through their national airlines are frequently subject to allegations of offers of tie-in sales, technology assistance in other fields, and counter-trade proposals that private firms cannot match. The belief is widespread in industry that these inducements are frequently used and are effective. Not surprisingly, no documented evidence of such arrangements is available.

A particularly salient aspect of government involvement concerns financing of purchases. Due to the long time interval associated with payback, financing terms have significant leverage on the eventual cost to the customer. The discussion that follows will examine the general situation and then look specifically at the circumstances for large and smaller aircraft.

Below-market element of financing is a major support policy used in the OECD Member countries. The Export-Import Bank (Eximbank) in the United States, as part of the commonline agreement relating to large transport aircraft, charges a fixed rate plus a 0.5 per cent commitment fee. However, it charges a 2 per cent application fee that is paid either up front or over the first six semi-annual instalments. On the guarantee option, the guarantee fee is 0.5 per cent with no loan application fee. However, the funding of the guaranteed paper is at market rates. The European export agencies only provide credit guarantees, but will support aircraft exports to the extent of 62.5 per cent of the cost of the aircraft rather than 42.5 per cent as in the case of the Eximbank. In consequence, the United States has offered 62.5 per cent and the Europeans have come down to 42.5 per cent on recent competitive transactions. Eximbank repayment occurs only after private lenders have been repaid. The funds are provided by private institutions, but the export agencies subsidise the rate at the commonline level, which is presently 12 per cent. Both the Eximbank and the European agencies will provide financing up to 85 per cent if the other offers it. The basic result is that the direct financing of a sale is close to parity except for the 2 per cent application fee
(the normal European fee is 0.3 per cent). This fee makes the financing of the US export more expensive and front loaded.

Another feature is that the Eximbank will not cover the foreign content of a US export, while the European export agencies will. In consequence, the US exporter has to find another way to finance this portion of the aircraft cost. With a growing percentage of foreign content in US aircraft exports, this becomes a growing problem and a competitive disadvantage for the US manufacturers.

The Eximbank and the European agencies now have an informal understanding not to provide financing commitments in one another's countries, i.e. the United Kingdom, France, Germany and the United States. This recent development may prevent some of the unusual transactions conducted in the past.

In the case of small aircraft, the impact of financing terms can be so large that it drastically changes the competitive balance in the purchase. In some cases there would be no sales without it. The preferential financing terms being offered by some foreign export agencies and manufacturers include a minimal down payment, a below-market interest rate, lengthy maturity, and deferral of the repayment of principal for a number of years. Some US regional airlines, with balance sheets and income statements that would not permit raising funds in the private debt markets, are purchasing foreign aircraft because of these below-market financing terms.

**Biotechnology**

Public policies, and to a lesser extent sector-specific policies, have had a fundamental effect on the development of biotechnology. Policies targeting biotechnology were first conceived in Japan and Europe in the early 1970s. In Germany, the BMFT (Ministry for Technological Research) launched a programme for industrial biotechnology in 1972. In 1973, the Japanese Science and Technology Agency established a committee for biotechnology (the committee for the promotion of life sciences). In Japan, long-term development of bio-reactors and medical applications was targeted, reflecting concerns over the international competitiveness of the Japanese pharmaceutical industry. In Germany, the programme was fitted more to the interests of the chemical industry in enzyme and fermentation technologies, but with support from interest groups concerned with global hunger and pesticides. By the early 1980s, the governments of all major industrialised countries except the United States and Italy had targeted biotechnology (Orsenigo, 1989, p. 169).

That is not to say that public funds in the United States were not spent on biotechnology. On the contrary, for basic research in biotechnology, the National Institute of Health (NIH) and the National Science Foundation (NSF) jointly provided over three times the funding of Japan, Germany, France and the United Kingdom combined through the decade of the 1980s. However, the US effort came through the general mandates of the NIH and the NSF to support scientific research; it did not represent a co-ordinated effort to target biotechnology.

Japanese public efforts have been focused further downstream than public support in the United States. While the distinction between basic and applied research is rather blurred in biotechnology, there is little doubt that the Japanese efforts have concentrated on the development of bioprocessing technologies. In
the main, the role of government agencies in Japan has been to assist in the co-
ordination of business strategies, harmonizing private strategies with the public
interest, and creating a shared long-term vision. As always, flexibility, pragmat-
ism, and eclecticism have been the hallmarks of Japanese industrial policy in
biotechnology.

In the United Kingdom, government policy has been directed at exploiting the
research base of the nation, trying to ensure that Britain's scientific prowess
translates into a global market-place presence. Accordingly, attention has been
given to finding how to invigorate the commercialisation of biotechnology. The
most salient aspect of government intervention was the foundation of Celltech by
the BTE, in collaboration with other companies and investors. Celltech was ini-
tially given preferential commercial rights to exploit research from the publicly
funded laboratories of the Medical Research Council. In sum, British policy
reflects a reluctance to engage in direct targeting. Indeed, the government quickly
sold off its minority equity position in Celltech.

In France, public policy has been focused on stimulating the involvement of
industry and the creation of new enterprises. In addition, public research
organisations such as the Institut Pasteur were conceived and supported as
nodes of scientific excellence and development. The transfer of knowledge to
industry was to be accomplished through the use of industrial fellowships linking
publicly funded research organisations to industry. Large companies were pro-
vided subsidies to assist their development as national champions. In biotechnol-
ogy, as in other industries, the French Government has taken the most dirigistic
stance among the leading industrial countries.

Semiconductors

As mentioned earlier, many executives believe that the semiconductor indus-
try is the archetypical modern strategic industry. As stated by the President and
CEO of SGS Thomson Microelectronics, "No strong industrial society can survive
without a strong and dynamic electronics industry and...a strong electronics
industry cannot exist without controlled access to advanced semiconductor tech-
ology" (Pistoria, 1989).

The semiconductor industry was pioneered in the United States. Its origin
there has been attributed in part to the country's concentration of high-risk R&D
resources, the presence of a bridging mechanism between the scientific and
business communities and organisations, and military procurement (Dosi, 1984,
p. 42). The Defense Department was willing to pay premium prices for leading-
edge devices like transistors and integrated circuits (Nelson, 1982). Through the
1950s and 1960s, US firms built and maintained an unassailed lead in semicon-
ductors. Europe and Japan were relegated to playing catch-up. The 1970s were
to change this.

In 1970, Intel introduced the first prototype of a DRAM, but by late 1979,
Fujitsu introduced the first working and marketable 64K DRAM, taking the industry
by surprise and signalling the arrival of a new competitive regime. Ever since, the
semiconductor industry has witnessed an extremely vigorous competitive race
between the United States and Japan.
Support policies in Japan, which appear to have assisted Japanese industry, include government-sponsored co-operative research – such as the VSLI project – and restrictive trade practices. Because of the large learning economies in the manufacture of semiconductors, the domestic industry can be both protected and made competitive through restrictions on imports. There seems little doubt that the protection and development of Japanese industry were the objectives of Japanese trade and investment policy, at least through the 1970s.

The US response has been both private and public. Besides individual firm responses, the industry itself took the unusual step in 1982 of organising the Semiconductor Research Corporation (SRC) to create generic research products for the industry and to increase the output of semiconductor engineers. By 1989 it had grown to a $20 million programme with forty-four organisations sharing in its funding. Its research is almost all contracted out to universities.

More recently, the industry formed and received partial government funding for Sematech – a consortium of fourteen US semiconductor manufacturers that sponsor and conduct research on semiconductor manufacturing technology. Its goal is to achieve parity with and then overtake Japan in semiconductor manufacturing by 1993. The organisation has a steady state annual budget of $200 million with half of the funding provided by the federal government. The Defense Department, through DARPA, is represented on the board of directors. The 1989 Report of the Advisory Council in Federal Participation in Sematech calls the consortium “a national project, not a national policy”. Whether Sematech will continue to receive matching federal government funding has been a matter of constant speculation; the indication is that the position of the federal government towards its participation in such ventures is extremely ambivalent because it involves the co-investment of public and private funds in a privately owned and operated consortium. It can also be construed as “targeting”, which is philosophically and ideologically uncomfortable for the US Government, and particularly for a Republican Administration.

4. Measuring industrial subsidies

One of the few elements of industrial support that can be measured is subsidies. However, even analysis of industrial subsidies is impeded by the lack of suitable data.

Yet, the available evidence, according to a recent OECD study (1989), suggests that the average industrial subsidy rates are much lower than for agriculture (see Figure 1 and Table 1). Among the OECD countries, the United States and New Zealand had the lowest rates for industry (0.5 and 0.8 per cent of sectoral GDP, respectively), while Sweden and Portugal had the highest (7.4 and 6.5 per cent). However, industry totals mask substantial differences in subsidisation within sectors. For instance, shipbuilding and steel have received concentrated support in practically all EC countries, as have railroads. Aerospace has also received concentrated support, particularly in the countries supporting the Airbus Consortium.
Figure 1. Industrial and agricultural subsidies, 1986*
As a percentage of sectoral GDP

### Table 1. Subsidies by sector (National Accounts definition)

Percentage of sectoral GDP

<table>
<thead>
<tr>
<th>Year</th>
<th>Industry</th>
<th>Agriculture</th>
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<th>Transport</th>
<th>Housing</th>
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* a) Including communications.
* b) Excluding mortgage interest deductibility.
* c) Including food processing.
* d) Based on input-output data.
* e) As a percentage of total GDP.

*Source: OECD, 1989.*
Data on subsidies, while of interest, do not capture more than a fraction of the totality of industrial support. "Orderly marketing agreements", "voluntary" restraints, standard sponsoring and government procurement are just some of the support activities discussed earlier but not reflected in subsidies. Indeed, an important message conveyed by the OECD data is that subsidies, while important, ought not to be thought of as the linchpin of support policies for strategic industries. Nevertheless, their distortionary impact is likely to be considerable.

5. Impact of support policies

The three thumbnail sketches of support policies in particular high-technology industries developed in Section 3 provide little foundation on which to generalise with respect to the impact of support policies on the nation states adopting the policies. What appears to be the case is the following: the European countries supporting Airbus have created a world class civilian aircraft industry in Europe – world class in the sense that it has an impressive share of the world market. What is invisible is the price that has been paid, and remains to be paid. Clearly, the sponsors are sufficiently impressed to continue funding the consortium. The Japanese are advancing rapidly, but Boeing nevertheless appears to be holding its lead. In biotechnology, the United States and Japan are vying for leadership; the US industry is unquestionably benefiting from a large allocation of federal funds to medical research; the Japanese industry is more co-ordinated, and government policy is focused on commercialisation rather than basic research. The US advantage stems as much, however, from the presence of a vigorous venture capital market and the capacity to develop new enterprises, and close university-industry linkages. However, the recent sale of Genentech (the leading US biotechnology firm) to Hoffman LaRoche signals the inability of US firms to raise the capital to maintain world leadership. In semiconductors, Japanese support policies seem to have been an important factor in leading to a rapid catch-up to the United States; the US response entails little in the way of government involvement.

Based on these observations and others, the following generalisation can be tentatively advanced. First, targeting has a better chance of being successful for a strategy that involves "catch-up" than for one that involves pushing the frontier. With no clear model to follow, it is extremely difficult and indeed hazardous for government officials to get involved in helping to identify the leading firms, industries, and technologies of the future. Indeed, in the United States, politically, it is almost impossible for government to explicitly involve itself in shaping industrial outcomes where global industrial prowess and dominance are the objectives.

Second, successful targeting requires something that most nations lack: the ability to co-ordinate various aspects of government policy – such as trade, investment, technology, and antitrust. Without this capacity, targeting is extremely difficult to effectuate, even setting aside its desirability. In addition, governments need the capacity to keep special interest groups at bay – or, at least, to channel their capacities in directions that advance the public interest.

Third, there is little systematic evidence that more dirigistic approaches work better. Japanese efforts in sector-specific policies seem to have done well; today,
they appear to be guided less by government than are French efforts. Certainly, this is so in micro-electronics, computers and biotechnology. In particular, the national champions approach adopted in France has been a highly visible failure. Moreover, the countries with high subsidy levels identified in Section 4 do not appear to be star performers. Japan has one of the lower rates of industrial subsidies, yet it is clearly the star performer.

Fourth, there seems to be considerable evidence and agreement that support of basic and generic research is both legitimate (from the perspective of economic science) and efficacious. The US lead in biotechnology stems in large measure from the availability of funds which could be steered into these opportunities without political involvement. However, there is also evidence that massive research expenditures are not sufficient to influence industrial outcomes in many instances. Differences in industrial structures, the cost of capital, education systems and the macroeconomic environment usually are more critical to industrial success than are sector-specific policies.

6. Conclusions

Sector-specific policies have a delicate rationale. With the possible exception of Japan, there is little evidence that overt sector-specific policies have been designed and implemented in a way that enhances the national welfare of the countries that have used them. That is not to say that government policy does not have enormous impact on industrial outcomes. For instance, there is little question that defence procurement was important to the early development of the civilian aircraft and semiconductor industries in the United States. However, these outcomes were simply a by-product of other missions, and ought not to be thought of as targeting. Moreover, the considerable intra-industry variability in firm-level profits suggests that the basis of competitive advantage lies at the level of the firm, not the industry or sector. Furthermore, at the level of the firm, organisational and economic factors are paramount in explaining the performance of the business enterprise (Hansen and Wernerfelt, 1989). To the extent that sector-specific policies impact firms uniformly, studies exploring the determinants of firm-level performance suggest that other factors, and in particular matters of internal organisation and management, are more critical to competitiveness than are sector-specific policies.

Finally, the linkage argument which is so often advanced in support of sector-specific policies is weak, as indicated earlier. This is, in part, because the magnitude of the input-output coefficient is a poor measure of the kind of linkage that really counts – those that involve the transfer of learning and skills. Moreover, the eighteenth century British textile industry and nineteenth century American machine tools are good examples of how a market system, not government policy, supported the development of these industries and the associated linkages.

Needless to say, sector-specific policies may well have a substantial beggar-thy-neighbour component, and on those grounds are likely to be a source of considerable inter-governmental friction. This has not been a substantial brake on sector-specific policies to date, primarily because the United States has been
reluctant to make it much of an issue, although this may be changing. However, if
the United States and other nations were to come to believe that the successful
industries it has are the ones its trading partners do not want, and were to begin to
retaliate, the efficiency of sector-specific policies would be even more in doubt.

What is needed is a careful articulation of the case for sector-specific policies
and agreement among nations as to what is acceptable support and what is not.
This would require a sophisticated understanding of the limits of market
processes in many different institutional environments, and an understanding of
the capacity of governmental processes at all levels to assist and hinder market
processes. Such an understanding would not only benefit the OECD Member
countries; it would be of tremendous value to Eastern Bloc countries that will
undoubtedly wish to play catch-up, now that they are unshackled from Marxist
dogma. Sector-specific policies are likely to be high on their agenda. Good schol-
arship and a careful review of industrial history can perhaps help them avoid the
most egregious policy errors.
Notes

1. Most academic economists in the United States are skeptical that there is a difference in economic significance between an industry that produces a dollar’s worth of silicon chips and one that produces a dollar’s worth of potato chips.

2. A variety of studies have established that the social returns to innovation are commonly greater than private returns.

3. According to the US Department of Commerce, the Airbus Consortium has received direct subsidies of $13 billion and it will not be profitable for the foreseeable future (Business Week, 8 October 1990, p. 42).

4. This section draws heavily from Orsenigo (1989).

5. In 1987, the federal government spent $2 billion to $7 billion on biotechnology research and development; the private sector provided an additional $2 billion.

6. The degree to which industrial subsidies are a serious policy problem depends on the magnitude of their welfare effects, which is likely to be a function of the size of the subsidies.

7. It has been argued that without Airbus, Boeing would have obtained a virtual monopoly, and Europeans and others would have paid more for aircraft. This conclusion is highly speculative. In the absence of Airbus, McDonnell Douglas and/or Lockheed would have had a decent chance of increasing market share against Boeing. In addition, US antitrust law would have constrained Boeing’s behaviour somewhat. Furthermore, with larger volumes and the attendant lower costs, purchasers of aircraft could well have received lower prices than those which have prevailed with the highly subsidised entry of Airbus.

8. The sponsors are the governments of France, Germany, the United Kingdom and Spain.

9. The primary victims of Airbus success appear to have been McDonnell-Douglas and Lockheed in the United States.
Bibliography


National Support Policies for Strategic Industries: The International Implications

by

Luc Soete

Professor of International Economics,
Maastricht Economics Research Institute on Innovation and Technology,
University of Limburg, the Netherlands

1. Introduction

Once upon a time, according to a story international trade theorists like to tell each other, there was a paradise in which everybody lived efficiently, producing and trading whatever was demanded in the most efficient combination. Then an angel came along and stamped on each person’s forehead a different colour – a kind of national flag – allowing him or her to produce and trade only with capital and land of the same colour. The diaspora that followed led to large differences in efficiency across the world, and to a huge world welfare loss. Since that unhappy moment, trade theorists (by definition economists with a world rather than national welfare vision) have been trying to show how to get back to paradise.

The first main “road back” had been paved by classical economists: their idea was that despite a country’s poor efficiency, there could be gains in welfare if the country specialised in those products/industries in which it was relatively most efficient. Such gains were mainly based on the application of division of labour principles to an international world. The neo-classical extension of this line of analysis more formally introduced “factor endowments” that indicated a country’s comparative advantage and established a number of crucial links with factor-price equalisation, income distribution and growth. In terms of our parable, it could be said that trade theory explained how, through free trade, paradise could be re-established all over the world despite national differences in “factor endowments”.

There is no doubt that international trade has been one of the main engines of growth in the postwar period. With the continuous liberalisation of trade, world trade flows increased over the period 1950 to 1975 by more than 500 per cent, compared with an increase in world output of only 200 per cent. However, despite the success of institutions such as the GATT in developing a stable, liberal and non-discriminatory trade system which came to dominate ever larger areas of
manufacturing, trade theorists themselves began to question the theoretical basis underlying such trade flows.

First of all, empirical trade analysts found it increasingly difficult not to be surprised by the large portion of trade flows which did not fit "pure" trade theory explanations. These findings, described as the Leontief paradox, seemed to be clear evidence of the limits and limited value of pure trade theory in a world dominated by more realistic imperfect competition phenomena. The unease with the existing theoretical trade framework became a standard opener in trade analyses. Bhagwati, writing some twenty years ago, put it as follows: "the realistic phenomena...such as the development of new technologies in consumption and production involve essentially phenomena of imperfect competition for which, despite Chamberlain and Joan Robinson, we still do not have today any serious theories of general equilibrium.... Unless therefore we have a new powerful theoretic system...we cannot really hope to make a dent in the traditional frame of analysis" (1970, p. 23); Hufbauer (1970), in a somewhat more ironical tone, reviewed his empirical "paradoxical" results by observing that they could "as yet offer little to compare with Samuelson's magnificent (if misleading) factor-price equalisation theorem".

Other queries related more directly to the success of "traditional trade theory" in quantifying the gains from trade. Much to the surprise of many policy-makers, trade analysts came up with rather low estimates of gains from trade following liberalisation and the creation of free trade markets. Some of the most important and obvious gains from opening up to trade – e.g. related to scale economies and product variety – were excluded from the pure trade model.

As the quote from Bhagwati cited above hinted, it was only a question of time before a "new" line of analysis appeared. This second approach, developed over the last ten years, started from a fundamentally different assumption: that most economic activities are characterised by increasing rather than decreasing returns. In other words, gains from trade are in the first instance the result of the scale economies that each national economy, whether large or small, can achieve through free trade. These gains are actually far more significant than traditional trade theory would lead one to believe. Many empirical studies within the "new" trade theory tradition have pointed to the significance of such gains, both in the further harmonisation of the European Community’s large internal market and in the Canada-US free trade agreement (Smith and Venables, 1988; Harris, 1984).

In terms of the opening parable, it could be said that the way to paradise for large nations, where particular activities have been concentrated in particular locations (Krugman’s favourite example is mushroom production in Pennsylvania), is the same as it is for the world as a whole: bring resources together, be it motor car manufacturing in Japan or ceramic tiles in Italy. The advantages accruing to the region or country from the "agglomeration" of a particular activity diminish in importance when compared to the advantages that efficient exploitation of world economies of scale offers to every world consumer.

However, in setting out from such a radically different assumption, "new" trade theory has also led to a plethora of "new", sometimes opposing theoretical results with respect to some of the basic trade theorems. The most controversial normative result from a traditional trade perspective has undoubtedly been the
illustration by Brander and Spencer (1983, 1985) that free trade may no longer be the only policy to maximise world welfare gains, but that a "strategic" trade policy may in some cases be justified and actually needed. As Dixit (1986) pointed out in his contribution to Krugman's book on strategic trade policy:

Recent research contains support for almost all the vocal and popular views on trade policy that only a few years ago struggled against the economists' conventional wisdom of free trade. Now the mercantilist arguments for restricting imports and promoting exports are being justified on grounds of "profit sharing". The fears that other governments could capture permanent advantage in industry after industry by giving each a small initial impetus down the learning curve now emerge as results of impeccable formal models. The claim that one's own government should be aggressive in the pursuit of such policies because other governments do the same is no longer dismissed as a non sequitur.

The discussion surrounding strategic trade policy has undoubtedly accentuated many features which — at least at first sight — appear to reflect more closely the industrial reality with which both policy-makers and businessmen are confronted in many sectors. Particularly with respect to analyses of technical change and international trade, this discussion seems to offer a better theoretical framework for debating the whole spectrum of trade, industrial and technology policies. The importance of monopoly rents, profit-sharing and strategic trade manipulation indeed seem of particular relevance to many high-technology industries. Furthermore, these new theories actually emerged on the US academic scene at a time of increasing fears in that country of the Japanese challenge in trade and technology (Mowery and Rosenberg, 1989).

However, the emergence of strategic trade concepts also points up some of the dynamic features associated with technological change, in particular its cumulativeness. In Dosi, Pavitt and Soete (1990), these features were identified with a different, third stream of analysis.

Compared with the previous set of "new" trade theories, this analysis more strongly emphasizes the dynamics of increasing returns, particularly those associated with production technology and innovation. Again returning to the opening parable, to the extent that technological development and growth are irreversible processes, there is no possible return to paradise. As many locational theories underline, the main reasons have to do with the way industrialisation locations get "selected" early on and, by appropriating the available agglomeration economies, exercise some degree of "competitive exclusion" — to use Arthur's (1985, 1989) term — on other locations. From a dynamic technology perspective, in other words, it does matter whether a region or country is specialised in mushroom production or silicon chips. Few authors adhering to the "new" trade theory have yet fully integrated these dynamic features in their trade models and policy conclusions¹.

Is there no "normative" world paradise to be attained according to this last view? In terms of unifying overall principle, the answer to that question can indeed only be no. The normative counterpart of any dynamic, more evolutionary analysis emphasizes the crucial role of history, of man-made interventions, of institutions, of particular international investment decisions of multinational corporations — in
other words, of the whole spectrum of individual and collective decisions made in a system as complex as the international economic environment.

This paper discusses, albeit briefly, some of the international implications of such strategic industrial policies. There is, as will be argued below, a significant role for policy-making, both in terms of the need for a more harmonized and more coherent set of national industrial, technology, competition and trade policies, and in terms of the need for international rule-based systems to go beyond trade and include industrial and technology policy.

From this perspective, there is a significant paradox in the actual emergence and growth of such domestic strategic industrial policies and their theoretical foundations, at a time when the “domestic” firms at which such policies are aimed are becoming increasingly global and “multi-domestic”; are themselves involved in so-called “strategic” alliances; and are increasingly sourcing on an international scale “strategic” science and technology inputs. It is as if such firms have become cause, victims and beneficiaries of the increased trade friction that followed widespread implementation of strategic trade policy. Before discussing these issues in more detail, it may be useful – as the repetitive, yet rather differentiated use of the word “strategic” in the above sentences illustrates – to discuss some of the various conceptual definitions used with respect to “strategic” industries.

2. Strategic industries

From an analytical point of view, it seems appropriate to consider within this context three rather different definitions of “strategic”: a technological one, a trade one and an industrial one.

The first, probably most minimalist definition relates to the military interpretation of the term “strategic”, whereby long-term access is the main reason for justifying strategic interest and readiness for extra support costs. Access to some products or technologies is thus a “strategic advantage”. The military notion of strategic is probably most clearly reflected in the attempt over the last decade to prevent the export of “strategic” high-tech products to Eastern European countries. The purpose here was clearly twofold, a military one – which need not be discussed here – and an economic “strategic” one, closely related to the essential role of certain high-tech products as inputs in both capital and final consumer goods.

However, it is not immediately obvious why high-tech products would fall under the category of strategic products, certainly not when compared to some scarce natural resource (e.g. oil), of which world supply is concentrated in one or a number of particular countries. To the extent that high-tech products are continuously subject to “creative destruction” through the entry onto the market of new inventions and innovations, and that knowledge is difficult to contain within firms let alone countries, new scientific and technological breakthroughs and the international diffusion of technology are likely to be major factors in rendering such strategic high-tech products quickly obsolete. If one thinks of the costs in developing strategic capabilities in e.g. micro-electronics technology, it will become obvious that the continuous improvements in performance achieved by the technolog-
ically leading firms might quickly render the costs of strategic support policies in this area prohibitive and, in the final instance, highly unlikely to succeed. Even the most successful strategic cases of technological “leap-froging” all seem to reflect more good fortune than a careful strategic consideration of costs and benefits. For example, Korea, which succeeded in developing a technological capability in the production of VLSI chips over a very short period, had the good fortune to come onto the market at a moment when Japanese firms were forced to raise chip prices following American anti-dumping suits and import tariff measures.

However, as this case well illustrates, the argument for using the term “strategic” to describe high-tech products is based on the cumulative, learning and dynamic increasing returns of technological advance in this area. For many technologies, the most typical example being micro-electronics, access to technological capability – or better, the existence of a national (whether of domestic or foreign origin) technological capability – may be essential for future technological success and for the successful transfer of technology and its effective use in other sectors of the economy. The high-tech products which fall under this first heading are in other words “strategic” in that they have a disproportionate importance in terms of their pervasiveness – e.g. they are essential “raw material” or intermediate technological input in many capital and final consumer products – and in that there are strong cumulative and increasing returns involved in their development. National and supra-national technology policies have focused sharply on such products, e.g. the VLSI, Sematech and JESSI support programmes in Japan, the United States and Europe. At the same time, the term “strategic” has often been used to justify support policies in particular high-tech areas which did not really satisfy the “pervasiveness” criteria. Nuclear energy, the European aerospace programmes (Concorde) and France’s TGV are examples; whether HDTV fulfils the pervasiveness criterion remains to be seen.

The second notion of “strategic” increasingly used in the policy arena is the one most closely related to new trade theory, and is very much identified with Brander and Spencer’s 1983 article. The argument here is a straightforward economic one based on the notion of increasing returns. These are, however, more directly associated with the actual production of many items which are being traded internationally. The resulting concentration of production of particular items in some regions/countries and not in others raises the possibility of strategic intervention, i.e. the initial stimulus to get the static and dynamic increasing returns under way within the region/country before others do the same. The problem here is of course that if everybody were to develop such strategic policies, no one would any longer reap the benefits of the scale and agglomeration economies which in theory justified such policies. From a dynamic point of view, however, the picture becomes more complicated. The regional or national externalities linked to the strategic product or sector could have a significant impact on growth, apparently justifying in a more systematic way policy support for such strategic sectors.

Trade and industrial support policies for certain sectors which differ greatly from country to country – indeed, inter alia, European support policies for the aerospace industry and the French TGV initiative – could be said to fall under this category. The product or sectoral focus of industrial policy is here clearly dictated
by notions of the region's or country's actual or potential comparative advantage. The main practical implementation problem relates to the delineation of such sectors. Probably no one would continue to include the iron and steel sector under the heading of strategic, though certainly both in theory and in practice the static and dynamic economies of scale have been and still are significant in this sector.

The third and probably broadest notion of strategic underpins directly the raison d'être of industrial policy. It can best be described with reference to the French notion of "filières". Some sectors have from a national perspective such essential forward and backward linkages, both in terms of material and knowledge inputs and outputs, that they have become strategic to the country. The French automobile industry is probably the best illustration. It is estimated that one French person in ten is linked to the production of French motor cars. In this very broad interpretation a sector can be said to have become strategic because of its widespread infiltration of the whole economy through the large amount of vertical linkages. It is obvious that this interpretation of the term can easily become a very defensive one. Here too, a military analogy can be drawn: a "strategic" withdrawal is one behind lines which can then be better defended or from where a new attack can be launched. In case of substantial import penetration, for example, the domestic sector might need to be protected temporarily for national strategic reasons. The additional costs in doing so are again justified in dynamic terms: if lost, the costs in developing such a widespread new filière or re-entering the sector could well be substantially higher.

All three interpretations of the notion of strategic bring into the picture the trade-off between policies directed towards static allocative efficiency and dynamic growth efficiency. Once concepts such as increasing returns are introduced, there indeed appears to be nothing in the mechanism leading to static allocative efficiency that would also guarantee fulfilment of the criteria of dynamic efficiency. In the static neo-classical "pure" trade world, the theorem of comparative advantage will operate in its purest form: each trading partner gains from trade since they get more commodities from abroad than they would otherwise be able to manufacture domestically without forgoing any production and consumption of the commodities in which they specialise. The same could be said with respect to the static interpretation of the early new trade contributions: as in the traditional case, trade gains — in the true sense of static allocative efficiency — are typically of a "once-and-for-all" nature.

By contrast, once some of the dynamic economies of scale associated with "strategic" products and industries are introduced, one is confronted with the possibility of significant trade-offs between statics and dynamics. This point was highlighted by many authors long before "new" trade and growth theory brought it in a coherent and formalized way to the attention of policy-makers. Indeed, if different commodities or sectors present significant differences in their dynamic strategic potential — e.g. in terms of economies of scale, technical progress, learning-by-doing, etc. — international specialisations which are efficient in terms of static comparative advantage criteria may in the long run generate either virtuous or vicious circles of technological advance/backwardness.

What the debate about strategic trade policy has driven home, in contrast to the previous literature, is that the existence of such possible trade-offs is more than a special case related to infant industries: once account is taken of the
continuous nature of technological change, with its various dynamic increasing returns and cumulative features, they are more likely to be the general condition of any economic system. In so far as the actual process of production in firms, regions or countries is closely associated with the existence of technological capabilities, mechanisms leading to specialisation in production also have a clear and significant dynamic counterpart – they also lead to specialisation in technological skills and capabilities.

In principle, then, there are strong arguments in favour of "strategic" technology policy (the first case), trade policy (the second case) or industrial policy (the third case). The report now examines some of the limits of such policies, focusing less on government implementation than on actual international effectiveness.

3. Domestic strategic policies for "multi-domestic" firms

While these new theoretical insights point to the importance of the welfare gains associated with free trade and the possible justification for strategic domestic industrial and technological government support action, the fact is that domestic firms with the main industrial or technological characteristics justifying government support action have become increasingly rare.

The emergence and growth of the multinational corporation (MNC) is of course not a new or recent feature. The actual internationalisation of production has been just one feature of the more general "internationalisation" of trade and flows of capital and technology that has been characteristic of the stable, liberal postwar trading system. While many such international investments might have been initially inspired by protectionist fears and a profound desire to secure access to large markets, the postwar growth in the internationalisation of production has been by and large of a complementary nature rather than a substitute for international trade flows. One could even go a step further: it is primarily the internationalisation of production over the last three decades – and not the actual international trade flows, as traditional trade theory would have it – that has led to catching-up and rapid technological diffusion of best-practice production techniques and products from the United States to a large number of OECD Member countries, and thus to the convergence of income levels.

One of the main reasons for this is the fact that despite initial impressions, foreign investment – particularly of US and European MNCs – was never limited to just production, but always included large parts of maintenance, engineering and development activities. This is, of course, not surprising. Important differences may exist between domestic and foreign user requirements; foreign regulation, standards and other procurement specifications will in all likelihood be rather different from those of the firm's home country; and there may be dissimilar tastes and other economically induced differences. These factors have undoubtedly led many multinational firms to set up or take over at a very early stage research and development laboratories in foreign countries not always directly linked to their production subsidiaries. There were many instances of this just after the Second World War and a few even before; examples include North American Philips in the United States, IBM's research lab in Switzerland and the takeovers of Pathé in France by Kodak and of the Belgian Gevaert by Agfa.
With the increased international location of production activities over the last two decades, R&D activities, particularly of US and European firms, have also been increasingly internationally located. This process has probably been most pronounced in the case of multinational firms with small OECD countries as their home base (e.g. Philips in the Netherlands). There is indeed no reason why only the home base should be relied upon to provide well qualified scientists and engineers. As Pavitt and Patel (1990) illustrate in Table 1, the Netherlands — and to a lesser extent Switzerland, Belgium and Canada — are typical examples of this international location of R&D processes.

Quite naturally, national technology support policies in small countries, whether strategic or not, have for a long time been faced with a growing discrepancy between the effectiveness of such national support and its foreign impact. The difference between technology support policies in various small countries is rather revealing in this context, because it brings to light the different national policy responses to basic questions: why should a small country have a (strategic) technology support policy, and how can the “good citizenship” of foreign firms be assessed?

In more recent times, however, such trends can no longer be said to be confined to small countries, or to the couple of foreign R&D labs set up or acquired by US and European MNCs over the postwar period. A new, more fundamental globalisation trend — involving a much wider set of international exchanges, including strategic alliances and networks of scientific and technological information — has emerged and grown rapidly, particularly between firms from the so-called Triad: the United States, Japan, and the EC. Furthermore, this globalisation trend is not contradicted by the Porter (1990) or Pavitt and Patel (1988) evidence about the strongly national home base of the competitive advantage of such emerging global firms. In line with the arguments set out in the Introduction, it is indeed in the first instance the national virtues which create the opportunity to cross borders. However, exactly as in the case of strategic trade theory, this emphasis, while pointing up some of the essential verities about the nature of international competitiveness and postwar trade flows, also underscores the new, emerging trend of globalisation and networking between such firms, which are becoming more and more global in their marketing, distribution and technology sourcing, as reflected in (for example) the number of strategic alliances.

The growth of strategic alliances and networks between such increasingly global firms raises three fundamental issues with respect to the strategic policy discussion, all of which call for international policy action.

**Strategic Alliances: Towards Further Cartelisation of World Production?**

First, there is the fundamental question as to the nature of such alliances. Are they indeed a new, more or less permanent feature of the new global network economy, a reflection of the need for international sourcing of and access to complex science and technology; or are they, rather, a temporary feature, the first step in the emergence at the world level of oligopolistic cartels in sectors dominated by static and dynamic economies of scale?
Obviously, the answer to this question is not just one or the other possibility. The literature on strategic alliances, as Table 2 illustrates, points to a wide variety of more or less technology-inspired motives for strategic inter-firm technology cooperation. These range from risk-sharing to seeking access to foreign markets. However, detailed research done by Hagedoorn and Schakenraad points to a number of motives linked to the structure of emerging industries:

For mature industries we found some evidence that strategic technology alliances are less associated with technology involved motives and much more related to market access and attempts to restructure existing industry organization... For high tech industries and new fields of technology technological complementarity appears to be the major motive for strategic alliances. Although a group of small companies play a distinct role in strategic alliances, these partnerships are in the first instance a matter of large companies. Large companies and in particular the group of largest companies follow the most cooperative strategy, in particular in industries which are characterized by oligopolistic structures.

(Hagedoorn and Schakenraad, 1990c)

The present-day trend towards globalisation, alliances and networking, to the extent that it involves a far greater share of world production (including production of component suppliers), investment (including intangible investment), access to markets and other firms' tacit knowledge (including mergers), cannot be viewed independently from the increasing trend towards world oligopoly in many sectors dominated by economies of scale.

The first major policy issue is, consequently, whether a global competition policy is needed and how it should be implemented. The existence of a supranational form of competition policy aimed at countering the emergence of worldwide cartels between global firms would directly undermine one of the reasons for strategic government support, namely dependence on "foreign" monopoly pricing.

**Privately sponsored or government strategically sponsored alliances**

The second major policy issue is whether such strategic alliances and technology networks are truly based on firms' actual needs for international exchanges, improving resource allocation, more dynamic innovation and faster spread of best practice techniques, or whether they are in the first instance motivated by the desire of large global firms to take advantage of various domestic strategic support policies. From this perspective, the attempt of global firms to become "multi-domestic" and present themselves as "good domestic citizens" in as many countries as possible is also the result of the growing importance of national strategic support schemes, which could provide major competitive advantages to domestic "national" competitors (Mowery and Rosenberg, 1989).

Again, an adequate response to these questions must take into account both possibilities. Many of the largest firms increasingly seek global strategies that strike a balance between reaping some of the scale advantages of global markets and exploiting the often geographically determined diversity of consumers and production factors. The large multinational firm's organisational and production technology often gives it the necessary flexibility to confront this diversity. The
decentralisation of its production units, marketing and even research, together with a diversification of subcontractors, will enable it to take full advantage of global access, including government-sponsored access to scientific and technological knowledge. At the same time, the precise location of such a firm’s plant will depend heavily on the local surrounding environment. Whereas the choice will often depend on the availability of local skills, infrastructure access to knowledge and local government support, the firm itself will of course contribute not just to local output and employment but also to the long-term development and growth of the region, in terms of skills, training, access to knowledge, local suppliers’ know-how and networks. These often scarce factors constitute precisely the “externalities”, i.e. the increasing return growth features of long-term development, that explain why regional/local authorities have always been keen on providing incentives for foreign firms to invest and locate in their particular region.

Here too, the multi-domestic firm questions the relevance of national policymaking. In contrast to the previous case, however, it does so from a regional/local perspective. As mentioned above, multi-domestic firms will both take advantage of and contribute to the emergence of locational infrastructural advantages. It is this infrastructure that “develops”, so to speak, the long-term externalities and human resources; the interaction with public research institutes and universities; input-output relations with local suppliers, users, etc.; and the basis of a regional growth pole.

Multi-domestic firms’ effective exploitation of as well as contribution to such locally as opposed to nationally created advantages raises a number of interesting policy paradoxes. At the national or supra-national (EC) level, there will be major concern, particularly at the technological end, about national strategic support policies flowing to such “foreign” firms. Attempts will be made to exclude them from nationally (including here also the EC) sponsored strategic policies. However, at the local site level, there will be increasing rivalry concerning the services offered to firms, with little interest in the domestic or foreign origin of such firms; to the region, most of the firms will be foreign. Such rivalry will itself often result in a multiplicity of new growth sites, science parks or “technopoli” – none developing the necessary size to reach some of the essential scale externalities and dynamic growth features, and all increasing the cost of communicating and interacting.

The growth in strategic alliances has also been strongly influenced by the actual policies set in motion, particularly in the EC. Table 3 illustrates the pattern of privately and EC-sponsored technology alliances within the framework of the EUREKA and ESPRIT programmes. The EC-sponsored alliances are an order of magnitude larger than the privately initiated co-operative alliances, and can from an EC perspective – with the creation and collaboration over European borders of a European IT industry – be considered a success. However, two crucial policy questions come immediately to mind.

First and foremost, to what extent have these initiatives led to further cartelisation of the European IT industry, with monopoly pricing as the main cost to the European consumer (see the previous discussion above), and secondly, to what extent have the benefits of such strategic support R&D programmes flowed to other “foreign” global firms, through strategic alliances between European and US and Japanese firms?
Clearly, while multi-domestic firms have sometimes succeeded in reaping the benefits of such (supra-)national policies, the national or supra-national (in the case of the EC) effectiveness of such policies is very much an open question.

"Strategic" networks of technology: who gets access and who is excluded?

The third policy issue relates to access to technology for those firms/countries not belonging to the networks.

As indicated above, one has witnessed over the 1980s in particular a rapid growth in strategic technology alliances between companies on an international scale. While there had been a gradual increase in the number of manufacturing joint ventures in the period from 1950 to 1975, R&D operations were of little importance to such ventures. Since the mid-1970s, there has been a dramatic growth in joint ventures involving R&D activities. Figure 1(a-f) presents a visual impression of the growth in international alliances based on the detailed data bank developed by Hagedoorn and Schakenraad (1990d) of new co-operative agreements in three core technologies: information technology, biotechnology and new materials.

In addition to the substantial growth in the number of new co-operative agreements over the 1980s, the data in Figure 1 illustrate the importance of firms from the Triad. The dominance of these "Triadic" companies is reflected in the fact that they account for over 90 per cent of all the agreements reported in Figure 1.

There are some minor differences between the three core technologies. In information technologies, the share of agreements with or among non-Triad country companies has risen to over 8 per cent, and in new materials the share of non-Triad co-operation reaches a level of almost 10 per cent. A large section of these non-Triad agreements covers collaborative projects between companies from Triad countries and companies from South East Asian NIEs. In biotechnology, about 95 per cent of the agreements are still concentrated in the Triad. In all three fields of technology, intra-US co-operation takes the largest share of all agreements – particularly in biotechnology, where over 35 per cent of the agreements refer to intra-US collaboration. That collaboration is followed by Western Europe-US partnerships, intra-Western European agreements and co-operation between companies from Japan and the United States.

As the data in Figure 1 already suggest, such a geographically concentrated network of strategic alliances raises major issues about access for those countries/companies not belonging to the already existing networks. In the absence of an international regulatory framework, it is likely that such technology networking will increase inequality of access to technology and investment. In other words, there is a need for broad international principles such as reciprocity in access to technology networks, including the particular preoccupations of the NIEs and developing countries.

In terms of this discussion on strategic policy, the data in Figure 1 undermine probably most strongly the effectiveness of national strategic technology policies. Such national support policies will increasingly lead to benefits flowing away to other countries and foreign firms. Eliminating the latter from these policies or
limiting the technology flows to foreign countries will be difficult to achieve and will generally be counter-productive, as the ICL case in the JESSI programme illustrates.

4. Strategic trade policy: the systemic risks

Having addressed the increasing lack of effectiveness of domestic strategic industrial policies, the report now turns to some of the international implications of such policies. The assumption here runs contrary to the arguments set out in the previous section: such domestic policies are not only justified on theoretical grounds, but they are effective with respect to domestic industry. What, in other words, are the international implications of strategic policy rivalry among individual nations/trade blocks?

It is important to distinguish some of the motives underlying the wide variety of strategic industrial policies. It may be useful to begin with those that originate in either domestic distortion or infant industry arguments – policies that were implemented in many OECD Member countries long before they could be upgraded to the title of “strategic” policies.

In their international interpretation, such policies belong to the broad category of domestic distortions. The domestic distortions approach (Caves, 1987) also points to the fact that trade interventions are a particularly inefficient way of dealing with the problem. In the interpretation of “strategic” industrial policy, for example, the often-encountered subsidy support arguments, by downgrading the role of trade policy, not only highlight the fact that the compensation must occur as closely as possible to the origin of the distortion; they also underline the real and hidden costs of the direct income transfer in favour of the strategic industry.

As a result, policy support for such direct income transfer will be less than in the case of an import restriction, where the hidden taxation is indirect and less obvious and can even be presented as being borne by foreign competitors.

Furthermore, and as highlighted in the domestic distortions literature, domestic strategic policy actions to correct one’s own domestic distortions have a significant international risk. “If one country used a *bona fide* domestic policy to correct a price distortion, such as forcing domestic producers to sell at short-run marginal cost (at home and abroad) when there is significant excess capacity, competing producers in other countries could invoke national anti-dumping laws because selling below full cost is defined as dumping in practically all jurisdictions, as well as in the Gatt Anti-dumping Code”. Similarly, “if one country subsidized the use of an overpriced input or assisted an exporting infant industry... producers in other countries could invoke national countervailing duty laws. Indeed, countervailing duty laws could apply even if a country used a pure income transfer to aid producers (workers) in distress because the subsidy would enable them to remain in their line of business” (Stegemann, 1989).

The systemic trade risks of strategic industrial policy are from this perspective related to retaliatory political pressure, and in particular to the easy access to “legal” anti-dumping and countervailing duty measures which domestic producers
are practically automatically entitled to once subsidising or selling below full costs can be proved.

The more defensive domestic distortion arguments can be expanded to include "foreign-caused" distortions. The strategic intervention is now motivated by the allegedly "foreign" unruly behaviour, itself often the result of foreign industrial policy which was not called strategic when implemented, but which after the fact clearly appeared to be "strategically" inspired in terms of the resulting successful foreign catching-up or increased world market share. This motivation is usually strongest in countries/sectors which have seen their world or domestic market position come under foreign pressure.

In this case, because of the transparency of subsidy claims for support for particular strategic industries, governments will have an even stronger preference to go for the more hidden import restriction apparently borne by the foreign competitors. As Stegemann put it: "The deficit of political support for an open domestic income transfer as compared to import restrictions is even larger if the motive for intervening with free trade could have been fudged by accusing foreigners of selling at 'unfairly low prices'". This political pressure has been typical, for example in the case of the US-Japan 1986 semiconductor trade agreement (see Baldwin and Krugman, 1987a) — where, rather than granting the US semiconductor industry R&D and production subsidies, US policy focused on attacking Japanese predatory pricing with the aim of freeing trade, particularly in Japan. The result, a near-doubling of the price of Japanese 256K chips, has hurt world consumers greatly and transformed Japanese industry into a "rent-collecting chip making cartel!" (The Economist, 22 September 1990) which invests its rents in the development of future generations of chips while dumping the newest generations onto the domestic market to the benefit of all user industries and Japanese consumers.

Strategic industrial policies thus contain a number of protectionist pressures, mainly because of the temptation to go for bilateral retaliatory trade action which — in typical protectionist fashion — leads to further domino protectionist effects. Clearly, strategic industrial policy calls for yellow and red cards on the international playing field; leaving things to the trade negotiators of the two teams might quickly result, as The Economist put it, in the same number of goals scored at each end.

At the strategic technology end, to link up to some of the arguments set out in Section 3, it is clear that domestic strategic technology policies, while aimed at solving some of the domestic distortions implicit in the possible static/dynamic trade-off, also could have important international implications — not least because of the origin of the technology support, i.e. private funds or government. The discussion surrounding the Boeing-Airbus case is also illustrative in this regard. Indeed the case is not limited to the issue of whether the Airbus subsidies made world consumers better off by lowering Boeing's prices (Baldwin and Krugman, 1987b), or whether Airbus was justified in claiming European subsidy support to overcome entry barriers in the building of wide-bodied aircraft. R&D support for Airbus might have been justified in terms of the indirect past military R&D support for Boeing. It also includes the international implications which such domestic government support for R&D might have on the long-term survival of competitors who invest in R&D without government support. From this perspective the Boeing-
Airbus case is again illustrative. The long-term result might be that both firms can only survive if both now benefit – on a more or less permanent basis – from government industrial and R&D support. In other words, the particular “strategic” technology policy has led to a domino effect whereby strategic technology support policies have become essential to the survival of firms in all the competing countries.

The distorting effects of such differences in R&D funding and the possible existence of “learning” barriers are at present of course weakened by the extent to which firms are increasingly entering strategic alliances to overcome such barriers, as we saw in the previous section.

Even apart from this, it is obvious that the spreading of domestic strategic technology policies will rarely be efficient from a global perspective. The multiplicity of nationally sponsored research initiatives will in all likelihood lead to duplication. Avenues which might be more promising, even essential from a world social rate of return perspective, will receive less priority. It is for this reason that the policy synthesis report currently under preparation in the framework of the OECD’s Technology Economy Programme calls for co-ordination of national policies, and even international burden-sharing once global issues such as the environment, health, food and population are included.

5. Conclusions

“New” trade theory and, in its footsteps, “new” growth theory have brought back into economic analysis a great deal of economic realism: with respect to the way firms operate in industries dominated by economies of scale and imperfect competition; the way consumers consume differentiated commodities and look continuously for variety; and the way countries grow and trade with one another, not on the basis of decreasing returns or “given” factor endowments, but on the basis of often historically grown “externalities”, based on absolute cost and technology-created advantages. In doing so, trade theory has brought back into the spotlight the importance of the gains from free trade to world consumers, yet at the same time it has opened up a Pandora’s box of possibilities for governments to intervene in order to set in motion the virtuous circle of growth, international competitiveness and technology accumulation.

To some extent, these “new” insights highlight the point made by many businessmen and national policy-makers long ago: that static international specialisations, which are clearly efficient in terms of static comparative advantage criteria, may not be so in the long run because of sectoral differences in dynamic growth potential. However, what this rather old debate dressed up in its new strategic policy clothes has underlined is that arguments about the existence of national policy trade-offs also have an international price. That price is probably least in terms of the actual subsidies spent on the strategic sector and their possible trade-distorting effect. The distortion is possibly highest when subsidies lead to the sort of retaliatory trade and pricing action typified by the 1986 semiconductor agreement between the US and Japan, with its high cost to world consumers and the systemic risk of increased protectionism it poses.
In this paper, the emphasis has been on another international feature of strategic policy: the domestic firms for which such strategic domestic policies could be developed on the basis of “newly” found theoretical wisdom have grown increasingly global, and are involved in strategic alliances with foreign firms – themselves possibly the result of strategic foreign policies. This increasing globalisation trend raises a number of important policy issues, not least with respect to the level at which policy should be implemented. It is obvious that global, network or multi-domestic firms increasingly question the meaning of such national policies. In many cases the “good citizenship” of these firms may equal that of national firms. In other cases, it may not. It is difficult if not impossible for governments to draw lines here: the result will generally be total inclusion or total exclusion of “foreign”-owned firms in national policies.

There is now an urgent need for international policy-making in a number of different areas related to technology issues. This discussion has stressed in particular the need for international competition policy. While such policy should aim at counteracting the emergence of worldwide cartels between global firms and reducing the divergence between national competition policies, it would also reduce much of the raison d’être for strategic policy.
Table 1. **Foreign-controlled domestic technology compared to nationally controlled foreign technology (based on US patenting 1981-1986)**

<table>
<thead>
<tr>
<th>Home country</th>
<th>US patenting from inside country by foreign firms (as % of country's total US patenting)</th>
<th>US patenting by national firms from outside home country (as % of country's total US patenting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>45.7</td>
<td>16.5</td>
</tr>
<tr>
<td>France</td>
<td>11.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Germany</td>
<td>11.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Italy</td>
<td>11.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Netherlands</td>
<td>9.5</td>
<td>73.4</td>
</tr>
<tr>
<td>Sweden</td>
<td>5.4</td>
<td>16.7</td>
</tr>
<tr>
<td>Switzerland</td>
<td>12.5</td>
<td>27.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>22.3</td>
<td>24.5</td>
</tr>
<tr>
<td>Western Europe</td>
<td>7.4</td>
<td>9.3</td>
</tr>
<tr>
<td>Canada</td>
<td>28.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Japan</td>
<td>1.2</td>
<td>0.5</td>
</tr>
<tr>
<td>United States</td>
<td>4.2</td>
<td>4.4</td>
</tr>
</tbody>
</table>

I. Motives related to basic and applied research and general technological developments:

- *Reduction, minimising and sharing of uncertainty in R&D:*

- *Reduction and sharing of costs of R&D:*

- *Increased complexity and inter-sectoral nature of new technologies, cross-fertilization of scientific disciplines and fields of technology, monitoring of evolution of technologies, technological synergies, access to scientific knowledge or to complementary technology:*

II. Motives related to concrete innovation processes:

- *Capturing of partner’s tacit knowledge or technology, technology transfer, technological leap-frogging:*

- *Shortening of product life cycle, reducing the period between invention and market introduction:*
  OECD (1986a), Mariotti and Ricotta (1986).

III. Motives related to market access and technology development:

- *Monitoring of environmental changes and opportunities:*

- *Internationalisation, globalisation and entry to foreign markets:*

- *New products and markets, market entry, expansion of product range:*
| ABB | X  |
| ASCOM | X  |
| AEROSP | X  |
| BMW | X  |
| BOSCH | 1 3 1 2 3 X |
| BA | 1 5 1 X |
| BULL | 4 3 8 2 11 X |
| CAP | 3 4 5 7 15 X |
| CGE | 2 1 4 1 X |
| DAIMLER | 1 6 5 1 X |
| ELECTR | 1 2 3 4 5 8 9 18 12 1 5 X |
| ENI | 7 1 2 6 8 9 18 12 |
| ERICSSON | 1 3 1 1 1 3 1 7 3 1 2 X |
| FIAT | 1 1 5 4 1 X |
| GEC | 1 2 1 9 3 13 5 20 14 1 9 X |
| IRI | 2 2 2 1 4 2 5 2 |
| KARUPP | 1 1 4 2 5 2 |
| LUCAS | 1 4 2 5 2 |
| MANNES | 1 1 4 2 5 2 |
| MATRA | 1 1 4 2 5 2 |
| NIXDORF | 1 1 4 2 5 2 |
| NOKIA | 1 1 4 2 5 2 |
| OLIVET | 1 1 4 2 5 2 |
| PHILIPS | 1 1 4 2 5 2 |
| PLESS | 1 1 4 2 5 2 |
| PSA | 1 1 4 2 5 2 |
| RENAULT | 1 1 4 2 5 2 |
| SAAB | 1 1 4 2 5 2 |
| SEMA | 1 1 4 2 5 2 |
| SIEMENS | 1 1 4 2 5 2 |
| STC | 1 1 4 2 5 2 |
| THOMSON | 1 1 4 2 5 2 |
| THORN | 1 1 4 2 5 2 |
| VOLMAC | 1 1 4 2 5 2 |
| VW | 1 1 4 2 5 2 |

Source: MERIT/CATI.
|   | ABB | ASCOM | AEROSP | BMW | BOSCH | BA | BULL | CAP | CGE | DAIMR | ELECR | ENI | ERICS | FIAT | GEC | IRI | KRUPP | LUCAS | MANNES | MATRA | NIXDRF | NOKIA | OLVET | PHILPS | PLESS | PSA | RENAU | SAAB | SEMA | SIEMNS | STC | THOMSN | THORN | VOLM | VW |
|---|-----|-------|--------|-----|-------|---|------|-----|-----|-------|-------|----|-------|------|-----|-----|-------|-------|--------|-------|-------|------|-------|-------|-----|-----|------|-----|-------|-------|-----|-----|
|   | X   | 1     | X      | 1   | 1     |   | 1    | 1   | 1   | 1     | X     |    | X     | 1    | 1   | 1   | 1     | X     | X      | 1     | 1    | 1    | 1     | X    |    |     |      |     |       |     |     |   |
|   |     |       |        |     |       |   |      |     |     |       |       |    |       |      |     |     |       |       |        |       |     |     |       |      |    |    |     |     |       |     |     |   |

(B)
Figure 1a. The structure of strategic partnering in biotechnology, 1980-1984

Legend:
- - - - - 4 or more alliances
- - - - 3 alliances
- - - - 2 alliances
- - - - 1 alliance

Source: Hagedoorn and Schakenraad (1990d)
Figure 1b. The structure of strategic partnering in biotechnology, 1985-1989

Legend:
- 4 or more alliances
- 3 alliances
- 2 alliances
- 1 alliance

Source: Hagedoorn and Schakenraad (1990d)
Figure 1c. The structure of strategic partnering in information technologies, 1980-1984

Legend:
- 7 or more alliances
- 5 or 6 alliances
- 3 or 4 alliances

European Firm
Japanese Firm
US Firm
Other

Source: Hagedoorn and Schakenraad (1990d)
Figure 1d. The structure of strategic partnering in information technologies, 1985-1989

Legend:
- 7 or more alliances
- 5 or 6 alliances
- 3 or 4 alliances

European Firm
Japanese Firm
US Firm
Other

Source: Hagedoorn and Schakenraad (1990d)
Figure 1e. The structure of strategic partnering in new materials technologies, 1980-1984

Legend:                       4 or more alliances
                             ···· 3 alliances
                             ···· 2 alliances
                             ······· 1 alliance

Source: Hagedoorn and Schakenraad (1990d)
Figure 1f. The structure of strategic partnering in new materials technologies, 1985-1989

Legend:
- 4 or more alliances
- 3 alliances
- 2 alliances
- 1 alliance

Source: Hagedoorn and Schakenraad (1990d)
Notes

1. The few exceptions include Markusen and McDonald [(1985), and Markusen (1989, 1990)], who indicate devastating results for the traditional distribution of trade welfare gains. For more detailed analysis see Dosi, Pavitt and Soete, 1990.

2. For a detailed theoretical argument along these lines very complementary to Porter’s more descriptive analysis, see Dosi, Pavitt and Soete, 1990.
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Beyond the Border: The New International Policy Arena

by

*Sylvia Ostry*

Chairman, Centre for International Studies, University of Toronto

1. Introduction

The title of this paper suggests that the new arena for international policy cooperation is moving beyond the border, to domestic policies. The basic reason for this shift lies in changes in the extent and nature of the international linkages among countries which have produced a new type of friction which could be called system friction. The struggle over competitiveness in the Triad of the United States, Japan and the European Community, which has generated the policies targeted at so-called strategic industries, is a symptom of this far broader malady of system friction. These developments will be described briefly as a background to the exploration of the policy options required to mitigate or contain the new discord.

2. International linkage

There have been three phases of growing international linkage among countries since the Second World War. The first of these was driven by trade, the golden age of the 1950s and 1960s launched by the dismantling of protectionist barriers in successive GATT rounds. Over the decade of the 1970s, three massivemcommodity and oil shocks initiated the second phase, which was financial integration, via the recycling of the OPEC surplus. The wave of financial integration accelerated in the 1980s, fed by the Ronald Thatcher revolution of deregulation and privatisation and the emergence of the Japanese current account surplus.

We are now at the outset of a third phase called globalisation, which is characterised by a surge in foreign direct investment. After the war foreign direct investment was characterised by “*le défi américain*” in Western Europe. The present upsurge, which began in 1983 and has steadily picked up speed, is very different in both origin and destination. By 1983 the United States had become a net recipient of FDI (i.e. large outflows were outweighed by still larger inflows).
1985 Japan became the largest net direct investor (due to large outflows and negligible inflows), followed by the United Kingdom and Germany. Both outward and inward FDI is dominated by the G-5 – the United States, Japan, Germany, France and the United Kingdom.

Apart from the dynamic Asian economies, the developing countries have been largely excluded from this trend. It is thus much more concentrated than are trade flows: the G-5 account for over 75 per cent of FDI but just over 40 per cent of world trade. If present investment flows are extrapolated (the recent slow-down of flows into the United States and the Middle East crisis may make such an assumption unwarranted at this time), a conservative estimate suggests they will grow at twice the rate of trade flows in the 1990s.

The prime agent of this third phase is the multinational enterprise. MNEs have a variety of objectives and rarely make decisions on the basis of only one consideration. However, one important factor driving globalisation today is the increased research and development costs required in the race for the technological frontier in leading-edge sectors. This has not only stimulated a wave of international mergers and acquisitions (the major form of FDI) but also spawned an array of new forms of international networking among the MNEs, including R&D/technology alliances. This technology networking has become so prominent that it deserves a new term: techno-globalism – and it is even more concentrated than investment: over 90 per cent of the technology agreements are made between companies with their home base in the Triad.

So the third phase of international linkage is centred on capital and technology flows. To a considerable degree, it has tended to exclude the non-OECD countries.

While it is convenient to delineate these three phases of international linkage chronologically, it is important to stress that they are not separate and independent of each other but closely interrelated in a complex fashion. Particularly striking, for example, is the relationship between investment and trade. A large and growing proportion of world trade involves intra-enterprise trade. For the United States and Japan, for example, trade related to foreign investment now accounts for over half of total trade flows.

Another manifestation of growing international linkage has been the changing nature of trade itself: an increasing proportion of trade among industrialised countries is in technologically sophisticated products manufactured by large firms operating in imperfectly competitive markets. In the twenty years between 1966 and 1986, high-technology goods climbed from 14 per cent to 22 per cent of world manufacturing exports. Finally, over the same period, powerful new players have entered the global arena – most importantly, Japan.

Indeed, it has been concern over the Japanese growth model and the role played by targeting so-called strategic sectors and technologies that has made competitiveness such a high profile issue in the Triad. Early in the 1980s, the conflict with Japan centred on asymmetry of import access to the Japanese market. While that is still an issue, the targeting debate has widened to a concern about policies allegedly designed to create competitive advantage. While the debate about Japanese targeting is by no means settled, the most important new development over the 1980s has been the “policy spillover” involving various
kinds of support for strategic sectors in the other two regional blocs. In addition to these new forms of government intervention, there have also been changes in the discipline of economics – the climate of ideas – which have undermined the liberal orthodoxy concerning the role of markets versus governments, in both trade and industrial policy, for leading-edge, high-technology industries (Ostry, 1990, Chapter 3).

In sum, these changes – in a transformed and far more interdependent international economy – have spawned the new international friction manifested in the struggle over leading-edge sectors and technologies. However, this is also a reflection of the much more pervasive phenomenon of system friction: the battle for market share in leading-edge sectors involves not only competition among multinational enterprises but also rivalry among the different market systems which influence the enterprise’s ability to compete. The following section describes the notion of system friction and the policy questions it evokes.

3. System friction

Economists have long ignored cultural, historical or institutional differences as factors of significance in market analysis. While interest in international economics has greatly increased, international forecasting models, for example, are based on the assumption that there is only one market model and thus the different “country blocks” all have identical structural properties.

More recently, however, some economists have urged that a better understanding of institutional (including regulatory) differences among countries may be significant, however difficult these may be to incorporate into theoretical or econometric modelling. One reason for this changing view in the early 1980s was the markedly different reaction, within the OECD, to the second OPEC oil shock (Ostry and Koromzay, 1982). A more important reason for the interest in different system properties, however, was the debate over competitiveness and the challenge of Japan, which stimulated a vast outpouring of analysis on the Japanese paradigm of successful innovation1. Indeed, in the analysis of the innovation process more generally, the importance of institutional factors has been increasingly highlighted2.

It is clearly beyond the scope or purpose of this paper to describe in any detail the burgeoning literature on institutional differences within the Triad. A highly stylised depiction would distinguish three dominant models:

- The US paradigm of a pluralist market economy, with its aggressive financial markets, is strongly consumer- and short-term-oriented. Its strength is dynamism and flexibility. Its dominant ethos is private sector competition and minimal government. However, producer interest groups generate an ad hoc, “implicit” industrial policy response.
- The Continental European models are variants of the social market economy and involve more extensive government interaction with the “social partners”. “Social market” implies a recognition of market imperfections and a governmental responsibility to rectify them as well as provide public
goods. An elastic definition of "public goods" may sometimes blur the line between the role of the market and the role of the state.

- The Japanese corporatist market economy is unique in its long view; in its producer orientation; its strategic use of co-operation and competition and blending of macro and micro policies; in the close and continuing interface of the state with business; and in its remarkable capacity to adapt to external shock.

For our purposes, it is useful to distinguish two aspects of these systems: the cultural and historical roots which influence behaviour, tastes and also institutions on the one hand, and government policies (which of course are also affected by the cultural legacy) on the other. The reason for this distinction is that the appropriate domain for international policy co-operation is government policy and not tastes, preferences or behaviour which should be accepted as "given" although, of course, not immutable. This point will be taken up shortly.

As many studies have shown, both the cultural legacy and government policy affect the competitiveness of the firm. Fundamental to competitiveness is innovation: the search, development and adoption of new products and processes. Innovation stems from the interaction between capabilities within the firm and industry and the firm's external environment, an omnibus term which comprises government policy (R&D, education, macro policy, trade policy, investment policy, competition policy, capital market regulation, etc.) and behavioural phenomena such as the tastes and attitudes of consumers, workers, entrepreneurs, etc.³.

One of the more important insights which is emerging from studies of the innovation process is that some national systems are more consonant (system-friendly) with particular technological paradigms than others. Examples are the American leadership from the end of the 19th century based on the Fordist paradigm of mass production (Nelson, 1990, pp. 117-132), and Japan's system-friendliness to the more flexible manufacturing paradigm of electronics-based technology (Freeman, 1987, pp. 55-90). Systems can adapt, however; indeed, the process of market competition is one major transmission mechanism of adaptation. Moreover, expanded international linkage (especially foreign investment) and the revolution in transport, information and communication technologies also create pressures for adaptation and a momentum to convergence that goes well beyond the organisation and behaviour of the firm.

There are many who would argue that competition among firms and a gradual process of system convergence are both necessary and sufficient to sustain the health of the world economy so long as governments refrain from self-defeating protectionist or interventionist policies. However, as pointed out above, the competitiveness of the firm depends not only on its own competitive strength but also on the interaction of its capabilities with the capabilities of the external environment in which it operates. Smart firms may have the potential to build superb mousetraps but not to determine the key policy and institutional aspects of their external environments (Dosi, 1988, p. 1121; Roobeek, 1990).

So competition among firms is also competition among systems, and the slow "natural" process of convergence will produce serious discord - system friction - along the way. A globalising world has a low tolerance for system divergence. Continuing instability and growing pressure for new forms of man-
aged trade are the likely outcomes. However, a new approach to mitigating system friction is, in fact, to undertake an international policy process to promote the convergence of those government policies which are most relevant to the process of innovation. Most of these policies are domestic: the new international arena beyond the border.

It is important to ask, if a process of international policy co-operation is undertaken to promote convergence: convergence to what? What is the regulatory model to be promoted? As suggested above, there is no single paradigm "out there". Of course, the overall objective must be to promote convergence towards policies that are compatible with market-oriented outcomes. However, as the following discussion will illustrate, in some policy areas no clear-cut guidelines emerge. In such cases the regulatory standards themselves will be an output of the process of harmonization.

It is instructive to note that two processes of convergence are now in fact under way in the international economy. The most advanced – locational competition – is that emerging in Europe, catalysed by Europe 1992. The choice laid out in the 1985 White Paper to base market completion on "mutual recognition" and the free flow of mobile factors of production launched a process which has been described by one analyst as follows:

competition between different regulatory systems...which is free competition among different locations...for internationally mobile resources, such as capital and entrepreneurship and also labour with a high content of human capital.

(Giersch, 1988, p. 5)

The implicit answer to the question "convergence to what?", given by locational competition, would be "that regulatory system which best reflects the preferences of the mobile resources, especially capital and entrepreneurship". So locational competition is a market-like process by which convergence emerges ex post – a result of the invisible hand, so to speak. Even in the case of European locational competition, however, there will be the need for the visible hand of the Commission in instances of significant divergence of key regulatory instruments such as competition policy, capital market regulation, social policy, taxation, etc. This process of ex ante convergence is likely to prove contentious and difficult, although ultimately successful because of the enhanced power of Brussels and the considerable political momentum generated by Europe 1992 and the events in the former Soviet bloc.

The European locational competition process of convergence is attractive because it involves limited supranational intervention, thus minimising political difficulties as well as the high risk of policy error in a period of rapid change and heightened uncertainty. However, it could not be duplicated at a global – or even an OECD – level at the present time, not only because the basic conditions of mutual recognition and free factor flow do not exist, but also – and more importantly – the divergences in regulation are wider (as between Japan, for example, and the United States) and there is (as yet) no sign of the strong political will at the international level to yield "sovereignty" or share power that now exists in Europe.
The other very different process of policy convergence recently launched is the bilateral US-Japanese "Structural Impediments Initiative" (SII). The SII covers a vast range of subjects – macro and micro policies as well as corporate culture and consumer tastes – and is tied to demonstrable results in the bilateral trade balance. On the micro policy front, a major issue is the divergence in competition policy between Japan and the United States. However, so many other items (both regulatory and cultural) were included in the American list of over 200 specific suggestions that it has elicited from a number of quarters the "Japanese are so different that special rules are required only for them" view. Behind this lies a quite unacceptable view of convergence on "everything" (to the American model?)\textsuperscript{4}. Another serious danger in the SII is that it is unlikely to produce the desired changes in the bilateral trade balance (which is influenced by many other factors unrelated to the negotiations), and thus risks inflaming congressional animosity and increasing the pressure for managed trade arrangements. Finally, a process of convergence which is bilateral and not transparent is hardly the most desirable or effective way of dealing with a fundamental systemic issue.

If the European approach is desirable but unattainable and the bilateral approach highly risky and potentially destabilizing, the only feasible alternative for initiating a process of harmonization is to place the issue in a multilateral forum. The only logical forum is the OECD, which alone has the secretariat expertise and the mandate to cover the broad range of policies relevant to the exercise.

4. Promoting convergence: an OECD post-Uruguay programme

The idea behind the promotion of convergence is an extension of the multilateral rules-based system, originally designed for international trade, to include domestic rules which significantly affect enterprise performance (competitiveness) and market access, not only for goods and services but also for investment and technology flows. Since the new international arena has now extended beyond the border, it would be fairer – and seen to be fairer – if multinational enterprises were to compete under the same set of domestic rules in different countries. Similarly, persistent marked asymmetry of access for investment and technology will generate serious friction, because broad overall reciprocity is fundamental to sustaining political support for the multilateral system.

There are at least three questions which would have to be confronted if the OECD were to launch this "Post-Uruguay Programme".

\textit{a) What policies?} \\
\textit{b) How is convergence to be achieved?} \\
\textit{c) Will convergence lead to overall reciprocity?}

This paper will try to provide some answers to each of these. However, it should be recognised that what is being proposed is not only a major new thrust in international policy co-operation but also an incursion into contentious analytic territory – broadly, the determinants of innovation and thus of competitiveness – where there is considerable disagreement among economists and policy analysts. Thus the "answers" should be regarded as proposals for discussion.
5. What policies?

The major criterion for policy selection is impact on the innovation process, because for advanced countries innovation is the primary determinant of competitiveness at the level of the firm and of rising productivity at the national level. However, in the case of some policies of undeniable importance in that context – education and training is the best example – the international friction stems more from access or reciprocity issues than from divergence per se (see below). In other cases – for example, fiscal policy – while the impact on innovation via savings, investment and the cost of capital is very considerable, there are other fora, specifically the G-7, where a policy co-ordination process is already under way. Finally, the Uruguay Round agenda includes a number of key items central to the innovation process – for example, intellectual property; anti-dumping regulations; industrial and agricultural product standards – and a successful outcome will lead to the reduction if not elimination of policy divergence.

Taking all this into account, an initial list of policies for the OECD to consider should include: competition policy; research and development policies; foreign direct investment policy; financial market regulation as it affects corporate governance.

In the case of competition policy, several high-profile issues are already on the international agenda and provide a useful starting point. As already mentioned, a number of these were prominent in the SII (vertical arrangements in the Japanese keiretsu; different enforcement procedures in the two countries, etc.). The differing treatment of research and production joint arrangements in the United States as compared with both Japan and the European Community has also generated a lively American debate with a number of experts in the innovation field arguing in favour of antitrust reforms that go beyond the 1984 National Cooperative Research Act and others warning of the danger of cartel-like behaviour. Thus it would be useful to begin with an analysis of differences in both vertical and horizontal arrangements (including enforcement) in the three trading blocs, and an assessment of these differences on performance.

In merger law, which is of increasing importance because of the large increase in transnational mergers and acquisitions (including newer modes such as joint ventures and strategic alliances), there does not appear to be any difference in substantive law: the language is remarkably similar in most jurisdictions. The divergence – and conflict – arises in application, since the general prohibition against mergers which will (or are likely to) “substantially lessen competition” leaves ample scope for discretion on the part of the authorities. The situation is even more complicated in the United States, where all fifty states can exercise jurisdiction independently from the federal government. For corporations planning transnational mergers, the degree of uncertainty created by differences in enforcement of merger law is a major impediment to rational decision-making.

In the R&D area, a number of policy issues need probing. One of the most obvious is government subsidies (including sectorally targeted tax incentives). The presence of large “externalities” (that is, benefits that spread beyond the firm to other firms or industries) has long provided a rationale for government intervention in basic research where private firms have little incentive to invest because
the benefits cannot be fully captured in profits (appropriated). (Another rationale is that pure science is a public good.) However, the new debate about subsidies centres not on basic research but on the "middle ground" between basic research and proprietary technology (so-called generic research) usually involving co-operative arrangements between firms organised and partly funded by government (thus raising, in addition to the subsidy question, the competition policy issue mentioned above).

The difficulty of defining this "middle ground" will require a good deal of analysis and discussion before proceeding to new international disciplines. As experts in innovation have emphasized, this is because there is no clear-cut boundary between basic research, generic technology, and commercial application (the "linear" model of innovation), but rather a complex nexus of interaction and feedback (the "simultaneous" or network model of innovation) (Jorde and Teece, 1990, pp. 76-78; Ziman, 1990). The extent and nature of government intervention that affects this more realistic model of innovation goes well beyond subsidies. Indeed, subsidies may be the least important factor, as the Japanese innovation paradigm – with its unique "blend of co-operation, competition, and shared information and objectives" – amply demonstrates (Ostry, 1990, p. 64). So progress on the subsidies front, while certainly important and desirable, should be seen only as one part of a much broader issue, which is the impact of government policies on the innovation process.

Finally, in this area of R&D policy, there is the thorny question of membership in government-sponsored consortia. There has already been a dispute over the membership of foreign subsidiaries in the European consortium called JESSI and the American Sematech (Ostry, 1990, pp. 66-75). The basic reason for the exclusion (seldom spelled out) rests on the concept of "strategic" industries or technologies. There is no settled definition of this concept, and indeed the term "strategic" has multiple meanings and its use is more confusing than enlightening. One definition of strategic would be a sector for which an exploitable advantage for a foreign firm or another country could have serious, widespread and long-term consequences. The risks would be especially high if the foreign supplier were a monopoly or a cartel, and if high sunk costs reduced the credible threat of entry (Flamm, 1990, pp. 225-292). In such industries, the major means of appropriating returns to product innovation comes from "first mover" advantage, i.e. getting there first and building up continuing and cumulative product improvement (as in semiconductors, computers, telecommunication, airframes, and aircraft engines) (Levin et al., 1987, pp. 783-832). These and other questions (e.g. what is a "foreign" firm, or indeed, is there a need for a supranational competition authority?) will have to be confronted before disciplines or codes of behaviour on government-sponsored consortia can be agreed.

In the foreign direct investment (FDI) policy sphere, the present GATT Round will deal with a limited aspect in the TRIMS (trade-related investment measures) negotiations. Essentially, what is at issue is some form of discipline on trade-distorting measures such as performance requirements of one kind or another. With the benefit of hindsight it is now clear that the US push for TRIMS reflected the world of the 1970s and early 1980s, when there was widespread hostility to multinational enterprises in the LDCs. The world of the 1990s will likely be dominated by a competitive bidding for investment as the former Soviet bloc countries
and the LDCs seek to alleviate their shortage of domestic savings and technology.

Within the OECD area the main problem is less likely to be overt investment inducements (tax holidays, subsidies, etc.) than direct and indirect measures to influence the content or "quality" of investment, such as local content regulation or rules of origin (Ostry, 1990, pp. 46-52). Another FDI issue, already evident in the United States, relates to the ownership of "strategic" assets (in a national security rather than commercial sense). A large number of bills that would constrain foreign investment are currently pending in the US Congress.

However, the major source of systemic friction in the investment area relates to asymmetry of access or overall reciprocity. Indeed, the United States has announced that it will raise the issue of its "investment imbalance" with Japan in a new round of SII follow-up, citing the 1989 figures of $32.5 billion of Japanese investment in the United States versus $1.64 billion of US investment in Japan. Within the European Community the reciprocity question has surfaced in the differences in ease of takeovers (mergers), the chief mechanism of FDI, among different member countries, especially the United Kingdom versus Germany. This relates to a fourth policy area: financial market regulation as it affects corporate governance.

A recent study prepared for the European Commission both documents the marked differences in takeover activity in the EC over the 1985-1988 period and examines the reasons for these differences, i.e. the obstacles to mergers (Booz-Allen Acquisition Services, 1989). These include a long list of structural differences (especially size and sophistication of equity markets, and the role of banks in corporate ownership and control), and a variety of regulatory differences (e.g., antitrust, company law, labour law, stock market regulations governing takeovers, etc.). Much of this is also relevant to the Japanese system, which in a number of respects resembles that of Germany. In particular, in both countries companies are more heavily owned by banks and other corporations (Kester, 1986, pp. 5-16). While some of these differences can be reduced by regulatory changes (and, indeed, the Commission will be undertaking to implement several), this study and numerous others have emphasized the structural differences between the Anglo-Saxon (UK and US) model on the one hand, and the German and Japanese models on the other. These differences in composition of ownership, i.e. the respective role of shareholders versus banks (also a reflection of the cultural legacy of countries), will be much more resistant to change. This is very important because the composition of ownership has a significant influence on the way corporations are managed, although the popular image of a clear-cut dichotomy between the Anglo-Saxon short-term "financially driven" model versus the German-Japanese long-term "industrial growth" model is too simplistic (Williamson, 1988, pp. 467-491; Jensen and Meckling, 1976, pp. 305-360).

In sum, this complex area of financial markets impacts both on corporate governance (and therefore on competitiveness) and on reciprocity of access for foreign direct investment. There is clearly some scope for regulatory harmonization, but the structural differences are more deep-seated and will be difficult to change. As a consequence, the reciprocity issue is likely to be a continuing source of friction, as it is in goods markets and as it will be in the technology area.
6. The process of harmonization

The objectives of the process in the OECD would be to:

- analyse, for each policy, the differences among countries, perhaps starting with the Triad;
- assess the main impact of those differences on industrial and trade performance;
- draw up a mutually agreed set of policy guidelines; a timetable for reform; and a means of monitoring progress (surveillance).

These are extremely complex problems and would require skilled secretariat assistance in providing objective analysis and information. There is good reason to launch the process as quickly as possible. It would be desirable, in the analytic phase, to include business representatives and outside experts. The process of promoting policy convergence itself would require a special intergovernmental committee.

Because the subject matter covers a number of areas, the committee’s effective operation involves a greater degree of co-ordination within national capitals than is customary. Of course, greater co-ordination within national capitals is desirable in and of itself, however difficult it is to launch and maintain. In most national capitals and in the general public, there is no real understanding that the new international arena is beyond the border. Separating trade policy from competition policy, R&D, financial market regulation, etc. only made sense when tariffs were the most important obstacle to international linkage.

It is important to emphasize again that while policy convergence is a desirable objective to pursue in international co-operation, it will not miraculously dissolve all points of international friction. Different cultural legacies will affect consumer tastes and preferences and corporate behaviour. National infrastructures (especially education and training) are extremely important, as is macro policy. Finally, convergence may reduce but will not eliminate marked asymmetry of access in the areas of investment and technology.

7. Reciprocity

The concept of reciprocity underlying the GATT is that of a broad balance of benefits in market access for goods. For a variety of historical reasons, even after more than forty years of negotiations, there still exist today some examples of marked asymmetry of access to markets for goods. This has been a source of considerable political friction, eroding the commitment to the rules-based multilateral system.

As we have seen, in the case of foreign direct investment, there are significant differences among countries in the OECD in ease of access via mergers (the main vehicle of investment flows). In addition, there are large differences in the present stock of FDI, with the most marked asymmetry apparent in Japan. [In 1989 the ratio of Japanese investment abroad to foreign investment in Japan was 23.6, up from 20.6 in 1984 (Terry, 1990; OECD, 1987).] There would be little
purpose in focusing on the stock issue, however, which is largely the result of past policies, including overt investment barriers that are now for the most part dismantled. As noted above, the issue of flows relates less to overt barriers than to structural characteristics of financial markets and regulatory differences across a number of different policies. Thus policy harmonization will narrow the asymmetry over time and an ongoing, multilateral surveillance process should help contain the political friction stemming from the basic notion of “unfairness” which is at the heart of the reciprocity debate. This would be facilitated by making the process as transparent as possible through publication of analytical studies and “progress reports” at OECD Ministerial meetings, for example.

The question of reciprocity of access in technology is in some respects more complex. A firm secures the information necessary to solve technological problems from many sources. The relevant “knowledge base” varies according to the particular technology, and a distinction can be made between the degree of “publicness” and universality versus “tacitness” and specificity (Dosi, 1988, references; Nelson, 1990, pp. 117-132). Scientific inputs are typically public and so is much generic technology, although to access such inputs requires a sophisticated base in R&D. However, “public” knowledge is itself complementary to the more specific and “tacit” knowledge generated within the firm, and it is the firm-specific knowledge which results in new products and processes.

The crucial point in these distinctions is that with the necessary investment in R&D it is easier to access the public than the tacit part of the knowledge base. If the system is characterised by university-based research and technology (as in the United States) rather than by non-public R&D and technology (Europe and Japan), then that system is structurally more accessible.

However, there are also avenues of access to tacit, specific knowledge: hiring employees from innovating firms or buying new high-technology startup firms are examples (as, of course, is patent licensing). Again, in systems where employee mobility is greater, small startup firms more prevalent, and takeovers easier, there will be a greater structural accessibility of the non-public knowledge base.

Thus, as in the case of investment, structural characteristics of different systems will generate asymmetry of access to technology. It will be essential to examine these issues in far greater depth and search for policies either to reduce or to compensate for differential access. Moreover, there is one relevant policy issue which could be tackled more quickly. This concerns the question of membership of foreign subsidiaries in government-sponsored research consortia where specific reciprocity conditions could be elaborated. The worst way of dealing with the problem of access asymmetry would be to attempt to stem the flow of knowledge across borders.

8. Conclusions

This paper has put forward a proposal for promoting convergence of a range of policies selected because of their direct or indirect impact on innovation and competitiveness. The list is suggestive, not exhaustive. Other candidates could
include: taxation of transnational enterprises; standards and testing procedures in selected leading-edge sectors; and intellectual property norms and standards and enforcement procedures to further the convergence process launched in the GATT. The alternatives to promoting convergence are continuing friction; instability and aggressive bilateralism; or an exclusionary form of managed trade.

Finally, any OECD initiative should be seen as a complement to the Uruguay Round’s efforts to strengthen the GATT. If those efforts prove successful, and in particular if a World Trade Organisation (WTO) is established, it would be important to ensure that strong informational links are forged between the OECD and the secretariat of the WTO. In the early 1980s, much of the analytical work on trade in services, intellectual property, investment, and agriculture was carried out at the OECD and proved invaluable in helping launch and facilitate the Uruguay Round negotiations. Perhaps at the end of this new OECD harmonization initiative, one could foresee a set of codes developed and then transferred to the WTO for broader application. After all, the basic purpose of OECD policy co-operation is to further global integration by extending and adapting the multilateral rules-based system.
Notes

1. See Ostry, 1990, Chapter 3 for selected bibliography.

2. See, for example, Dosi, 1988, pp. 1120-1171. Many of the papers prepared for the OECD conferences on Technology and Economic Policy (TEP) focus on cultural, historical and institutional factors.

3. See Dosi, 1988, for literature survey and bibliography.

4. See Bhagwati, 1989. He argues (pp. 45-46) that "if everything becomes a question of fair trade, the only outcome will be to remove altogether the possibility of ever agreeing to a rule-oriented trading system".


6. For a discussion of the evolution of the concept and the distinction between the basic commitment to symmetric rights and obligations in the contract and reciprocity as a negotiating modality, see Bhagwati, 1988, pp. 35-37.

7. For a discussion about the reasons for Japan's alleged low import propensity see Ostry, 1990, pp. 9-10 and references cited therein. The issue of reducing or eliminating the "special and differential" treatment for the more advanced developing countries has pervaded a number of negotiating groups in the Uruguay Round.
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Support Policies for Strategic Industries: An Assessment and Some Policy Recommendations

by

Barrie Stevens

OECD Secretariat, Advisory Unit to the Secretary-General

The following contribution is an evaluation of the conference discussions, constructed around what were generally considered as the central themes of the debate. It begins therefore with an attempt to come to grips with the nebulous concept of "strategic industries", before turning to the question of how government policy towards key industries has evolved over the last few decades. It then turns its attention to the potential impact of state support of these industries on the national economy, and on the global system of trade, investment and technology. In view of the importance of deep-seated structural differences between economies, not only in economic terms but also in the social, institutional, historical and cultural domains, it would seem that the 1990s hold out the prospect of "competition" or even "friction" between entire systems. These aspects are also considered, before concluding with a broad set of policy recommendations.

1. Defining "strategic industries"

The field of international competition has undergone a significant transformation in the last ten or fifteen years. In a number of economic activities, the existence of imperfect competition and economies of scale and learning is now widely accepted, as is also the fact that natural endowment is no longer necessarily the major determinant of national competitiveness. It was the notion of the capacity to create comparative advantage that sparked off a first note of dissent among participants. Some considered dynamic comparative advantages to be a natural extension of static comparative advantages, offering only limited scope for government intervention. Others, however, pointed to the cumulative nature of technological change and the potential for first-mover advantage in the subsequent generation of innovations, which often tempts governments to push the industry in question just enough to get it locked into the market.

How, though, does one identify a "strategic industry"? Various (partially overlapping) criteria were proposed. For example, such industries could embrace all products and technologies whose long-term availability is crucial to a country's
economic interests. A second criterion would be based on the notion of static and dynamic increasing returns. A third approach might ask whether there are regional or national externalities linked to the strategic product or sector which have a significant impact on growth by providing a foundation of vital intangible investment for other firms in the same industry or in related industries. A fourth view would place less emphasis on the industry or sector, and much more on the pervasiveness of certain generic technologies such as semiconductors, robotics and micro-engineering. However, perhaps the broadest notion of “strategic” relates to activities which infiltrate the whole national economy, with essential forward and backward linkages in terms of material and knowledge inputs.

The main problem here clearly consists in delineating sectors or products on the basis of such criteria. For example, many would have difficulty classifying the iron and steel industry as a strategic sector in current terminological usage, despite its important static and dynamic economies of scale and its contribution to the economy’s infrastructure. Yet some countries regard shipbuilding as fulfilling a key industrial role. Others have pursued a policy of phasing out their shipyards. Thus none of these definitions provided a satisfactory and unequivocal interpretation of a “strategic industry”; indeed, this was considered in all probability an impossible task. What was decisive, however, was not a workable concept, but the fact that many governments are able to identify what they perceive to be “strategic” industries and are willing to promote them with specific policies.

2. The evolution of policy stance in the Triad countries

Underlying the first round of views was an implicit juxtaposition of shifts in competition and industry policy approaches to key economic activities as they have evolved in the three regions of the Triad. What was revealing about the debate was not so much the apparent convergence in policy thrust as the manifest discrepancy in all three regions between policy intent and policy reality.

In Europe, the trend of the 1970s to provide sectoral support to declining industries was reversed in favour of more broadly based policies. Certainly among European participants at the meeting, there seemed to be a commonly held view that while there were under certain circumstances grounds for rejecting what was called the “naïve” attitude to keeping markets entirely open, the thrust of governments’ role should lie predominantly in providing support for R&D, infrastructure, education and training, and setting the right macroeconomic conditions for furthering technological development. It was also noted with interest that the European Commission’s conceptual approach to industrial policy has recently undergone a marked shift away from sectoral measures.

Yet confronting these declarations in favour of infrastructural and framework policies was the inescapable reality of European and joint government-sponsored programmes such as ESPRIT, EUREKA and Airbus, as well as specific national support for the TGV in France, semiconductors in Germany, aircraft construction in the Netherlands, etc. On top of this come various types of non-tariff barriers on imports of key products such as automobiles, for instance in France, Italy and the United Kingdom.
The United States has not generally seen itself as being involved in the promotion of specific sectors. In the 1980s, it tended to react on a sectoral basis to targeted policies in Japan and Europe, for example through anti-dumping actions and the semiconductor agreement with Japan. The Structural Impediments Initiative (SII) is somewhat different, in that its approach is broader. It covers issue areas ranging from land prices, savings and investment to retail distribution structures and R&D. While doubts were voiced about the possibility of these talks substantially redressing the US-Japan trade imbalance, they were considered useful because they improved US understanding of the mechanisms and processes underlying the Japanese socio-economic system.

At the same time, however, there can be little doubt that partial government funding of the semiconductor programme Sematech can be construed as “targeting”. And in biotechnology research, the federal government’s share of the funding outweighed that of the private sector’s by a large margin. Moreover, the perennial question of spin-offs from defence spending to the electronics industry, the aerospace sector, etc. still remains.

In postwar Japan, the government began with traditional protectionist trade measures coupled with tough but nonetheless sheltered competition; in a second phase, the government played the role of decision co-ordinator for the private sector; now the state’s role is restricted to laying the basis for growth by promoting R&D, the improvement of infrastructure, the accumulation of human capital, etc. It was stressed that within this new approach, great care was being taken to defuse potential conflict with Japan’s trading partners from the outset. Thus in its recent recommendations for R&D policy, MITI proposes that all new projects sponsored by government should be willing to accept foreign participation, and that the results should be accessible without restriction.

Unquestionably, however, there was much unease with this version of present-day Japanese industrial policy. To be sure, it would be difficult to explain the deep-seated structural changes and quantitative and qualitative improvements in industrial performance in Japan solely by the use of MITI-supported and co-ordinated measures. Yet MITI was not the sole player in the policy field. For example, the Ministry of Finance and the Fair Trade Commission also contributed to greater synchronisation of government-industry strategy and action. More generally, given that the indirect effects of policies are frequently more important than the direct impact, much attention needs to be paid to the consequences of policies relating to financial markets, competition, etc., and the interplay of policies with country-specific socio-economic and institutional structures.

3. Support policies for strategic industries and their impact at domestic level

A wide range of promotional measures applied in OECD Member countries to support strategic industries were discussed: trade-related measures; industrial and technology policies, including support to private R&D and specific subsidies; discriminatory procurement policies; regional support measures; tax policies; and discriminatory technical standards.
Quantification problems notwithstanding, there is little evidence that policies in support of specific technology-intensive activities have significantly improved the national welfare of the country implementing them. In the few cases where such policies have had a major impact on industrial performance, their effectiveness appears to have been restricted to the catch-up phase. Furthermore, successful targeting depends to an important degree on a capacity most countries lack, namely the ability to co-ordinate measures across a large spectrum of different policies, e.g. those involving trade, technology, competition, etc.

A major constraint on the effectiveness of sector- or technology-specific national support policies is the emergence of the multi-domestic corporation. The current trend among major players in strategically sensitive sectors is to strengthen their competitive position, share the burden of R&D costs or gain a foothold on foreign markets via an intricate web of joint ventures, co-operative agreements, etc. This has further blurred the distinction between "home" and "host" country, and complicated any definition of national economic interest. By extension, national technology policy to support specific firms or activities becomes increasingly meaningless because there are so many leakages – in terms of both financial advantages and research results – to non-national enterprises.

This viewpoint was strengthened by the representatives of multinational corporations around the table, who left no doubt as to the fact that they regard themselves as citizens of the country or region (e.g. Europe) in which they operate, and that they desired to be involved in the policy formulation process conducted by the respective authorities. They considered their thinking in this regard to be well ahead of that of policy-makers. The successful multinational corporation of the 1990s needed to satisfy numerous criteria: it should have a "passport" for all the countries it operates in; its shareholding should be global and its main board international; and its senior executive managers should be nationals of the country of operation.

Particular attention came to be focused on broader framework-setting policies. There are numerous illustrations of governments operating through financial markets to skew capital costs in favour of certain activities (e.g. export-oriented industries), and of authorities omitting to apply antitrust laws in specific cases. Japan was used to exemplify the case of measures aimed at encouraging high domestic savings for relatively limited investment opportunities, thus enabling industry to benefit from low interest rates and easy access to share capital.

Considerable importance attaches also to vertical integration in industry as a means of internalising externalities and giving the sectors concerned an added competitive edge. This process seems to be most advanced in Japan, an observation which begs the question of why other OECD Member countries do not have comparable degrees of vertical integration in their own industrial structures. However, it may be misleading to place so much emphasis on industrial integration. The question of access to capital can be much more important. Close financial relations between industry and banks encourage a longer-term vision of technological innovation. In Japan, for example, the banking sector plays a crucial role in two respects. Through their stockholdings in manufacturing companies, financial institutions are able to shelter management and its long-term view of product and corporate development from short-term views of individual shareholders. In addi-
tion, the main bank among a company’s lending institutions is able to monitor the company’s performance on the basis of a long-term relationship, and co-ordinate information and lending in support of long-term investments. Strong relationships between the financial sector and industry that serve the interests of long-term investment in technology also exist in Germany.

4. The systemic impacts of government support to strategic industries

Defining either strategic industries or industrial targeting measures was thought to be an extremely difficult (if not impossible) task. However, as long as countries consider the policies of their competitors to be targeted at specific products or activities, there will be policy spillovers and retaliatory actions in the international economy. This is largely because government support to strategic industries has an impact not only on the countries implementing such policies, but also on their trading partners and the international system of trade, finance and investment, as well as on the global allocation of resources. Tensions may arise even where there are no beneficial effects for the industry receiving the support. It is the perception of others that counts.

With respect to the question of global resource allocation, duplication of effort was singled out by some participants as a major problem. It was suggested that each time an important new product or process comes to the fore, a massive shift in worldwide R&D effort takes place that frequently leads to substantial duplication (e.g. JESSI, Sematech). While this does imply a waste of resources, it may nonetheless produce some benefits, for instance in the form of accelerated diffusion of the associated innovations. Moreover, the question remains as to why competition between enterprises is a “good” thing, while that between governments is considered a “bad” thing.

The business participants identified a crucial dilemma here. On the one hand, highly skilled manpower will most likely be relatively scarce in the years to come, making duplication of research and development effort a luxury no one could really afford. On the other hand, it was important not to have to rely too heavily on foreign supplies of technology, an argument which was invoked in particular with regard to semiconductors.

Quite apart from the economic aspects, there are political costs and benefits to be considered. When competition in key technological activities is conducted on the basis of taxpayers’ money, the risk of a political response is all the greater because of the pressure that business brings to bear on politicians. This is borne out by US action on semiconductors and in automobiles. Yet the form of response has economic consequences. Counteraction in the shape of trade protection or subsidies to leading-edge industries is costly.

It was also emphasized that in a number of industries, corporate alliances among major firms benefiting from government support – including joint ventures and cross-shareholdings – may well in future reinforce existing trends towards international cartelisation.

A further risk at international level is that of locational competition triggered by the use of regional aid, discriminatory government procurement, etc. as a
magnet for foreign direct investment. The implications of such regional rivalry could be further compounded if major state-supported technology projects were to magnify the already existing growth poles to the detriment of other areas. Especially in Europe, the strain on regional funds could mount enormously as the pressures for inter-regional compensation grow (e.g. to make good Ireland's outflow of highly trained manpower).

Finally, the issue was broached as to whether, if government support to strategically important industries continues in the future on the same scale as today, private risk capital will be available at all for major technological ventures. In the United States, there is widespread concern that projects such as the Airbus could breed similar ventures. There is already some uncertainty as to how capital markets will react when it comes to the production of the next new generation of passenger aircraft. Given the scale of government support for Airbus and its success in capturing large segments of the market, it was thought that the prospects for Boeing and McDonnell Douglas of obtaining sufficient private risk capital on Wall Street might be significantly diminished.

5. System competition versus system friction

There was broad consensus on the importance of the social, institutional, historical, and cultural environments for the competitiveness of key industries, and indeed for the overall economy. This has underlined the importance of national systems and the interaction of their various component parts. For example, in the field of foreign direct investment, mergers and acquisitions are the chief means of access; however, there are significant differences among OECD Member countries in the national treatment of acquisition by and mergers with foreign companies. These impediments are compounded by structural differences in financial markets (e.g. capacity and degree of sophistication of equity markets; role of banks in corporate ownership and control) and in regulations (e.g. company law; stock market rules governing takeovers). Many of these characteristics are deeply rooted in the national cultural and historical fabric, and will be slow to change. Others, however, are more susceptible to analysis and policy discussion.

There was broad agreement that increasing awareness of such differences has turned the spotlight on the issue of friction between systems. Views diverged, however, on how to resolve those frictions. The most advanced of the propositions put forward advocated greater multilateral convergence of domestic policies, and some move towards reciprocity in the field of technology and investment policies.

Two distinct sets of arguments were ranged against this idea. The first was a counter-thesis that system competition is in fact beneficial, even if it leads to friction. This reflects a kind of Darwinian belief that such rivalry helps to identify what sort of capitalistic model best promotes economic growth and human welfare. The most effective and efficient system would materialise over time; the process of natural selection should not be forced. The thrust of the second line of counter-argument was encapsulated in the question "Convergence to what?". It was felt to be both unjust and unwise to establish ex ante the contours of the international playing field towards which the rules of the game should progress.
On the whole, the risks of a "wait and see" approach were considered too great. Not only were the costs of the system friction thought to be already much too high; there was also a real danger that time was running out to find multilateral solutions, and that the temptation to seek bilateral and unilateral courses of action was growing — risks that would be amplified by a slow-down in economic growth. Moreover, if the present open system of trade, investment, finance and technology were to degenerate into one of managed trade, it would be those outside the system (e.g. the developing countries) who would bear the brunt of the costs and lose access to important technologies. Within an agreed, broad framework of rules there would remain sufficient room for continuing competition between systems.

6. Conclusions and policy recommendations

Policies to support "strategic" technologies are becoming a source of increasing international friction. Despite evidence that the effectiveness of such policies is highly questionable, strategic R&D support is often perceived by other countries as affording an unfair competitive advantage. An important step towards alleviating such tensions in the future would be the establishment of appropriate guidelines for government support to research and development.

However, as the discussions clearly demonstrated, such guidelines can only be part of the solution. The question of support to strategic technologies is inextricably interwoven with the broader, interrelated problems of the globalisation process itself, of the considerable structural differences that exist between economies, and of access to investment opportunities.

The growth and spread of multi-domestic corporations is a major driving force behind the trend towards the globalisation of the economy, with important implications for the effectiveness of both domestic and international policy-making. It is becoming increasingly important to develop the statistical tools to monitor and measure the extent of globalisation of multi-domestic firms and their trading and investment activities.

One implication of this growing multi-domicity is that it is becoming more and more impractical to promote only domestically owned firms and exclude foreign-owned companies, even if the latter make substantial intangible investments domestically. There are thus strong arguments for basing technology support policies on the principle of equal treatment and non-exclusion. Similarly, with regard to the question of membership of foreign-owned firms in government-sponsored consortia, careful thought needs to be given to the validity of so-called strategic arguments for excluding foreign subsidiaries, and the possibilities should be explored for granting access to government-sponsored consortia on a reciprocal basis.

At the same time, the importance of social, institutional, historical, and cultural features has clearly moved to the fore. Evidence indicates that some socio-economic systems are more conducive than others to the emergence of particular technological paradigms, and that some national technology systems are structurally more accessible than others. By the same token, the synergistic effects of the
interaction among financial institutions, industrial structure, tax regime and regulatory system vary from country to country. In order to understand better the role of such institutional and cultural factors in explaining differences between countries in technological, industrial and overall economic performance, analytical work in this field needs to be extended. Particular attention would need to be paid to the role that bank-industry relationships play in developing a longer-term outlook on investment in technological innovation.

National competition policies have proved in the past to be powerful motors for growth by creating competitive conditions within national borders. However, where there are significant differences between countries in competition law, in particular as regards the application and enforcement of rules governing mergers, acquisitions, alliances, etc., the risk of international friction increases. Hence, the possibilities need to be explored for reducing the divergences between national competition policies and for developing a common competition policy framework. Such a framework could focus on obstacles to mergers and alliances and other impediments to competition which might emerge at the international level, but also on the treatment of international cartels and monopolies.

Foreign direct investment is an important vehicle for access to, and diffusion of, technological innovation. The principal source of international friction in the field of FDI relates to problems of asymmetry of access and lack of reciprocity. The scope for reducing divergences in financial market regulations and in other fields of regulation needs to be examined, with a view to easing the international frictions surrounding issues of reciprocity in foreign direct investment.

However, the extent to which technology is internationally accessible also depends to a large degree on the structure of a country’s technological system, e.g. whether research is predominantly university-driven with a publicly accessible knowledge base, or whether it is conducted primarily in enterprises where knowledge tends to be more proprietal. Examination of these issues could be deepened and ways considered for reducing or compensating for differential access.

Developing countries are particularly vulnerable in this regard. There is already a significant risk that many developing countries may increasingly lose touch with technological progress in the industrialised regions of the world. If this trend is to be halted and reversed, special attention must be paid to facilitating developing countries’ access to new product and process technologies, but also to assisting them in establishing the appropriate physical, educational and managerial infrastructures for assimilating and harnessing technological change.

Substantial results in at least some of these domains could make a major contribution to ensuring that satisfactory economic progress in the 1990s is not severely impeded by international trade and investment disputes about support to key technological sectors.
Annex

OECD Forum for the Future

Support Policies for Strategic Industries

Chairman

Jean-Claude Paye Secretary-General of the OECD

Participants

Robert Blackburn Assistant Deputy Minister
Industry, Science and Technology
Canada

Pierre Borgeaud President and Chief Executive Officer
Sulzer AG
Switzerland

J. Michael Farren Under Secretary for International Trade
US Department of Commerce
United States

Horst Herke Vice President, Economic Affairs
General Motors Europe
Belgium

Barry O. Jones Member of Parliament
formerly Minister for Science and Small Business
Australia

Lars Bernhard Deputy Permanent Secretary
Jørgensen
Ministry of Industry
Denmark

Shigeo Muraoka Special Adviser to Minister for International Trade and
Industry
formerly Vice-Minister for International Trade and
Industry (MITI)
Japan
Sylvia Ostry  Chairman, Centre for International Studies  
University of Toronto  
formerly the Prime Minister's Personal Representative for  
the Economic Summit and Deputy Minister for the  
Multilateral Trade Negotiations  
Canada

Romano Prodi  Professor of Economics  
University of Bologna  
formerly President and CEO of IRI and  
Minister of Industry  
Italy

Luc Soete  Professor of International Economics  
Maastricht Economics Research Institute on Innovation  
and Technology  
University of Limburg  
The Netherlands

Michael Sohlman  Secretary of State for Trade  
Ministry of Foreign Affairs  
Sweden

Lothar F. W. Sparberg  Chairman of the Supervisory Board  
IBM Deutschland GmbH  
Chairman of BIAC  
Germany

David Stout  Professor of Economics  
Member of the Economic and Social Research Council  
Head of Corporate Development and Economics  
Unilever PLC  
United Kingdom

David J. Teece  Professor of Business Administration  
Walter A. Haas School of Business  
University of California at Berkeley  
United States

Eugenio Triana  Secretary of State for the Promotion of Industry and  
Technology  
Ministry of Industry and Energy  
Spain

Masaru Yoshitomi  Director-General  
Economic Research Institute  
Economic Planning Agency  
Japan

**OECD Secretariat**

Makoto Taniguchi  Deputy Secretary-General

Wolfgang Michalski  Head of the Advisory Unit to the Secretary-General
STRATEGIC INDUSTRIES IN A GLOBAL ECONOMY:
POLICY ISSUES FOR THE 1990s

Government support to economically strategic industries is already generating friction among governments, and promises to become a critical issue in the 1990s. Some governments consider support essential for an economy's competitiveness, while others see it as a major threat to the future of the international system of trade, investment and technology transfer.

The contributions in this report, based on an OECD Forum for the Future conference, assess the issues at stake, and conclude on the need for concerted international attention to the question of agreed guidelines for state support to R&D, greater international convergence of policies relating to competition and foreign investment, more analysis of structural differences between national economies, and the accessibility of technology for third countries.