CHAPTER 14

International Competitiveness, Trade and Technology Policies

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14.1 Introduction

In this Chapter the discussion started in the previous Chapter by Scherer on the role of technological innovation in determining international competitiveness and comparative advantage is expanded to the policy debate, in particular the implications for trade and technology policy. The latter have received over the last decade more and more policy attention and are today as high on the US policy agenda, as they appear to have been for much longer on the Japanese and EC policy agendas.

One reason for this increased policy recognition, economists like to believe, is the newly found economic theory that after all, “strategic” trade or technology policy intervention might be justified, even required in particular cases, thus breaking down nearly 25 years of what could be called an economists’ cartel agreement in support of all trade liberalization. We thus start this Chapter—and despite the analysis in the previous Chapter by Scherer—with our own account and assessment of old and new trade theory based, among others, on the analysis presented in Dosi, Pavitt and Soete [15], after which we elaborate on the somewhat pervasive notion of “strategic”, and its various forms of policy

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implementation. In the next sections, we question though the basis of the national focus of such policies. Strategic national policy discussions appear, indeed, increasingly out of tune with the internationalisation level at which most of the supposedly beneficiaries of such policy intervention, large, often multinational firms, appear to operate. From this perspective it appears paradoxical that, now that the scope for national strategic trade and technology policy is becoming recognized by both international trade theorists and national policy makers, the effectiveness and possibility for implementation of such policies appear much open to debate.

14.2 International Competitiveness: on Statics and Dynamics

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

A. The first main direction of analysis, going back to classical economists, tried to show how despite a country’s poor efficiency, there could nevertheless be gains in welfare by specializing in those products/industries in which the country was relatively most efficient. Such gains were by and large based on the principles of division of labour applied to an international world. The neo-classical extension of this line of analysis introduced more formally ‘factor endowments’ as a factor explaining 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 established how, through God’s invisible hand free trade would undo the angel’s ill-doings and re-establish paradise all over the world, despite the national differences in ‘factor endowments’.

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

First of all empirical trade analysts found it more and more difficult not to be surprised by the large amount of trade flows which did not fit “pure” trade theory explanations. These findings conveniently described as a “paradox” (the so-called Leontief paradox) seemed more and more evidence of the limits and limited value of pure trade theory in a

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1 Parts of this section are based on Dosi, Pavitt and Soete [15, chapter 1].
2 The parable is from Paul Krugman, who quotes Paul Samuelson.
world dominated by more realistic imperfect competition phenomena\(^3\). The unease with the existing theoretical trade framework became a standard opener of many trade analyses. Bhagwati e.g. writing some 20 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" [4, p. 23]. Hufbauer in a 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" [28, p. 192].

The second queries related more directly to the success (or lack there-off) 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 trade liberalisation and e.g. the creation of free trade markets\(^4\). The actual estimated gains from trade actually excluded *ex officio* some of the most important and obvious gains from opening up to trade related to imperfect competition, for instance the efficiency gains associated with the reaping of scale economies or the consumer gains associated with the availability of greater product variety, which the pure trade model did and could not include. It became, as the quote from Bhagwati cited above hinted at, only a question of time before a "new" line of analysis was developed.

B. This second main "new" direction of analysis, developed over the last ten years and associated with the names of Grossman, Helpman and Krugman started from a fundamentally different assumption, namely that many if not most economic activities are characterized by increasing rather than decreasing returns. Gains from trade are from this perspective in the first instance the result from the scale economies each national economy can achieve through free trade, whether it is the size of Luxembourg or the US. 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 thus pointed towards the significance of such gains. This was done most clearly by Smith and Venables [44] with respect to the further harmonisation of the European Community's internal market and by Harris [27]. (See also Cox and Harris, [12].) with respect to the Canada-US free trade agreement.

In terms of our parable, it could be said that just like in large nations, where particular activities have been concentrated in particular locations—Krugman's favourite example being mushroom production in Pennsylvania - "paradise" for the world as a whole will be achieved by bringing resources together, whether it be motor car manufacturing in Japan or ceramic tiles in Italy. Again "free trade" will be essential for getting there; this time though, primarily because it allows consumers to reap the 'imperfect competition' advantages (scale economies and product differentiation) of such trade. The advantages accruing to the region or country from the 'agglomeration' of a particular set of activity

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\(^3\) See also Scherer's Chapter in this book.

\(^4\) See in particular the estimates with respect to the enlargement of the EC in the 70s and later on with respect to the formation of the single European market.
are in this approach in other words not so much of importance, compared to the advantages to every world consumer of the efficient exploitation of world economies of scale.

In setting out from such a radically different starting assumption, "new" trade theory has, however, also led to a plethora of 'new', sometimes reverse, sometimes similar, 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 [5, 6], that free trade might in some cases of market structure no longer be the only world maximum welfare gain, but that a 'strategic' trade policy might be justified and actually needed. As Dixit 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 emerges 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." [14]

The discussion surrounding strategic trade policy has brought to the forefront many features which appear at least at first sight to reflect better the industrial reality which both policy makers and businessmen are being confronted with in many sectors. Particularly with respect to analyses of technical change and international trade, this discussion seems to offer a better theoretical framework to discuss appropriate policies covering the whole spectrum of trade, industrial and technology policies. The importance of monopoly rents, of profit sharing and strategic trade manipulation seem indeed of particular relevance to many high technology industries. Furthermore, the actual emergence of these new theories on the US academic scene occurred at a time of increasing fear in the US of the Japanese challenge in trade and technology [34].

The emergence of strategic trade concepts brings, however, also to the forefront some of the dynamic features associated with technological change in particular its cumulative-ness. Together with Giovanni Dosi and Keith Pavitt, we identified these features with a different, third stream of analysis [15].

C. Compared to the previous set of 'new' trade theories, it is based on a greater emphasis on the dynamics of increasing returns, particularly those associated with production technology and innovation. In terms of the opening parable, to the extent that technological development and growth are irreversible processes, there is no possible return to "paradise": like virginity, once lost it is lost for ever. There is rather a historically driven development process with no particular connotation of optimality. Dynamic features closely associated with technical change, such as learning and the accompanying dynamic feedback effects (both positive and negative), are from this perspective the main
explanatory factor behind the very different development and specialisation patterns (some virtuous, some vicious) countries appear to get "locked in".  

As emphasized in many locational theories, the reasons for such differentiated "path dependent" development processes have to do with the way industrialisation locations get 'selected' early on and, by appropriating the available agglomeration economies, exercise some 'competitive exclusion'—to use Arthur's [1, 2] term—on other locations. From a dynamic technology perspective, it does matter, in other words, whether a region or country is specialized in mushroom production or silicon chips. Few authors in the "new" trade theory have yet fully integrated these dynamic features in their trade models and policy conclusions.

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

More than in the second direction of analysis, this third approach brings to the forefront the possible trade off between policies directed towards static allocative efficiency and dynamic growth efficiency. There appears indeed, once concepts such as increasing returns are being introduced, nothing in the mechanism leading to static allocative efficiency that would also necessarily guarantee the fulfilment of the criteria of dynamic efficiency. As highlighted in Dosi, Pavitt and Soete [15]: "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 it gets more commodities from abroad than it would otherwise be able to manufacture domestically without foregoing any production and consumption of the commodities in which it specializes. 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 meaning 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 has been highlighted by many authors long before present contribution in trade 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 either generate in the long run virtuous or vicious circles of technological advance/backwardness. See also Clulow and Soete [11].

In the next sections of this Chapter, we discuss albeit briefly some of the international

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5 Many recent contributions in the evolutionary and so-called new growth literature have brought to the forefront new explanations for the old empirical question of "why growth rates differ". For recent overviews see, among others, [43, 46].

6 The couple of exceptions include Markusen and McDonald [32] and Markusen [30, 31], with devastating results for the traditional distribution of trade welfare gains. For more detailed analysis see [15].
implications of "strategic" trade and technology policies. There is, as we will try to argue 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 going beyond trade and including industrial and technology policy.

From this perspective there is a significant paradox in the actual growth and emergence of such "domestic" strategic industrial policies and their theoretical foundations, at a time when the "domestic" firms at which such policies are aimed at are becoming increasingly global and "multi-national"; 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 some of the increased trade friction following the widespread implementation of strategic trade policy.

Before discussing these issues in more detail, it might be useful though 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.

14.3 Strategic Industries and Policies: an Attempt at Clarification

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

A. The first, probably most minimalistic definition of "strategic" can actually be found in its analogy with the military interpretation of the term "strategic", whereby long term access is the main reason for justifying the strategic interest and readiness for extra support costs. Access to some products or technologies contains from this perspective a "strategic" advantage. Such a '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 resources are concentrated in one or a number of particular countries. To the extent that high tech products are continuously subject to "creative destruction" through the coming on 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 be obvious that the continuous improvements in performance by the technologically leading firms, might render the costs of strategic support policies in this area often prohibitive and certainly highly risky. The, at first sight successful, case of technological "leapfrogging": South Korea, which succeeded in developing a technological capability in the production of VLSI chips over a very short period, illustrates from this
perspective probably more the particularly “fitting” institutional surroundings as well as the haphazard luck of good fortune, than any careful “strategic” policy consideration of costs and benefits. Thus the entry of Samsung and Gold Star in wafer based IC production a couple of years before Japanese firms were forced to raise chip prices following American anti-dumping suits and import tariff measures, allowed those firms to reap quickly high returns on their investments, whereas the role and in particular the “financial patience” of the chaebuls in pouring in resources with little financial shareholder accountability and the close US-Korean ties both in terms of trade flows as well as in terms of the training of Korean scientists and engineers in the US, etc., were all crucial, exceptional factors in the Korean “strategic” leapfrogging story.

However, as this case illustrates well, the “strategic” argument involved in the case of high tech products is one which is in the first instance based on the cumulative, learning and dynamic increasing returns features of technological advance in this area. For many technologies, so the strategic policy argument runs, access or better the existence of a national technological capability might be essential for future technological success and for the successful transfer and effective use of technology in other sectors of the economy. The high tech products which fall under this first “strategic” heading are in other words strategic in that they have an out of proportion 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 that there are strong cumulative and increasing return features involved in the development of such technologies. National and supranational technology policies have very much focused on such products. One may think of the VLSI, Sematech and Jessi support programmes in Japan, the US or 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: one may think of nuclear energy or the European aerospace programmes (Concorde), and today the TGV. Whether HDTV fulfills the ‘pervasiveness’ criterion remains to be seen.

B. The second notion of “strategic” increasingly used in the policy arena is the one most closely related to new trade theory, and very much identified with Brander and Spencer’s article [5]. The argument here is straightforward economic based on the notion of increasing returns. These are, however, more directly associated with the actual production of many products which are being traded internationally. The resulting international concentration of production of particular products in some regions/countries and not in others, raises the possibility for “strategic” intervention, i.e. the initial stimulus to get the static production increasing returns under way within the region/country before any other region/country would do the same thing. The problem here is of course that if everybody were to develop such “strategic” policies, no one would any more reap the benefits of the scale and agglomeration economies which in theory justified such policies. From a dynamic point of view, however, as we discussed above7 and following some of the “new” growth contributions in this area 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.

7 See section 14.2.C
Trade and industrial support policies for some particular sectors which differ very much from country to country could be said to fall under this category. One may think of the European support policies for the aerospace industry, the French TGV initiative, etc. The product or sectoral focus of industrial policy is here clearly dictated by notions of the region or country’s comparative or potential comparative advantage. The main practical implementation problem relates to the delineation of such sectors. No one would probably include any longer the iron and steel sector under the heading of strategic; it is clear though that both in theory and in practice the static and dynamic economies of scale have been and still are significant in this sector.

C. The third and probably broadest notion of strategic underpins directly the raison d’être of industrial policy. It can be best 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 in- and outputs, that they have become “strategic” to the country. The French automobile industry is probably the best illustration of such a sector. One in ten Frenchmen has been estimated to be 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 last “broadest” interpretation of the term “strategic” can easily become a very defensive interpretation of the term strategic. Here too analogy with some military use of the term “strategic” (e.g. a “strategic” withdrawal, behind lines which can be better defended or from where a new attack can be launched) seems appropriate. In case of substantial import penetration e.g. 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.

A variety of arguments can thus be put forward in favour of “strategic” policy: primarily technology inspired (our first case), trade inspired (our second case) or industrial inspired (our third case) arguments. Let us now turn to some of the limits of such policies, less from a government’s implementation perspective than from the actual international effectiveness of such national policies.

14.4 Domestic Strategic Policies for “Multi-National” Firms

Opposed to the new theoretical insights which point both to the importance of the welfare gains associated with free trade, and the possible justification for strategic “domestic” industrial and technology government support action, there is, as was already mentioned above, the rather paradoxical reality that the domestic firms which would display some of the main industrial or technological characteristics justifying such government support action have become increasingly rare.

The growth and emergence of the multi-national corporation is of course not a new, or recent feature. There exists now a vast literature providing detailed insights on the reasons

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8 This also explains why in the 50’s and 60’s both in the EC (ESCC) and Japan these sectors were the core of much “strategic” policy intervention even though the word strategic was not yet used.
underlying the growth of multinational firms\(^9\). The actual internationalisation of production has been just one feature of the more general “internationalisation” pattern of growth in international trade and international flows of capital and technology which has been characteristic of the post-war stable, liberal trading system mentioned above. While many such international investments might have been initially inspired by protectionists fears and by a profound desire to secure access to large markets, the post-war growth in the internationalisation of production has been by and large of a complementary nature rather than a substitute to international trade flows. One could even go a step further: it is primarily the internationalisation of production over the last three decades which has led to catching-up and rapid technological diffusion of “best practice” production techniques and products from the US to a large number of OECD countries, and thus to the convergence of income levels, rather than just the actual international trade flows as traditional trade theory would lead one to believe\(^10\).

One of the main reasons why this has been the case is the fact that 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 might exist between domestic and foreign user requirements. Foreign regulation, standards and other procurement specifications will in all likelihood be rather different from the home base country of the firm; not to speak of other taste, and economically induced differences between the foreign and home country. These factors have undoubtedly led many multinational firms to set up or take over already in a very early stage\(^11\) research and development laboratories in foreign countries, sometimes directly linked to their production subsidiaries, sometimes not.

With the increase in the 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\(^12\). This process has probably been clearest in the case of multinational firms with, as their “home-base”, small OECD countries (one can think of the Dutch, Swiss and Swedish multinationals). In these countries the need for more international sourcing of relevant scientific and technological inputs is of course felt much more rapidly. There is indeed no reason, why only the ‘home’ basis should be relied upon in terms of the provision of well qualified scientists and engineers. Evidence on the international location of R&D activities remains however extremely limited. The available US Department of Commerce data point to the fact that over the 70’s and 80’s there has been a gradual increase (from about 6 to 10\%) in the foreign share of total R&D expenditure of US MNCs (see, among others, Freeman and Hagedoorn [22]).

Figure 14.1 based on available “official” OECD R&D data, indicates for the EC as a whole the trends in the domestic and foreign company financed R&D for the period 1981-

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\(^9\) For recent overviews see in particular Dunning [16, 17].

\(^10\) This emerges e.g. from the crucial importance in EC imports and intra-EC trade of high-tech sectors such as electronics, of foreign multinational’s intra-firm trade. The latter not only accounts for more than 50\% of total EC imports in sectors such as computers, electronic consumer goods and electronic components; it also accounts for more than 50\% of total intra-EC trade in those sectors. In other words, it is in the first instance (foreign) MNCs which appear to exploit most trade advantages in the single European market. See Grupp and Soete [24].

\(^11\) Often just after or even before World War II, one can think of North American Philips in the US, IBM in Europe including Switzerland, the take-overs of Pathé in France by Kodak, of the Belgian Gervaert by Agfa, etc.

\(^12\) There exists by now a voluminous literature on this subject. See, among others, [7, 8, 23, 41].
The figure suggests that the importance of foreign R&D remains small and has only been gradually increasing to some 8.5% of total company financed R&D. There are good reasons though to believe that such official data underestimate the foreign nature of company financed R&D particularly in some of the small European countries such as Belgium, the Netherlands, Sweden or Switzerland. In Table 14.1, the official R&D data are compared with evidence based on US patent data and gathered by Patel and Pavitt [39]. The table illustrates not only the likely underestimation of the foreign owned/controlled share of total company financed R&D particularly in small countries, it also illustrates the extreme diversification in international R&D location pattern between OECD countries, and between Japan, the US and the large European countries in particular.

With respect to the small(er) countries, the patent data reported in Table 14.1 illustrate, how such countries can sometimes be characterized by either a strong presence of foreign MNCs’ R&D activities (Belgium, Canada, Switzerland and to broaden the size a little, the UK), or by large domestic MNCs with a strong R&D presence abroad (The Netherlands, Sweden and again Switzerland and the UK). National technology support policies in those countries, whether strategic or not, have been faced for a long time with the growing discrepancy between the effectiveness of such national support compared to its international, foreign impact. The difference between technology support policies in various small countries is rather revealing in this context. In countries such as Belgium or Canada, the policy focus is very much on improving the physical and human infrastructure in attracting foreign MNCs investment both in production and R&D. In countries such as the Netherlands, the policy is aimed at small and medium sized firms in an effort to “free” itself from the dominance of the large domestic MNCs. The latter are pushed in their demands for domestic R&D support to the higher EC policy level. These differences in

**Figure 14.1** Business-funded R&D funds in the EC by source of funds

![Business-funded R&D funds in the EC by source of funds](image-url)
national policy reflect responses to the basic questions such countries are struggling with: why would, given the international sourcing and leakage effects, national countries have a (strategic) technology support policy, and how can policy makers assess the "good citizenship" of foreign firms?

In more recent times, and in our view to a larger extent than the official R&D figures as reported in Table 14.1 tend to illustrate, this debate can no longer be said to be confined to such smaller countries, or to the couple of foreign R&D labs set up or acquired by US and European MNCs over the post-war period\textsuperscript{13}. A more fundamental "globalisation" trend, involving a much wider set of international exchanges including strategic alliances, networks of scientific and technological information, R&D subcontracting has emerged and grown rapidly particularly between the so-called Triad firms\textsuperscript{14}. Such a globalisation trend is not contradicted by the Porter [42] or Pavitt and Patel [39] evidence about the strongly 'national' home basis of the competitive advantage of such emerging global firms. In line with the arguments set out in section 14.1, it is indeed in the first instance the national virtues which create the opportunity to cross borders. However, this emphasis, exactly as in the case of strategic trade theory, while bringing to the forefront some of the essential "verités" about the nature of international competitiveness and post-war trade flows, does underscore the new, emerging trend of globalisation and networking between such firms, becoming more and more global in their marketing, distribution R&D and technology sourcing, as reflected e.g. in the number of strategic alliances.

The growth in strategic alliances and networks, reviewed in depth by Chesnais [10], Hagedoorn and Schakenraad [25], Mowery [33] and Mytelka [36] between such increasingly "global" firms raises with respect to the strategic policy discussion three clear issues.

A. First, one may raise some questions as to the nature of such alliances. Are such alliances indeed a new, more or less permanent feature of the new global network economy closely related to the complexity of science and technology and the need for international sourcing of and access to 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. The literature on strategic alliances points to a wide variety of more or less technology inspired motives for strategic inter-firm cooperation. These range from research risk-sharing to seeking access and entry in foreign markets [26]. The present day trend towards globalisation, alliances and networking, in so far as 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 increase in a trend towards world oligopoly in many sectors dominated by economies of scale.

A first major policy issue is consequently whether a global competition policy is needed and how it should be implemented. Without entering this debate\textsuperscript{15}, it will be clear that

\textsuperscript{13} Our view is thus contrary to the arguments and evidence put forward by Pavitt and Patel [40] or Duysters and Hagedoorn [18]. For more evidence on the internationalisation of R&D see Soete and Verspagen [45].

\textsuperscript{14} For an overview of the evidence see, among others, Freeman and Hagedoorn [22].

\textsuperscript{15} For a clear outspoken view on this issue see Gertry [38].
Table 14.1 Foreign controlled domestic technology compared to nationally controlled foreign technology (based on R&D (1988) and US patenting (1981-1986))

<table>
<thead>
<tr>
<th>Home country</th>
<th>Foreign Company-financed R&amp;D (as a % of total R&amp;D expenditure 1989)</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>n.a.</td>
<td>45.7</td>
<td>16.5</td>
</tr>
<tr>
<td>France</td>
<td>13.5</td>
<td>11.8</td>
<td>3.8</td>
</tr>
<tr>
<td>FR Germany</td>
<td>3.0</td>
<td>11.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Italy</td>
<td>7.8</td>
<td>11.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Netherlands</td>
<td>4.4</td>
<td>9.5</td>
<td>73.4</td>
</tr>
<tr>
<td>Sweden</td>
<td>2.3</td>
<td>5.4</td>
<td>16.7</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2.0</td>
<td>12.5</td>
<td>27.8</td>
</tr>
<tr>
<td>UK</td>
<td>16.2</td>
<td>22.3</td>
<td>24.5</td>
</tr>
<tr>
<td>EC/Western Europe</td>
<td>8.4</td>
<td>7.4</td>
<td>9.3</td>
</tr>
<tr>
<td>Canada</td>
<td>18.8</td>
<td>28.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Japan</td>
<td>0.1</td>
<td>1.2</td>
<td>0.5</td>
</tr>
<tr>
<td>USA</td>
<td>13.7</td>
<td>4.2</td>
<td>4.4</td>
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the existence of a supra-national form of international competition policy, aimed at countering the emergence of world wide cartels between global firms, would directly undermine one of the reasons for strategic government support, namely those based on arguments of dependence on “foreign” monopoly pricing.

B. The second major policy issue, which the discussion on networking and globalisation brings to the forefront within the context of strategic technology policies, is the possible impact and inducement of such policies on international localisation and networking. Indeed, are strategic alliances and technology networks truly based on such firms’ needs for international exchanges improving resource allocation, more dynamic innovation and faster spread of best practice techniques, or are they in the first instance motivated by the desire of large “global” firms to take advantage from various domestic “strategic” support
policies? From this perspective, the attempt of global firms to become "multi-national" 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 [34].

Again an adequate response to these questions can only consist in emphasizing both features. The aim of many of the largest firms is increasingly directed towards global strategies which find a balance between reaping some of the industry specific scale advantages of global markets yet exploiting the often geographically determined diversity of consumers and production factors. The large multinational firm's organisation and its production technology often give it the necessary flexibility to confront this diversity. The decentralization of its production units, marketing and even research, together with a diversification of sub-contractors, will enable it to take full advantage of global access, including access to government sponsored 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 locational 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", increasing return growth features of long term development, and explain why regional/local authorities have always been keen on providing "incentives" for foreign firms to invest and locate in their particular region.

The effective exploitation as well as the contribution of multi-national firms to such locally as opposed to nationally created advantages raises a number of interesting policy paradoxes. At the national, or supra-national (the 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 such firms from national (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", being set up, few 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\(^\text{16}\). It is from this perspective interesting to observe that the much heralded "subsidiarity principle" in the European Treaty on Economic and Monetary Union (the so-called Maastricht Treaty) gives way, as is becoming obvious from the growth in European regional policy "identity", to many new regional strategic policy support initiatives.

C. The third policy issue with respect to the increasing trend in networking and strategic alliances, and of particular relevance to the discussion surrounding strategic policy, relates to access to technology for those firms/countries not belonging to the networks. As indicated above, one has witnessed particularly over the 1980s a rapid growth in

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\(^\text{16}\) For early discussions of some of those locational features of agglomeration effects see David [13], Arthur [2] and more recently Murphy, Schleifer and Vishny [35].
“strategic” technology alliances by companies on an international scale. This has however occurred primarily between firms from the so-called Triad: the US, Japan and the EC. It has been estimated that over 90% of all technology agreements and alliances are made between companies from the US, Japan and the EC (see, among others, Hagedoom and Schakenraad [25, 26] and Freeman and Hagedoom [22]).

This 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. Such possibility of “exclusion” is characteristic of processes of increasing returns and learning. There is here an emerging need for broad international principles such as reciprocity concerning access to technology networks, including the particular preoccupations of the NICs and developing countries17.

14.5 Strategic Trade Policy: the International Risks

So far we have highlighted the lack of effectiveness of “domestic” strategic industrial policies in an increasing international technology world. We now turn to some of the international policy implications and aspects of such “domestically” inspired policies. In doing so, we will assume, for sake of argument, that, contrary to the questions raised in the previous section, such domestic policies appear not only justified on theoretical grounds but that they are also effective with respect to domestic industry. What are in other words the international implications of the strategic policy rivalry among individual nations/trade blocks?

It is important to distinguish here among some of the motives underlying the wide variety of “strategic” industrial policies. Let us first discuss some of the more offensive industrial policies which have at their origin either some domestic distortion or some infant industry argumentation. A starting point for the discussion surrounding such strategic industrial policy proposals is the domestic distortions approach going back to some basic principles about gains from trade and economic welfare18.

The domestic distortions approach highlights a number of elements that, from an analytical perspective, are worth emphasizing. First, such an approach focuses attention on the fact that at the origin of the issue, there is generally a particular domestic distortion which policy makers are trying to correct by interfering with trade. Second, it points to the fact that such trade interventions are a particularly inefficient way of dealing with such distortions. In the case of “strategic” industrial policy e.g. the emphasis put on subsidy support rather than trade policy highlights the fact that the compensation must occur as closely as possible at the origin of the distortion and brings thus better to the forefront the real and hidden costs of the direct income transfer in favour of the “strategic” industry. As a result the policy support for such direct income transfer will probably be less than in the case of trade intervention, e.g. import restriction, where the hidden taxation is indirect, thus less obvious and can even be presented as being borne by the foreign competitors.

17 This issue has been emphasized in particular in the OECD so-called TEP report (OECD, 1991).
18 As can be found back e.g. in Corden’s classic book on Trade and Economic Welfare (1974).
However, and as highlighted in the domestic distortions literature, such 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 others 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." [45].

The trade risks of strategic industrial policy are from this perspective in the first instance related to the trade retaliatory political pressure and in particular the easy access to "legal" anti-dumping and countervailing duty measures which domestic producers are practically automatically entitled to, once it can be proven to be subsidized or sold below full costs.

In the case of the more defensive inspired arguments for domestic "strategic" industrial policy, the distortion arguments can be expanded to include now "foreign-caused" distortions. The "strategic" intervention is now motivated by the allegedly "foreign" unruly behaviour. That behaviour is than often considered the result of foreign "strategic" industrial policy, which was not called strategic when implemented, but can only appear ex post in terms of the resulting successful foreign catching-up or increased world market share as clearly "strategic" inspired. Typically, this motivation is strongest in countries/sectors which have seen their world or domestic market position coming under foreign pressure.

In this case, because of the transparency of subsidy claims for support for particular strategic industries, governments will even more prefer to go for the more hidden import restrictions, 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' [45]. A by now well-known case, illustrating the perverse results that may emerge from such domestic political processes, is the US-Japan 1986 semiconductor trade agreement. Rather than granting the US semiconductor industry e.g. R&D and production subsidies, US policy focused on attacking Japanese predatory pricing with the ostensible purpose of opening the Japanese market. The result was nearly a doubling in the price of Japanese 256K chips, which has hurt world consumers a lot and transformed Japanese industry into a "rent-collecting chip making cartel" [19], investing its rents in the development of future generations of chips, while "dumping" on the domestic market, to the benefit of all Japanese user industries and consumers, the newest generations of chips.

Strategic industrial policies contain therefore a number of protectionist pressures, primarily because of the temptation to go for bilateral retaliatory trade action, which in typical protectionist fashion could lead to further "domino" protectionist effects.

At the strategic technology end, and linking 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, do also have possible important international implications. Within regional trade blocks this is already explicitly recognized. In case of the EC for instance, national and/or regional technology support policies have to be notified to the Community’s directorate for competition policy and are only accepted if they fulfill certain requirements (strategic sectors; no more than 30 to 50% of total R&D costs can be subsidized; etc.). At a broader international level, the discussion surrounding the possible distorting impact of government R&D support has probably been most hotly debated with respect to the European subsidies for Airbus.

The case here is indeed not just limited to the issue whether the Airbus subsidies did make world consumers better off by lowering Boeing’s prices [3], or whether Airbus was justified in claiming European subsidy support to overcome the entry barriers in the building of wide-bodied aircraft. It also includes the international implications which such domestic (EC) government support for R&D might have on the long-term survival of competitors which invest in R&D without government support. From this perspective the Boeing-Airbus case is again illustrative. Thus whereas R&D support for Airbus might have been justified in terms of the indirect past military R&D support for Boeing, the industrial and the long-term result might be that both firms can only survive if both are now benefitting on a more or less permanent basis from government industrial and R&D support. The particular ‘strategic’ technology policy has resulted in other words in a domino-effect of strategic technology support policies in all competing firms’ countries, which has now become essential to the survival of all those firms.

There are in other words, major international distorting effects related to differences in public funding of industrial R&D, which have so far only rarely been addressed, let alone recognised. In our view, it could well be argued that one of the reasons why firms are so much prepared today to go into a multiplicity of international ‘strategic’ alliances is related to the desire of such firms to counter the international distorting effects of domestic R&D support policies.

14.6 Conclusions

“New” trade theory and in its footsteps, “new” growth theory have brought back, in economic analysis, a great deal of economic realism. Realism with respect to the way firms operate in industries dominated by economies of scale and imperfect competition, consumers consume differentiated commodities and look continuously for variety, and countries grow and trade 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 to the forefront the importance of the gains from free trade to world consumers, yet at the same time opened up a Pandora’s box about the possibility of governments intervening 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 before: that static international specialisations which are clearly efficient in terms of static comparative advantage criteria may well 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 brought to the forefront is that arguments about the existence of such possible national policy trade-offs do also have an international price. That price is probably least in terms of the actual subsidies spent on the "strategic" sector; it is possibly highest when it leads to retaliatory trade and pricing action, as e.g. typified in the 1986 Semiconductor Agreement between the US and Japan, with its high cost to world consumers.

In this paper, the emphasis has been on another international feature of strategic policy, namely the fact that the domestic firms (for whom such "strategic" domestic policies could be developed on the basis of the "new" found theoretical wisdom) have grown increasingly global, are involved themselves 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 those with respect to the level at which policy should be implemented. It is obvious that global, network or multi-national firms increasingly call into question the meaning of many national policies. In many cases such firms might be just as good "citizens" as nationally owned firms. In other cases, they will not be. 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.

Now that technology policy is again high on the policy agenda of most developed countries, it might sound frustrating at least to policy makers that the effectiveness of such policy seems to become undermined by the very actors on which such policies have traditionally focused: the large, nationally-owned, R&D performing firms. But maybe this is exactly where technology policy has gone wrong and needs to be re-oriented: away from national prestige and the technological nurturing of its leading firms, and more towards those less footloose features of the process of technical change: the local network of small and medium sized firms; the higher education, training and basic research infrastructure; the local institutional set-up; etc. The importance of this wider and broader concept of technology policy more and more recognized in the notion of "national systems of innovation"19 is not being questioned by our analysis, rather the contrary.

References


19 See amongst others Freeman [21], Lundvall [29] and Nelson [37].


