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A Policy for Industrial Champions: from picking winners to fostering excellence and the growth of firms

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Abstract

The EU has experienced different options to support the emergence of champions: (i) targeted support for *strategic* sectors and large technology initiatives (e.g. Airbus, Ariane, HDTV and ESPRIT); (ii) a support of declining sectors with the ECSC Treaty; and (iii) an emphasis on horizontal policies since the early 1990's. Recently, the disappointing performances of certain high-tech sectors and the growing productivity gap with the US have raised concerns about the ability of the pro-market approach to help EU companies withstand international competition. Stylised facts show that the EU does not suffer from the absence of large world-class companies, but rather from the absence of growing companies in new high-technology industries. With a few exceptions, the EU has not been able to promote the emergence of international players in the fast-growing sectors of the economy. Against this background, the paper reviews the arguments for and against pro-champions policies and explores the contribution of different EU policies – competition, trade and research - to the twin goal of providing a stimulating and disciplining environment for large companies while at the same time facilitating the growth of young innovative enterprises.

Key words: champion, manufacturing, competition policy, trade policy, research policy.

JEL code: L40, L53, L60.

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Addendum

This paper was written in the context of the debate on industrial champions and the concerns of deindustrialisation in Europe that has re-emerged since late 2003. This debate has renewed questions on the nature of EU industrial policy. France, and to a lesser extent Germany, have advocated supporting industrial champions as a way to reinforce the industrial strength of the Union. A number of policy-oriented reports have also argued for a stronger role of industrial policy in helping the emergence of global enterprises and strengthening the competitive advantages of the EU. The objective of this paper is to shed further light on this debate.

Recently attention has shifted towards the concept of "economic patriotism", which in some Member States has translated into protectionist measures aimed at supporting large companies, particularly in the energy sector. The process of European integration of utility markets is less advanced than for most manufacturing sectors, due to the fact that some Member States remain reluctant to open their national markets to competition. The result has been that in some Member States a number of large incumbents have been allowed to benefit from a cosy position, which in turn has enabled them to adopt an expansionary stance in the markets of other Member States.

Integration of European markets is a pre-condition for the emergence of competitive European champions. However, our paper looks beyond the role of the internal market and aims at analysing how various policy levers, such as competition, trade, or research policies, could be mobilised in order to support the development of efficient large companies.

Large companies, when they operate in a competitive environment, play a significant part in terms of employment and wealth creation. Our analysis of European industry shows that the Union already possesses a significant number of champions, although mostly present in scale-intensive medium-to-high technology industries. In these sectors European companies rank amongst the world's largest and best performing. Conversely, Europe has a worryingly weak specialisation in the fast-growing high-technology sectors, where hardly any world-class companies are European.

When it comes to enterprise creation, Europe shows a healthy entrepreneurial dynamism. However, the newly-created companies find it hard to grow and quite often remain too small to be able to challenge leading foreign competitors. Young and innovative European companies in knowledge sectors face numerous hurdles and obstacles which hinder their growth opportunities. Fragmented finance markets stand in the way of their growth. They have less access to available knowledge or research support.

The targeted industrial policies that have succeeded in aerospace or high-speed trains are not transferable to the new rapidly changing sectors. Unfortunately, Europe has traditionally performed better in strengthening century-old companies than in helping the young and innovative ones to succeed.

The challenges for European policy-makers come on two fronts. On the one hand, as far as mature large firms are concerned, public authorities must ensure that companies evolve in a competitive environment so that they have the necessary stimulus to continuously

innovate and thrive in the global market. In this respect, the internal market, competition and trade policies have an active role to play in order to discipline would-be champions.

On the other hand, in the newest and fast-growing sectors of the economy, the role of public policies should focus on facilitating and accompanying the emergence of competitive players. Focused support to research and innovation, particularly for the promotion of access to technology by SMEs, should be enhanced. Increased support to large-scale R&D intensive initiatives could also be extremely helpful.

The various economic policies should be complementary in achieving this two-pronged objective, i.e. to provide a stimulating environment for well-established companies while facilitating the development of young firms in growing sectors. At EU level, the internal market, competition, trade and research policies have key complementary tasks to pursue. This would create positive synergies with national policies, especially in the research field.

Content

1. INTRODUCTION: INDUSTRIAL POLICY AND EUROPEAN CHAMPIONS

Recently the concept of "industrial champions" has attracted renewed attention. The commercial and industrial successes of Airbus coupled with Europe's weak performance in other high-technology sectors have led many politicians and businessmen to plea for a proactive public role in supporting other would-be champions. Outright calls to support European champions have also been made to defend a number of State bail-outs or mergers.

The debate on industrial champions initially re-emerged in Europe in late 2003, in the context of concerns about *deindustrialization* repeatedly expressed by various Member States and the European Council. The Commission addressed the issue of deindustrialization in various documents, notably the Communication of April 2004 "Fostering structural change: an industrial policy for an enlarged Europe". While acknowledging certain worrying trends, notably slow productivity growth, the Commission concluded that deindustrialization was a long term process of structural change that had to be anticipated and accompanied. This assessment is widely shared by most economists having analysed the issue. The role of public authorities would also be to put in place the most favourable framework conditions for enterprises to adapt to change and thrive.

But the debate on deindustrialization has evolved gradually towards a broader reflection on the nature of EU industrial policy. In this context, with a view to reinforcing the industrial strength of the Union, France and, to a lesser extent, Germany[1] have advocated supporting industrial champions. At present, France is setting up an "Agency for innovation" to allocate 1 billion euros a year to a limited number of big innovation projects. The main beneficiaries will be large industrial groups, as the aim of the agency is to develop the "Airbus or Ariane programmes of tomorrow" [2]. The French bail-out of Alsthom, the E.On-Ruhrgas saga in Germany[3], the Franco-German-Spanish calls to create a European "champion" in shipbuilding and the trade conflict with the US on subsidies to Airbus and Boeing, have also been influenced in one way or another by the drive to protect or support industrial champions.

Box 1: What is meant by "industrial champions"?

The notion of "industrial champions" is highly controversial and should be treated with care. A clear definition of its meaning has not been provided by any of its advocates. Does the concept refer to large companies? If so, the EU presumably would not have enough large firms in its industrial structure, and policymakers should promote the emergence of companies with a critical size. Or does it refer to successful companies whatever their size? In this case attention should be focused on the search for excellence in one or a few firms in every sector, with a view to ensuring

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1 Mr Monti, former Competition commissioner at the European Commission, was quoted saying: "I think that even in Germany, when people discuss industrial policy, national champions or European champions, the debate is not marked by the same reflexes or the same vigorously systematic approach as in France." (*Le Monde*, 17 July 2004).

2 Jacques Chirac, speech of 4th January 2005, Paris.

3 In 2001; E.On acquired a majority stake in the German company Ruhrgas, which gave the company a strong position on the electricity sector. Although the merger was authorised by the Berman Ministry of economics, the Bundeskarellamt (BKA) did not approve it and the authorisation was challenged by E.On competitors.

4 In the political and industrial context the *strategic* concept has normally been applied to mean « important » (i.e. in terms of employment or technology) or « defence/military » related. More

there are some "winners". Finally, does it mean a competitive position in *strategic* sectors? This would imply that there are crucial sectors in which the EU must be represented and be successful[4]. The role of the public authorities would be to promote their development if the market alone does not manage to.

Clearly, the term has been used to cover a variety of concepts. The lack of a common definition gives rise to different theories and different policy implications.

All economies aim to create "global players" or "champions" when they go international. This was the case in Europe and the United States, then in Japan, and it is now happening in China where some global players are rapidly emerging, with strong support by the Chinese public authorities.

Actually, the debate is really about the means of ensuring that large companies emerge and successfully compete at the global level. It has stemmed from doubts about the capacity of the market alone to create such global companies. Thus, the main issue is whether large world-class European companies would emerge "on their own", or whether policymakers should play an active role, and how, in supporting the development of such "champions". As we will discuss, this question needs to be addressed against the background of Europe's industrial structure and its strengths and weaknesses in terms of sectoral specialisation.

On the other hand, the social costs associated with industrial restructuring in traditional sectors have also been present in the minds of politicians pleading for protection or support for large national companies. Thus, the debate on European champions usually confronts three policy alternatives:

- the first is the pro-market approach. According to this view, the size of the internal market, provided there are no obstacles, should make it possible for enterprises to restructure, exploit economies of scale and increase their efficiency. This was the main objective of the Single Market in the 1990s: to create a vast home market that would allow European firms to compete on an equal footing with American firms;
- the second is that of explicit public support of individual companies or sectors that are considered *strategic* for international competitiveness.
- the third option, which also entails targeted public intervention, is that of supporting large ailing companies to avoid the social consequences of large industrial bankruptcies or major restructuring.

These three policy alternatives – pro-market, support to strategic sectors or companies, and support for lame-ducks – rely on different roles for industrial, trade and competition policies. The focus and balance of the three will largely depend on the role and prominence that is given to industrial policy[5]. The EU has already experienced the three

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recently however the meaning of "strategic sectors" has been often stretched to cover basically any sector important in terms of employment. In economics, the term *strategic* (e.g. « *strategic* trade policy ») is normally used in the sense of game theory, that is, implying a strategic interdependence of firms' or governments' decisions. Many large sectors in terms of employment, as well as most military or technology-intensive industries, are also oligopolistic and thus « strategic » in the economic sense.

5 The pro-market option is typically associated with free trade and a tough competition policy. Conversely, a champions policy rather relies on a strategic trade policy combined with a loose

political options: (i) several examples of targeted support for *strategic* sectors and large technology initiatives (e.g. Airbus, Ariane, HDTV and ESPRIT); (ii) a support of declining sectors with the ECSC Treaty; and (iii) an emphasis on horizontal policies since the early 1990's. Recently, the disappointing performances of certain high-tech sectors and the growing productivity gap with the US have raised concerns about the ability of the pro-market approach to help EU companies withstand international competition.

The aim of this paper is to review the arguments for and against pro-champions policies, in light of the existing literature and lessons from past experiences. We will also examine the most marked characteristics of Europe's industry and draw some policy orientations.

Section two will analyse the theoretical background underlying targeted public intervention and will scrutinise the economic arguments for and against "champions" policies. If the theoretical justifications remain controversial, strategic trade models shed some light on the channels through which committed government support can influence the development of national companies that operate in international markets. At the same time, the emergence of the knowledge economy has developed new strands in the market failure literature related to information asymmetries, agglomeration effects and coordination externalities.

The third section will draw some lessons from the experience of past interventionist policies. The EU has made attempts at promoting large technological projects, with some examples of both success and failure. Empirical studies of industrial policies in developed countries point to interesting evidence on the factors that can increase the chances of success of targeted industrial policies and the circumstances in which such policies can be relevant.

In the fourth section, the prevailing industrial context in the EU will be analysed. In particular, stylised facts show that the EU does not suffer from the absence of large world-class companies, but rather from the absence of growing companies in new high-technology industries. With a few exceptions, the EU has not been able to promote the emergence of international players in the fast-growing sectors of the economy. The patterns of European investments in R&D confirm a certain lack of dynamism of Europe's industrial fabric. The older and largest European firms are amongst the world's top performers, but the EU lacks a critical mass of fast-growing R&D-intensive "not-so-large" and medium-sized companies.

Against this background, the paper will explore the contribution of different EU policies to the twin goal of providing a stimulating and disciplining environment for large companies while at the same time facilitating the growth of young innovative enterprises.

2. IS THERE A RATIONALE FOR CHAMPIONING COMPANIES?

Even if pro-champion policies are generally based on political considerations, their advocates most often use economic arguments to make their case. This section will explore economic justifications underlying policies to promote industrial champions.

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competition policy: public authorities may be more inclined to authorise (or encourage) mergers in order to foster the creation of companies with a critical size to succeed in international markets. Policies aimed to support lame ducks normally rely on subsidies and trade defence measures. For an analysis of the complementarities and conflicts between trade, competition and industrial policies, see Buigues, Jacquemin and Sapir (1995).

As we have discussed above, the idea of supporting industrial champions can refer either to sectoral policies driven by protectionism and fear of too-rapid adjustment –support for "lame ducks"-- or to proactive interventions aimed to favour *strategic* companies or sectors.

Any economic rationale to support "lame-duck" champions?

The idea of championing high-value added sectors or enterprises may leave scope for debate and will be the main focus of this chapter. On the other hand, artificially keeping afloat lame-ducks in sectors that have lost comparative advantages or failed to restructure has no possible economic justification.

Most pleas for supporting lame-ducks are actually aimed at avoiding the unpleasant costs of adjustment. In the context of declining industries --e.g. coal, steel, clothing, and shipbuilding-- support for industrial champions is indeed usually a disguised way of alleviating social costs. At the regional level, company closures can lead to higher unemployment and social tension. But adjustment costs are also largely related to skill mismatches or labour market rigidities. Dismissed workers may not have the necessary skills to be employable in growing sectors. Lack of possibilities or a reluctance to retrain, as well as an unwillingness to change to another sector or move to another region may make it very difficult to be reemployed. High and unconditional unemployment subsidies compensate the income loss of dismissed workers but may also lower their incentives to make the necessary efforts to find a new, different job. Collective bargaining and minimum salary provisions can also prevent unemployed from accepting competitive wages in other companies.

Against this background, retraining programmes and otherwise directly tackling labour market rigidities are the most productive ways of intervening. The easier alternative of artificially subsidising lame ducks –not to mention trade protection- is a waste of resources that only delays inevitable restructuring. Worse still, in the long-run it prevents the natural process of adjustment: it can lead to an excessive specialisation in declining sectors while depriving economies of the resources necessary for the growth of emerging companies.

In addition, from an economic point of view, public support for failing companies tends to prolong productive inefficiencies in the beneficiary companies. In the broader context of the common market, such privileged treatments also work to the detriment of more efficient competitors.

Overall, the socio-political difficulties of facing the root of the problems associated with restructuring have too often led politicians to subsidise and protect ailing companies. Still, few would argue for the economic sense in artificially prolonging the survival of enterprises that are no longer competitive.

But the case against "strategic" Champions is not so straightforward

Today the most controversial debate lies between the advocates of proactive public support of strategic champions versus those who believe in allowing market forces to act freely, with very limited or strictly horizontal public intervention. Pro-champions policies are associated with a favourable treatment of emerging technological sectors or pioneering companies, be it directly through State aid or through other less direct means

like trade protection, public procurement or a lenient competition policy[6]. Public intervention in this context can also be looked at from the angle of favouring specific companies or from that of supporting specific (strategic) industrial projects.

The rest of this section reviews the economic arguments underlying targeted industrial policies starting with infant industry promotion and strategic trade. Next we discuss an argument which is also put forward by most advocates of industrial champions: that firm size is a critical factor for success in the face of globalisation. Then we analyse a number of market failures associated with large-scale high-risk investments, and lastly we explore the role of large companies in fostering agglomeration externalities and contributing to the development of regional clusters.

2.1. Supporting infant industries and strategic trade policies

Support for infant industries and "strategic trade policies" are aimed at increasing domestic welfare by promoting a stronger position for national industries at the expense of foreign competitors.

i) Entry support or the *infant-industry* argument

The typical case of infant industry promotion is that of a government subsidising entry of a domestic firm into a market dominated by a foreign incumbent.

In the most common model, the incumbent has a substantial cost-advantage and enjoys a comfortable leadership. Scale is the typical source of higher efficiency by the incumbent. The presence of learning-by-doing, by which unit costs decrease with the accumulated experience of production, is a production externality that can also provide a substantial disadvantage to latecomers.

In such a context, an investment or production subsidy to the newcomer could cover the initial losses of entry and induce a sufficiently large output in the initial period to speed up the learning accumulation. This would push the national entrant down the learning curve allowing it to reduce unit costs and eventually compete effectively with the incumbent. Graph 1 presents the dynamics of two competing companies – one incumbent and one latecomer- in the presence of learning-by-doing.

Graph 1 – Public intervention in the case of learning by doing

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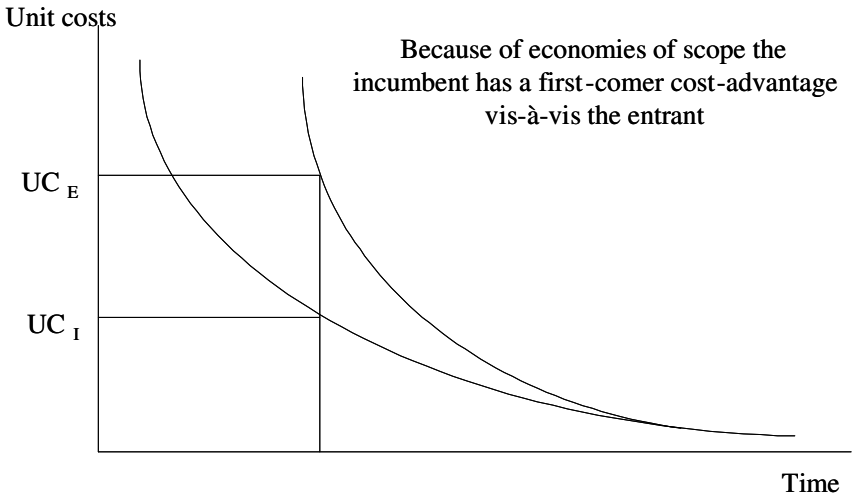
[6] As mentioned in footnote 4, the strategic concept in an "economic" sense is different from the strategic concept as used in politics. Most of the recent interventions range in the second category and see "strategic" as leading edge sectors where the EU must develop competitive advantages. Most recent pleas in favour of industrial Champions also fall under this category. See for instance Report n° 374 of the French Senate (2004), "Relocation: for a European neo-colbertism ". p. 268. "*…the Working Party encourages the European Union to facilitate the emergence of" European champions ", capable of carrying major industrial projects that underpin the pre-eminence of the Union where it has comparative advantages. The objective is to reproduce the methods which allowed the successes of Ariane or Airbus. Only the political will to implement industrial ambitions over the medium term would make it possible to launch major industrial projects in leading-edge sectors (biotechnologies, hardware information technology and software, semiconductors), as it was the case twenty years ago.* ".

See also the report published also in 2004 by the D. Strauss-Kahn-Group "50 Proposals for tomorrow's Europe" where one of the proposals in this field of European industrial policy is to "a*dapt Community competition law to allow European players to develop with the necessary critical mass to operate on the world market".*



Even in terms of global welfare, in the face of prevailing market power of the incumbent firm (or reduced group of firms), public intervention that would induce entry would normally have a positive effect. Analytically the welfare impact of entry can be modelled as the shift from a monopoly to a duopoly, or from an oligopoly with n competitors to an n+1 oligopoly. Entry of an additional competitor would lead to higher competition, increased production and lower prices[7]. The incumbent profits are reduced but consumer welfare is enhanced. Entry would also change the prevailing market structure and thereby would normally have a positive impact on the efficiency and innovative effort by the firms in the market[8].

On the other hand, the cost structure may be such that entry leads to the duplication of large sunk costs like essential facilities or research and is not economically efficient. In a much quoted study Neven and Seabright (1995) found that Airbus' entry into the market for large commercial aircrafts prevented he realisation of substantial economies of scale and scope, having a relatively small impact on prices[9].

More recent economic findings on the cumulative nature of innovation activities further support the infant industry case. The future path of innovation processes shows a significant dependence on recent innovations and state-of-the-art knowledge. In particular, in any given sector the innovators of tomorrow are likely to be the innovators of today. Empirical studies confirm this path-dependent nature of technological knowledge accumulation patterns[10].

This cumulative nature of innovation and technological knowledge reinforces the market failure linked to economies of scope and learning-by-doing. In a context of steep learning

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7 In the shift from a monopoly to a Stackelberg duopoly, for instance, the new competitor adapts its production to the leader's output, whereas the incumbent anticipates the entrant's reaction. In the post-entry equilibrium total output is higher, leading to lower prices and increased consumer welfare. See for instance Meiklejohn (1999) in European Economy (1999).

8 For low levels of competition the impact of entry on innovation would also be generally positive. The relationship between competition and innovation is believed to present an inverted-U shape. See Aghion et al (2005).

9 The authors also argue that the welfare effects of Airbus' entry were also weakened by the reduction in the competitive pressure after the takeover of the third player in the market, McDonnell Douglas, by Boeing in 1997. Their estimated impact on welfare is positive for Europe, but negative on the global level.

10 See for instance Patel and Pavitt (1994).

curves and cumulative effects, national firms can be more easily excluded from a particular technology trajectory dominated by foreign firms.

But the infant-industry case for entry subsidies is far from being unchallenged. In fact, in a case of free entry with fixed costs, subsidies may be a deadweight loss. If entry is profitable, that is if future returns compensate the necessary upfront investment, a rational firm will enter with or without government support. Therefore, in this context state aid would have no incentive effect, being equivalent to a transfer from taxpayers to shareholders.

Dasgupta and Stiglitz (1988) show that in theory the presence of learning-by-doing does not fundamentally change this result. Assuming that capital markets are complete and the potential entrant has perfect foresight of its learning capacity and hence its future profits, the case is analogous to the static one: if entry is profitable the firm would enter the market in any case and the subsidy would have no incentive effect. Therefore, for learning-by-doing to provide a valid theoretical argument for state support, other market failures need to be present, notably incomplete capital markets or imperfect information. Support for a domestic champion can make sense when it is difficult to find funding in the context of uncertain future profits in the long term.

On the other hand, it has also been argued that path-dependency can lead to a myopic underinvestment in innovative activities, if private agents underestimate the returns of technological investments and R&D. But even in this case it is difficult to contend that public authorities have a better foresight of the learning capacity of private agents.

Finally, another interesting case where subsidies can increase welfare occurs when the learning effects are not fully internal to the firm. If it is the accumulated collective experience of the industry that leads to decreasing unit costs, when a company increases production other firms also benefit from a cost-reduction. Within a cluster where firms have close and repetitive interactions this type of externality is more likely to occur. Such a case is to a large extent analogous to the presence of R&D externalities, as companies only partially appropriate the benefits of their investment.

Box 2: Extensions- Supporting infant industries

Some extensions of the typical entry model which could provide further ground for championing domestic companies are the implementation of entry-deterrence tactics by an incumbent or the launching of a new product.

It may be the case that a potential entrant has to incur one-off losses in order to overcome entry deterrence tactics by the established incumbent. Entry deterrence strategies may take a wide array of forms including sunk investments to increase capacity, or heavy expenditures in marketing and advertising. Government commitment towards the domestic champion might countervail the deterrence effect and push it to enter the market. Such a setting is however not fundamentally different from the general case of entry with sunk costs. The main difference lies in the strategic behaviour by the incumbent, which under specific assumptions might be countervailed by government intervention[11].

Another theoretical setting where subsidies may be justified is the launching of a new product. In a hypothetical case where the costs (or risks) of launching a new product are such that given the demand for that new product entry is marginally unprofitable, a subsidy would lower the average

[11] Leahy and Neary (1995) have examined the role of government's commitment in deterring the incumbent's strategic behaviour.

cost curve of the firm and make it profitable for it to start the production of the good. In those cases where a subsidy at the margin suffices to make the company launch the product, the generated consumer surplus may outweigh the costs of the subsidy (Meiklejohn 1999).

ii) Strategic trade policy[12]

The underlying motivation for "strategic policy" is to reinforce the specialisation of domestic companies in strategic industries. The strategic policy rationale lies behind the calls for interventionist industrial policies in oligopolistic markets. With a view to retaining the largest possible share of the excess profits within national borders, governments may have an incentive to foster an artificially dominant position of domestic "champions". This is particularly the case in high-technology sectors, which are associated with high value added jobs, a more trained and specialised workforce and ultimately higher growth rates and employment.

Spencer and Brander (1983) were the first to develop the case for "strategic policy". Since their seminal work, significant theoretical attention has been placed on imperfect competition as a rationale for targeted industrial policy in open economies.

In the Brander-Spencer analysis, subsidies to a domestic company deter investment and production by foreign competitors. They also increase the market share of the domestic firms and raise their profits by more than the amount of the aid. The central insight from strategic trade - the opportunity for government to affect market outcomes in the presence of imperfect competition - is very robust to different underlying models[13].

Leahy and Neary (2001) proved the robustness of the theoretical case for investment subsidies. In a model with general functional forms, a positive subsidy is optimal if two conditions are fulfilled. First, investments have to be "unfriendly", that is higher domestic investment reduces the profits of foreign competitors; and second, investments need to be "strategic substitutes", meaning that when investment by a domestic firm increases, the optimal response by foreign competitors is to reduce their investment[14].

Intuitively, the subsidy leads the domestic firm to increase its production. The foreign competitor anticipating the higher output by the subsidised firm reduces its own output, which leads to a leveraging effect of the subsidy on the profits and market share of the domestic firm. Hence, the motive for subsidies resides in the profit "stealing" from the foreign producer.

Box 3 – Extensions - Strategic Trade Policy[15]

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[12] We present « infant industry » and « strategic trade » arguments separately, whereas actually both concepts overlap to a large extent. However, the emphasis of the former is on stimulating successful entry, while the latter focuses rather on the interaction of oligopolistic firms and the subsequent room for governments to intervene and affect the decisions of foreign competitors.

[13] See Krugman and Obstfeld (2000) for a non-technical discussion of the strategic trade policy analysis.

[14] Such conditions are fulfilled under both Cournot and Bertrand competition. The results are also robust for other extensions such as treating the investment as market expanding rather than cost-reducing or introducing inter-firm spill-overs.

[15] This box draws on Brander (1995) "Strategic trade policy", which presents a review of extensions to the original strategic trade model.

Numerous extensions to the initial strategic trade model have been analysed in the literature. Overall, the result of an optimal positive subsidy is quite robust.

Most strategic trade literature concerns two companies competing in a third country market. This allows one focusing on the impact on profits and disregards the effects on consumer welfare. This approach also rules out the possibility of affecting the decisions of foreign companies through import tariffs or quotas. However, if both companies are competing in the "world market" the potential positive effect on world consumers (including domestic ones) comes to further support the case for strategic policy. As in the infant-industry case, this is due to the reduction of the oligopoly distortion. Goods produced by imperfectly competing firms tend to be underprovided. Therefore, *ceteris paribus*, policies that subsidise the production of such goods can have a positive impact on overall efficiency[16].

Dixit (1984) examined the case of multiple domestic and foreign firms. As the number of domestic firms increases, subsidies to a domestic firm raise the output of the subsidised firm but reduce the output and profit of the non-subsidised ones creating an additional domestic cost of the subsidy. Hence, as the number of domestic firms grows relative to the number of foreign firms the subsidy becomes damaging to national interest: most profit-snatching happens between domestic rivals. Opposite, if the number of foreign firms grows relative to domestic ones, the subsidy has a higher positive impact on domestic welfare.

Ulph and Winters (1994) use a model with different oligopolies using similar production factors to explore the implications of internationally mobile highly skilled human capital. Interestingly, they find that R&D subsidies to knowledge-intensive sectors attract scientists and engineers from competing countries.

As we have seen, in certain cases strategic trade policy can be considered analogous to an entry subsidy. In a dynamic context, the presence of learning-by-doing externalities would clearly enhance the incentives to implement strategic trade policies. Interestingly however, from a welfare point of view the most attractive strategic policy would be to subsidise those companies earning above normal profits, that is those which are the most efficient vis-à-vis their competitors.

Overall, even after adapting the basic models to account for multiple products, general equilibrium effects, economies of scope or other possibilities not considered here, like informational asymmetries or market segmentation, under most models there is still an incentive for unilateral intervention.

The drawback of strategic trade policies

But strategic policies have an important drawback: their beggar-thy-neighbour nature and the ensuing prospect of retaliation. Policies based on strategic (or infant-industry) considerations seek to raise national income at the expense of other countries. If they lead to retaliation they become mutually self-defeating.

Brander (1995) comments on the case involving two active governments. If two governments simultaneously choose the subsidy level, the game has similar characteristics to a "prisoners' dilemma". Both governments have an incentive to provide a subsidy to their domestic firm regardless of the action by their counterpart government. In the equilibrium solution both governments intervene and both countries are worse off than they would be had there been no intervention from either side.

The possibility of triggering a trade or subsidy war by competing countries makes it hardly advisable to implement such policies in practice. In the Union the main rationale of State

[16] In addition, a production subsidy is always more efficient than an import tariff, as the latter entails the negative implications of protected markets for domestic consumers.

aid control is to prevent similar profit-stealing behaviour between Member States. The WTO can also impose remedial action if it is demonstrated that subsidies cause adverse effects for other WTO members[17].

2.2. Big is beautiful: does market failure justify support for industrial champions?

i) Economies of scale and scope

One of the most popular reasons invoked to support domestic champions is the link between a firm's size and its capacity to compete. In the presence of economies of scale - increasing returns associated with high fixed costs and low marginal costs-- large companies produce more efficiently than smaller competitors. In high-technology sectors a minimum scale is also required to allow for a critical mass of investments in research and innovation[18]. Large companies can also benefit from economies of scope, associated with the possibility to combine the production, research or distribution of similar products and services.

However, provided there are no additional market failures like imperfect access to finance or information, the presence of economies of scale does not justify intervention. As in the infant industry case, if entry or capacity expansions are profitable, that is, if future returns compensate for the upfront investments, a rational firm will invest and grow to the efficient size, with or without government support.

Against this background, ensuring access to large markets and tackling potential obstacles to firm growth, like limited access to finance or regulatory hurdles, would be more efficient ways of promoting enterprise growth than direct support. In markets with significant economies of scale, companies will have a natural incentive to invest and grow to the efficient size.

Conversely, protection of national champions, e.g. by preventing entry and limiting competitive pressure, can aggravate the problems associated with market power in terms of dead-weight loss, productive inefficiencies and lack of incentives to innovate.

ii) Market failures in a knowledge economy: do they justify support to large firms?

In knowledge-intensive activities market failures are more pervasive than in traditional sectors. The presence of knowledge externalities is widely recognised: firms cannot appropriate all the benefits of their own investment in R&D and innovation because some gains accrue to other firms or sectors. As a result, the social return on investment on knowledge creation is larger than the private return and the R&D effort will normally be below that which is socially optimal. Consequently, there is a role for the public sector to organise publicly funded R&D or to enhance the incentives of private firms to invest in knowledge creation.

But besides knowledge externalities, financial market imperfections, coordination failures and spillovers are also more likely to arise in knowledge-intensive activities.

The uncertainty involved in high-technology activities or projects tends to increase the risk especially when the costs are very high. In this context, access to external funding is more difficult the more complex the life cycle of the product and the more risk adverse

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[17] See section 5.

[18] Firm-size arguments were already largely behind the 1992 initiative. The Spaak report already pointed in 1956 to scale and firm size as necessary means to stimulate productivity amongst the six Members of the EC.

investors are. This is particularly the case for start-ups investing in intangible assets such as R&D and innovation. Big firms may face similar problems when investing in projects that are very large relative to their equity base, although in general they have a greater capacity to finance innovation (higher capacity to retain profit, higher capacity to accede to markets or obtain credits).

Some large-scale projects may also require cooperation between several firms, particularly in high-tech sectors. R&D collaboration can reduce costs, facilitate knowledge and risk-sharing between participating firms, foster the diffusion of the acquired knowledge, increase the chances of success, and prevent duplication of R&D efforts.

Coordination failures arise when the private returns to individual participants in a project are above their individual costs when all participants cooperate, but below when only some of the participants do. Typically, coordination failures may arise in large-scale innovation projects when different firms have to rely on each other, there are high sunk costs and the outcomes are very uncertain. The presence of sunk costs implies a low resale value which may decrease the incentive of firms to collaborate. Moreover, the need for collaboration may bring other difficulties such as the risk of sharing knowledge with competitors, or choosing the wrong partner. For these reasons, some large projects may not be undertaken unless public authorities play a coordination role. In this case, public intervention may help organise coordination amongst large and small firms within the same project[19].

iii) Agglomeration externalities: the role of large companies as a catalyst for the development of knowledge-intensive activities and the emergence of clusters.

The presumed existence of positive spillovers has sometimes provided a further rationale for governments to attract large companies or support home-based ones, in the expectation that they will trigger or reinforce agglomeration effects[20].

Industrial agglomerations or *clusters* are an increasingly important determinant of competitiveness and innovation, particularly in high-tech sectors where tacit knowledge plays a prominent role. Clusters encompass a high density of producers, customers and suppliers with strong links to the regional universities and research institutes. They are generally associated with better economic performance, mostly through enhanced collaboration coupled with a highly competitive environment. While collaboration is necessary due to the specialised and complex pieces of knowledge needed to build sophisticated products, competition stimulates rivalry and a continuous search for innovations.

However the role that large companies' production or research centres play in the emergence of clusters or their impact on the capacity of regions to attract further economic activity is still an open question. A recurrent insight from most empirical studies on clusters is that they cannot be created from scratch. Attracting a specific (large) player would not be a guarantee of significant stimulus to regional development.

In fact, most research on innovation and clusters supports horizontal policies. The focus of innovation systems concerning public intervention is on indirect inducement through the institutional setting, rather than on direct involvement in the economic activity. In this view of the world, the main role of public authorities is to develop and strengthen the

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19 See Rodrick (2004).

20 In the presence of agglomeration externalities a firm's profitability increases when it is located close to its competitors, suppliers and customers. In this context, by aiding a firm to set up in a given territory, a government might be able to trigger or reinforce the development of a cluster.

institutions which are conducive to growth, while refraining from intervening in the selection of market outcomes.

More concretely, according to the national innovation systems (NIS) literature, an important task of industrial innovation and technology policies is to promote learning processes throughout the economy, stimulating interactions amongst organisations and individuals. This also involves ensuring strong links between firms and knowledge producers such as universities and research centres, or enhancing knowledge diffusion, particularly to small firms, so that as many companies as possible acquire the competencies to come up with innovations. Hence, public authorities affect economic activities mainly by acting upon the creation and diffusion of knowledge (i.e. through public laboratories, research centres or universities), or by shaping the incentives of economic agents, be it through financial or regulatory means. The concepts of innovation systems and clusters, stemming originally from evolutionary economics, have become an influential intellectual framework backing horizontal technology and industrial policies[21].

On the other hand, more often than not one finds big manufacturing companies at the basis of the formation and development of clusters. Examples abound of this. In Europe , the Dresden cluster centres around the chip factories of Infineon and AMD, the nanoelectronics cluster in Rhône-Alpes around STMicroelectronics (in addition to Philips and Motorola), the cluster in Eindhoven around a broad array of technological activities by Philips, and a final example is of the well-known case of Nokia and its impact on the Finnish economy.

Box 4: The ICT Cluster of the Helsinki Region: is Nokia a self-made champion?

The ICT Cluster of the Helsinki region may be the most studied European cluster. Many researchers have found that the role of the Finnish public authorities has not involved narrowly supporting a national "winner". The public sector has instead focused on providing a learning environment through numerous technology programmes based on competitive funding, a systematically high priority on education, and committed support for "industry-pull" R&D[22]. The specificity of the Finnish model has been described as an early application of the "national systems approach" focused on strengthening existing and emerging clusters.

Nevertheless, despite the presumed "horizontal approach", the public authorities seem to have played a significant role in the early 1990s in reinforcing the emerging sectoral specialisation of the country. In the white paper on the "National Industry Strategy for Finland" of 1993, ICT (together with health-care) was identified as a potentially strong expanding cluster. The breakthrough of Nokia followed a few years later and with it, the success of the ICT sector fed back into the public commitment to R&D funding and top education. In 1999, Nokia's value-added was 3,3% of GDP. The company accounted for 35% of business R&D and 5% of total manufacturing employment[23].

Nokia's role as an engine of the ICT cluster is uncontested. More than 4 000 firms – mainly small and medium sized – are part of the cluster. Studies and surveys confirm that Nokia is essential for the cluster's functioning[24]. The company acts not only as a large demanding customer for many smaller firms but is also the industrial engine of technology programmes around which SMEs, universities and research organizations operate. Nokia also continuously transfers technology to the cluster through spin-offs and trains employees who often disseminate the acquired knowledge

21 See Navarro (2003)

22 See for instance Ylä-Anttila and Palmberg (2005). Abetti (2004) emphasises the public role of creation and funding of 16 incubators in the Helsinki area.

23 See Daveri and Silva. (2004).

24 See J.Tukiainen (2003) or Ylä-Anttila and Palmberg (2005).

through job-switching. The company also provides international visibility and reputation to the cluster.

One can infer that a policy committed to knowledge and R&D, with marked consideration for the ICT sector and aimed to support existing and emerging clusters, created the conditions for the development of a "national champion".

Agrawal and Cockburn (2002) emphasise the role of large R&D-intensive firms in enhancing regional innovation systems, notably by promoting the absorption of university research and stimulating local industrial R&D. Such large firms engage in collaborative research with universities and sponsor labs, hire professors as consultants directly leveraging university research, license rights to university inventions and so on, thereby directly affecting the commercialization of university research. They also have an impact on the size of labour and factor markets and develop social networks with suppliers, buyers, and partners on which SMEs can draw. They purchase products, licenses, consulting services and even entire start-ups creating an intermediate market between university research and large-scale production and distribution. The results of Agrawal and Cockburn are preliminary. Yet they indicate that large R&D-intensive firms appear to play an important role in mediating research spillovers.

The OECD has also acknowledged the role of large companies in the creation and growth of SMEs, particularly young technology-intensive enterprises. Apart from being important customers, large companies often play a role as a source of funding through their own risk-capital funds. The possibility that large companies may purchase successful SMEs also improves the prospects of would-be risk capital investors and their willingness to provide equity to start-ups.[25]

2.3. Government failure as a reason for caution

Economic arguments in favour of interventionist policies, however, should not be considered in a vacuum. Often overlooked, institutional arguments generally disfavour the pursuit of selective support for individual companies or sectors.

The theory of government failures highlights the limits of political processes in promoting overall economic welfare. Biases towards promoting self or national interest, or regulatory "capture", undermine the credibility of interventionist policies. Companies and sectoral federations tend to engage in active rent-seeking behaviours or resist adjustment, arguing for subsidies or trade protection[26]. Furthermore, in the institutional context of the EU, in the absence of genuinely "European" firms it is unlikely that policymakers would decouple policy support from the nationality of the company involved.

Furthermore, any pro-intervention argument needs to be qualified by the impact of State aid, protection, or wider governmental support on increasing companies' inefficiencies. As discussed above in the context of lame-ducks, X-inefficiencies tend to emerge upon

[25] Science, technology and industry OECD Outlook 2004.

[26] Empirical studies have shown how large firms could capture trade instruments and prevent maverick exporters from entering the market.

favourable treatment by public authorities, or to continue when lobbying ensures a cushion for declining industries[27].

As for strategic and infant industry policies, they not only face the problem of their beggar-thy-neighbour nature but also entail high informational requirements. Normally, for instance, there will be uncertainty as to whether a once-and-for-all intervention (e.g. a subsidy) will be sufficient and uncertainty about the amount of subsidy necessary to significantly influence firm behaviour. Firms, who have better information than public authorities on all these parameters, will have a natural incentive to mislead governments.

Pro-champions policies are discredited by their dangerous potential to make a bad judgment about which sectors or companies to favour. There are innumerable factors contributing to the success or failure of a specific company or sector that cannot be controlled. There is an opportunity cost linked to the interdependence of different industries amongst which scarce resources could be allocated. If there is no guarantee of governments making a good judgment on which sectors to favour, this fact is a strong argument to the discredit of strategic policies. What is more, taxes introduce a distortion in the economy that may well offset any benefit of intervention.

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In conclusion, **economic arguments in favour of targeted industrial policies are controversial**. Even if strategic trade theory or infant industry arguments lead to the conclusion that public intervention can have a positive effect on domestic welfare, this comes at the expense of foreign competitors and their home countries. Targeted industrial policies would make sense from the point of view of a domestic policy-maker, but could be self-defeating if they triggered retaliation. On the contrary, for knowledge-driven sectors the literature on innovation systems pleads rather for policies aimed at reinforcing the creation and diffusion of knowledge in a broad sense. At the same time, large companies can play a significant role in the development of regional clusters, particularly where scale is a determinant factor of success. In the presence of significant coordination or financial market failures, public sector involvement in high-risk large-scale projects can also make a difference.

Against this background, lessons from past experience and case studies can shed some light on the results achieved in the past by targeted industrial policies.

3. LESSONS FROM PAST EXPERIENCE AND CASE STUDIES

The approach to industrial champions has evolved with the ebb and flow of the debate on industrial policy, reflecting competing views of economic organisation that pit the advocates of more liberal market economies against those who favour a more planned, interventionist economy. Traditionally, industrial champions have been largely associated with active state intervention, specifically aimed at influencing industrial change by supporting firms that produce certain goods or wish to enter specific markets. Past experience shows that in many cases the economy has been at the service of political objectives. More recently, the horizontal approach has shifted the focus on competitiveness as a whole excluding interventions that rely on selective support of specific enterprises or sectors.

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[27] However, the difficulties to quantify those inefficiencies tend to weaken this argument. Furthermore, it is also difficult to identify the causes of these inefficiencies – decline of the market or government intervention.

3.1. A brief overview of past industrial policies in Europe: from a sectoral to a horizontal approach

i) Sectoral industrial policy

The promotion of national champions was a prominent characteristic of industrial policy of the Community from 1970 to 1980, which was largely based on political objectives. The ECSC Treaty made industrial policy a Community matter and foresaw the establishment of crisis cartels to restructure European industry (see box below). Competition policy and trade policy found themselves at the service of industrial objectives – in this case, to maintain a steel industry in the European Community. The crisis cartel was implemented during the period 1980-1985. Production quotas were complemented by price minima for producers and the negotiations of Voluntary Exports Arrangements with foreign exporters[28].

Box 5: Industrial policy in the ECSC Treaty

The ECSC Treaty established in 1951 had various objectives: economic (supply the market in order to rebuild Europe), political (avoid a new war between Germany and France*) and social (facilitate restructuring). This Treaty concerned specifically the steel and coal industries. The organisation of these markets and the intervention of public authorities were explicitly governed by the ECSC Treaty, which created a framework of production and distribution arrangements and set up an autonomous institutional system to manage it.

The initial objective: the development of the European steel industry

Article 3 of the Treaty states that the Community shall ensure a steady development of the industry in order to supply the market at low prices. Article 4 sets the principles of competition and free trade. The objective of article 3 –supply the market at low prices – contains the foundations of a pro-active industrial policy. In the 1980s, the Commission justified the implementation of the crisis cartel because the principles of article 3 were endangered (JO L 291/1, 31.10.1980).

The coordination of the market

Articles 45 and 57 establish that the market can be coordinated by public authorities if needed (through programmes anticipating foreseeable developments in production, consumption, exports and imports, analysis of prices and production). Furthermore, article 60 sets specific rules for pricing (publicity for prices, basing point system**).

Provisions for the creation of a crisis cartel

Article 58 deals with the implementation of a system of production quotas if needed while article 61 deals with minimum prices. Article 71 states that Member-states are responsible for trade policy. However, article 74 allows the Commission to negotiate antidumping duties and voluntary export restrictions. In accordance with article 58, the system of production quotas may be accompanied to the necessary extent by the measures provided for in Article 74.

* *R. Schuman. French Minister of foreign affairs*. Declaration on 9 May 9th 1950.

[28] 17 countries signed these agreements.

*** Basing Point System: allow producers to set a price + transportation costs based on a location.*

It can be said that the objectives of the cartel were achieved. Following restructuring operations by all major firms and a decrease in production capacities of 7% -the European steel industry survived and avoided major bankruptcies. The crisis cartel ended in 1986-88 and ever since, the steel industry has been submitted to market based rule, especially following the end of the ECSC Treaty in 2002.

ii) Towards a horizontal approach

During the 1980s, the emphasis shifted gradually towards the creation of more competitive conditions. The Single Market Programme was both a sign of the shift and a powerful stimulus to industrial activity and the expectations of economic operators. Gradually it became widely accepted that income and jobs could not be permanently sustained through subsidies to specific sectors and that adjustment should not be indefinitely postponed. Competition policy grew in importance. Added to the budgetary costs of subsidies and the non sustainability of uncompetitive, often state-owned, enterprises was the view that Europe ought to move forward into areas where it had a genuine comparative advantage.

The shift from a sectoral to a horizontal industrial policy was consolidated by the 1990 Communication "*Industrial policy in an open and competitive environment – Guidelines for a Community approach*"[29]. The consensus it embodied was clearly in favour of a policy focused on the creation of favourable framework conditions for firms: the Community should not try to pick winners or artificially draw on state aids to selectively support specific firms. The Community structural funds, reinforced, were available to assist structural adjustment.

Box 6: Industrial policy in the treaty

Whereas the Community has solid competencies in the fields of competition and trade, for other industrial policy tools the powers in the hands of the Commission are more limited. Neither the Nice Treaty nor the draft Constitutional Treaty agreed by Member States at the Brussels Summit of 17-18 June 2004, provide any basis whatsoever for any kind of picking-winners or pro-champions policies.

The architects of European integration recognised early the central role of economic integration. Yet if the Treaty establishing the European Coal and Steel Community (ECSC) and the Euratom Treaty contain explicit sectoral provisions, neither the Rome Treaty nor the Single Act contain any base for a common industrial policy. Community action in this field had to be based on the general Treaty objectives, either using legal bases designed for more specific purposes, or Article 235 of the EEC Treaty.

It was only under Article 130 of the Maastricht Treaty (renumbered Article 157 by the Amsterdam Treaty), that the Community was given for the first time – as of 1992 – an explicit legal base for industrial policy, with competitiveness at its heart. Its powers, however, were still subject to the principle of subsidiarity and to unanimity in the Council. The scope and content of Article 130 had

[29] COM (90) 556 final of 16.11.1990.

been prepared on the basis of the Bangemann Communication "Industrial policy in an open and competitive environment – Guidelines for a Community approach"[30] of 1990. This Commission Communication set out the framework for a modern industrial policy at Community level, emphasising the need to concentrate on the creation of the best possible framework conditions for enterprises. This document was the result of controversial discussions between advocates of a *dirigiste* approach and defenders of a more liberal market economy. It reflected an agreement on a horizontal and pragmatic approach, aimed at improving competitiveness. The creation of the Internal Market was seen as a key element for an improved business environment, with an active competition policy, strengthened efforts on RTD and training and trade policy as additional important elements.

More specifically, Art. 157 (ex-130), under Title XVI "Industry" states that:

> 1. The Community and the Member States shall ensure that the conditions necessary for the competitiveness of the Community's industry exist.
>
> For that purpose, in accordance with a system of open and competitive markets, their action shall be aimed at:
>
> — speeding up the adjustment of industry to structural changes,
>
> — encouraging an environment favourable to initiative and to the development of undertakings throughout the Community, particularly small and medium-sized undertakings,
>
> — encouraging an environment favourable to cooperation between undertakings,
>
> — fostering better exploitation of the industrial potential of policies of innovation, research and technological development.
>
> 2. The Member States shall consult each other in liaison with the Commission and, where necessary, shall coordinate their action. The Commission may take any useful initiative to promote such coordination.
>
> 3. The Community shall contribute to the achievement of the objectives set out in paragraph 1 through the policies and activities it pursues under other provisions of this Treaty. The Council, acting in accordance with the procedure referred to in Article 251 and after consulting the Economic and Social Committee, may decide on specific measures in support of action taken in the Member States to achieve the objectives set out in paragraph 1.
>
> This title shall not provide a basis for the introduction by the Community of any measure which could lead to a distortion of competition or contains tax provisions or provisions relating to the rights and interests of employed persons.

The Nice Treaty did not change the scope of Art. 157 but did allow for measures to be adopted by the Council by qualified majority instead of unanimity. It also added additional limitations to the last sentence of para. 3 relating to provisions on tax matters or employment rights and interests. These limitations were an important condition for several Member States to accept the change from unanimity to qualified majority.

iii) The promotion of large scale technological projects

In addition to the horizontal approach of industrial policy, the Community put emphasis on the need to enhance the technological base of the European industry. Through the creation of European consortia, major projects were put in place with the aim to promote

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[30] COM (90) 556 final of 16.11.1990. See also file note (J. Diaz Pardo) of 13 April 2000, "L'article 157 (ex-article 130) du Traité"

a European-scale approach to industrial specialisation. In this case as well, the industrial objectives corresponded to a political view of the role of Europe vis-à-vis the United States: promoting major technological projects to allow Europe to be a serious contender in the face of US power.

The advocates of pro-Champions policies often refer to the undeniable successes in this period of companies such as Airbus or Ariane. In both cases, industrial cooperation at the European level made it possible to exploit economies of scale and promote successful entry. Airbus started in 1970 as a European consortium of French, German and later, Spanish and UK companies as it became clear that only by co-operating would European aircraft manufacturers be able to compete effectively with the US giants. Public support in the form of reimbursable loans for new aircraft programmes helped Airbus develop gradually. It was only in the 1990s, however, that Airbus started to become a major player. Today, Airbus and Boeing compete neck-and-neck in the large civil aircraft market segment. It seems hard to deny that European public authorities got a good return for the State aids they granted to Airbus (albeit at the detriment of Boeing's profits). The creation of a big European competitor should have also had a positive effect in overall world competition, breaking the near-monopoly of Boeing.

The defence sector has also witnessed a number of cooperation initiatives, but the persistent national fragmentation of the defence markets has prevented the achievement of sufficient efficiency gains.

To be fair, there have also been failures. Whenever there are market or technological uncertainties, strategic choices involve a risk. Many of the factors contributing to the success of a project are unavoidably beyond the authorities' control. It was the case for example of the Eureka project in the numerical television where industrialists, supported by the Community, had set up a viable technological project. However, the project was not supported by the distributors and programme editors, who chose the American standard[31].

Table 1: Overview of past measures

	Direct aid for large national businesses	**Aid to European consortia**	**Horizontal policies**
Actions	Crisis cartel (Article 58 of the ECSC Treaty). Quotas, capacity reduction, state aids.	Regrouping of companies at national level. Aid for these consortia	Single Market (1990s)
Objectives	Maintaining an industry in crisis (steel).	Promoting high-tech sectors in which Europe is not represented.	Creating a large scale market.
Political implications	Competition and trade policy at the service of industrial objectives: crisis cartel, regrouping of companies, production quotas, commercial protection.	Competition and trade policy at the service of strategic sectors. Targeted research projects. Regrouping of "national champions".	Avoiding competition distortions. De-fragmentation of markets.
Results	Cost to the Community:	Airbus, Ariane:	Single Market

[31] Cohen et Lorenzi (2000).

	38 billion Ecus over 5 years. Maintaining an industry.	challenge to American companies. Failure of Esprit, HDTV	largely achieved for goods. In 2005, transposition deficit: 2,9% for EU-15; 3,9% for EU-25.

3.2. Lessons from empirical studies

Numerous case studies and historical assessments have tried to shed some light onto the actual role of governments in influencing the performance of targeted national industries and the factors that affect the likelihood of the success or failure of such intervention[32].

The global assessment seems to be that policies that directly aim to encourage the development of national companies in specific industries, by protection or subsidies, have a mixed record.

It is broadly acknowledged that interventionist policies in countries like Japan, Korea and France have had an important impact in the development of individual industries. Studies point to various examples where such policies had a sizeable influence and where public authorities successfully assisted companies in catching up with foreign technology leaders.

For instance, this was the case of Japan's electronics industry, one of the sectors targeted by "Big projects" or "Large scale industrial R&D Systems" promoted by the MITI. Japan aimed at supporting high cost and long term industrial projects in areas where it wanted to catch up with the US. More generally, it is interesting to recall that even the countries that today most badly advocate free-market policies (e.g. the US or the UK) originally developed their industrial base with the help of proactive infant-industry and targeted industrial policies[33].

Beyond these broad considerations, there are a number of interesting insights from empirical studies that are worth highlighting:

- Subsidies targeted at specific commercial products or designs have generally been less successful than policies aimed at supporting a broad sector or industry. Industry case-studies point to sizeable uncertainties in the evolution of rapidly developing technologies. It is normally extraordinarily difficult to foresee ex ante what technologies will take the lead. Broad industry support is more neutral towards the existing technological paths and possible market development and therefore does not require governments to place a risky "bet" on particular companies.
- Sector-specific *indirect* support can have a strong impact. This includes regulation, but publicly funded university research and training is also crucially important. Mowery and Nelson (1999) give examples of pharmaceuticals, medical diagnostic, and

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[32] Empirical studies analysing the impact of targeted national industrial policies on individual sectors abound. An interesting reference is "Studies of seven industries", by Mowery and Nelson (1999). Mowery and Nelson take a comprehensive look at industries in which technological innovation plays an important role and identify the factors having the strongest impact on competitiveness, including the policy framework. Krugman-Obstfeld (2000), in the chapter on Strategic Trade Policy, also present a number of interesting case-studies.

[33] Chang (2002)

especially the computer, semiconductor and software industries. Government procurement policies also have a powerful stimulating capability, but it is critical that they involve competition between contractors. US procurement programs related to the (large) defence budget have normally had the effect of inducing vigorous competition for the contracts, including among young computer and semiconductor firms. In stark contrast, in European countries similar purchases have been systematically awarded to national champions, allowing for a much lesser impact on stimulating innovation and entry.

The impact of academic research on industrial performance has also been highlighted by a study from the US National Academy of Engineering (NAE, 2003). The NAE-study explores the contributions of publicly funded research to five important industries: the network systems and communications industry, the medical devices and equipment industry, the aerospace industry, the transportation, distribution and logistics services industry and the financial services industry. The massive public efforts of knowledge creation, but also the links between industry, science and technology have been crucial in bringing scientific insights to the market place. The study also highlights that the ability of academia and industry to tap into public-private partnership R&D initiatives provides numerous opportunities for technology creation and innovation.

- Public support to help national industry *catch up* towards an existing technological leader can be a good bet, especially when a "safe path" exists. Conversely, for sectors that are already at the technological frontier, targeted industrial policies are much riskier and generally less successful. This has been particularly illustrated by certain experiences in late developers such as Japan and South Korea. Applied to Europe, it could be seen as providing some empirical support for a proactive governmental role in those technological industries where the Union is lagging behind and a "safe path" exists. In a way, a similar argument has been put forward to explain ex-post the successful story of public support to Airbus[34]. The aircraft-producing sector features relatively few technological and market uncertainties with respect to other high-technology sectors. Though the large commercial planes produced today are safer, lighter and more efficient than, say, first generation Boeing 747s produced at the beginning of the 1970s, they are still arguably not a *fundamentally* different product and serve similar consumer needs. Success in the commercial aircrafts sector seems to be largely determined by financial commitment and economies of scale. Therefore, when governments engaged to support Airbus, they had a clear idea of what they were aiming for.

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To sum up, **Europe has some experience in various approaches to industrial policy**. The ESCS Treaty was a unique experience of a centralised policy at European level, which was justified by political reasons at the very beginning of the European Community. The "horizontal" policy that has since gradually displaced more interventionist tendencies has also left some room for a number of sector specific programmes. The record of such "champion" initiatives is mixed: for every success such as Airbus, one can cite a HDTV failure.

The lessons from the European experience, as well as from a broader array of empirical studies of industrial policies around the world, point to a number of critical factors. These

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[34] See Seabright (2005) and Sutton (1998).

include notably the importance of indirect support and competitive public procurement, or to the significance of industry-specific characteristics. **Technologies with unpredictable development paths and open to the unexpected are bad candidates for public intervention**. **Conversely, even in high-tech sectors, when a relatively safe path exists and scale matters, public funds and commitment can make for a simple recipe for success**. The case for measures enhancing the technological base is also uncontested.

Before drawing policy implications, it is useful to complement the above analysis with a review of the main characteristics of the European industrial structure.

4. MAIN CHARACTERISTICS OF EUROPE'S INDUSTRIAL STRUCTURE: WHAT IS AT STAKE?

Over the course of the two past decades, the European Single Market has nearly been achieved. One of the main impacts has been to boost intra-EU trade and to increase the intra-European activities of companies. The integration of national markets has entailed major restructuring operations, e.g. through mergers and acquisitions[35] and has resulted in the emergence of many worldwide companies.

However, in certain sectors like defence or most network industries, former national markets are not yet fully integrated at the EU level[36]. This has influenced the size of European companies and undermined their ability to remain competitive in scale and technology-intensive sectors which are rapidly becoming global. The structure and dynamics of European industry are also affected by a number of social and institutional factors, including the regulatory environment, or Europe's values with respect to social protection and personal risk.

On the whole, Europe's industrial structure is characterised by:

- a predominance of small and medium-sized companies (SMEs) although large companies produce a sizeable share of total value added and are a major source of employment;

- a significant number of European companies amongst the world's biggest, but a marked absence of large European companies in technological and knowledge-intensive industries coupled with a weak European specialisation in these industries;

- a slow pace of change of the industrial structure. Most new companies remain small and too few to achieve the necessary size to compete globally. This hampers the natural process of reallocation of resources towards fast-growing sectors;

- a deficit in R&D and innovation investment, which is very concentrated in a small number of very large firms. Europe lacks a critical mass of fast-growing SMEs with intensive investment in R&D.

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35 See Davies S., Rondi L., Sembenelli (2001) or Baldwin and Wyplosz (2004).

36 The internal market is far more advanced in manufacturing industries than in network industries such as electricity and gas. Recent examples in the energy sector show the temptation of governments to support national champions rather than the emergence of European players. The on-going wave of proposed takeovers by former monopolists such as German E.On bid on Spanish Endesa or by Italian Enel on Franco-Belgian Suez have lead to related protectionist reaction by governments backing national counter-bids (Gas Natural and Gaz de France).

Some of the advocates of supporting industrial champions argue that European firms are not large enough to compete globally. This claim is not supported by the facts. We examine next how factors like the sluggish rates of industrial change within and between sectors and the resulting absence of world-class European companies in emerging high-tech sectors are greater reasons for concern.

4.1. What is the relative importance of large firms in Europe's industry?

i) Small companies abound but large companies matter…

Overall, small and medium-sized companies dominate the European industrial structure. SMEs account for most of the number of units (99%) and for half of the jobs[37]. The relative importance of SMEs is even higher in the new Member States than in the EU-15.

On the other hand, nearly half of the total value added comes from large companies, a third coming from the very large ones (more than 1000 employees).

Table 2: Distribution of value-added, number of companies and number of jobs according to company size[38] (manufacturing industry), 2001[39].

Manufacturing– Value-added

€ Mill.	EU-25	EU-15	EEC-10
Total	1 534 510	1 450 140	84 368.8
Between 1 and 9	7.4%	7.6%	3.2%
Between 10 and 499	50.2%	49.9%	55.8%
Between 500 and 999	12.4%	12.2%	14.8%
1 000 or more	30.0%	30.3%	26.2%

Manufacturing– Number of units

Units	EU-25	EU-15	EEC-10
Total	2 165 842	1 708 757	457 085
Between 1 and 9	79.6%	77.7%	87.0%
Between 10 and 499	20.0%	22.0%	12.7%
Between 500 and 999	0.2%	0.2%	0.2%
1 000 or more	0.1%	0.1%	0.1%

[37] The breakdown used here follows Cohen and Lorenzi (2000). The authors made a comparison between the distribution of enterprises in the US and the EU. In this classification "medium-sized" companies are those with 10 to 499 employees. By contrast, Eurostat regards "large companies" as those with 250 or more employees.

[38] This does not follow the Eurostat definition of large enterprise (more than 250), but that of Cohen and Lorenzi (2000). In their report, the authors claim that the EU-15 has many micro-enterprises compared to the US. The case is no longer so straightforward as regards EU-15.

[39] Data for 2002 and 2003 are not available for all Member States and do not give detailed information about the share of large firms of more than 1000 employees. Furthermore, although some new Member States can still face structural changes and restructuring, these figures would not change dramatically in a short time period.

Manufacturing - Number of jobs

	EU-25	EU-15	EEC-10
Total	100.0%	100.0%	100.0%
Between 1 and 9	9.8%	9.2%	12.5%
Between 10 and 499	57.5%	57.6%	56.7%
Between 500 and 999	10.5%	10.1%	12.2%
1 000 or more	22.3%	23.1%	18.6%

Source: Eurostat, NewCronos

ii) The relative importance of large and small firms depends on the sector

The importance of large firms varies greatly between sectors, depending mostly on industry characteristics such as the presence of scale economies and sizeable fixed costs. Thus, the sectors of transport equipment, chemicals or coking are the most highly dominated by large companies. In these sectors, companies employing more than 500 employees produce between 60 and 80% of the EU-25 total value added. At the opposite end of the spectrum one finds the textile, shoe-making and wood sectors where large companies contribute no more than 15% of the EU-25 total value added (see annex 1)[40].

However, these statistics do not capture the whole reality. Many new sectors – e.g. biotechnology or ICT - are represented by a higher proportion of small and medium size enterprises, and it is not possible to estimate this proportion through traditional industrial nomenclature. For example, most biotech firms are SMEs. A typical European biotech firm starts with an average of 9 employees (16 in the US). Ten years later, the average number of employees is 42 (66 in the US)[41].

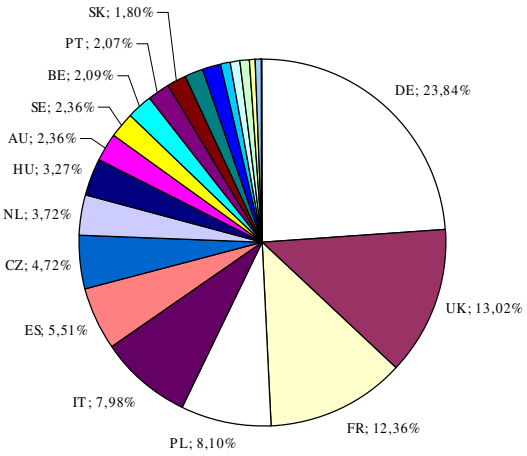
iii) The presence of large firms is geographically concentrated

Germany, France and the United-Kingdom account for nearly half of the Union's manufacturing value-added realised by large companies (See graph 2). German large companies alone are responsible for almost one fourth of the total, followed by French and British. Some new Member States still have a significant number of very large companies (more than 1000 employees), but this situation is probably due to delays in structural reforms (privatisation and liberalisation) and may be reversed in the future.

Graph 2 – Distribution of value-added in 2001 (firms of more 250)

[40] For more details, see "EU Sectoral Competitiveness Indicators" (2005).

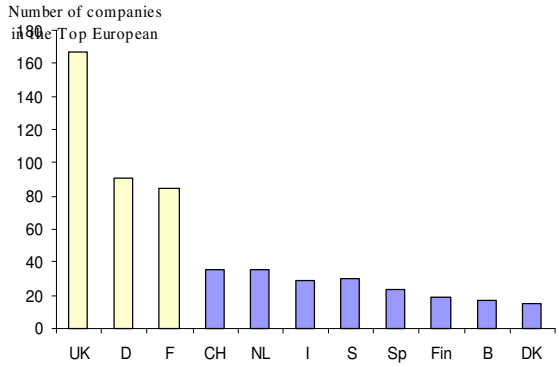
[41] These "typical" firms refer to 96% of biotechnology performers after subtraction of atypical companies (atypical because of stellar performance or origins). For more details, see *Biotechnonology in Europe: 2005 Comparative study*. Critical I: comparative study for Europabio. April 2005.



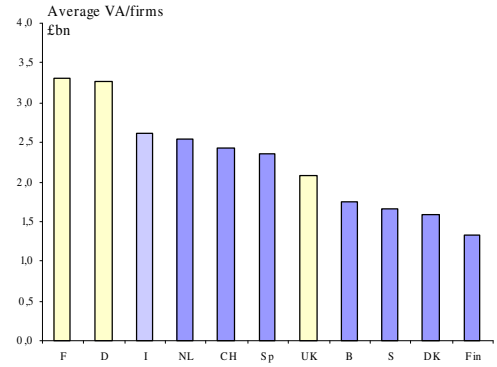
Source: Eurostat

The scoreboard of the top 600 European companies published by the UK Department of Trade and Industry (DTI) shows similar results. 95% of the value added accounted for by the 600 companies comes from 11 countries of Europe and two-thirds from just three of them – France, Germany and the United Kingdom. This confirms that many of the companies contributing most to value added are concentrated in a small number of countries[42]. The UK has the highest number of companies and total value-added in the top-600. However, the average size of British firms is smaller than in Germany or France.

Graph 4 – Top 600 European companies in 2005 (DTI scoreboard)



Source: DTI value-added scoreboard- 2005



Source: DTI value-added scoreboard

4.2. Are large European firms global players?

i) Many "European champions" are well positioned in the international scene

Rankings of the world largest firms reveal that European companies are well positioned relative to their US and Japanese counterparts. According to the 2004 ranking drawn up by Fortune of the world's 50 top companies in terms of revenues, 20 were from the European Union, with seven in the manufacturing sector and the rest in services (retail,

42 This does not however imply that they are "national champions" as most operate on several European markets.

banking, insurance)[43]. The most significant trend of recent years is the growing presence of Chinese companies amongst the world's top ranks. In 2004, a few Chinese companies were propelled into the top 50 (Sinopec, State Grid, Chinese National Petroleum). Amongst the top 500, one could find 16 Chinese companies (in sectors such as petroleum, chemicals, banks, telecommunications), compared with only 3 in 1995.

Table 3: Ranking according to revenues in 2004

European ranking	World ranking	Company	Country	Sector	2004 revenue Mill. $
1	2	BP	UK	Industry	285 059
2	4	Royal Dutch Shell	UK/NL	Industry	268 690
3	6	DaimlerChrysler	DE	Industry	176 687
4	10	Total	F	Industry	152 610
5	13	Axa	F	Services	121 606
6	14	Allianz	DE	Services	118 937
7	15	Volkswagen	DE	Industry	110 649
8	17	ING Group	NL	Services	105 886
9	21	Siemens	DE	Industry	91 493
10	22	Carrefour	F	Services	90 382
11	24	Assicurazioni Generali	I	Services	83 268
12	30	Fortis	B/NL	Services	75 518
13	33	ENI	I	Industry	74 228
14	35	Aviva	UK	Services	73 025
15	36	HSBC Holdings	UK	Services	72 550
16	37	Deutsche Telekom	DE	Services	71 989
17	41	Peugeot	F	Industry	70 642
18	42	Metro	DE	Services	70 159
19	43	Nestlé	CH	Industry	69 826
20	45	BNP Paribas	F	Services	68 654

Source : Fortune (2005). Europe's top 50.

ii) Large European companies are hardly present in knowledge-intensive and high-technology sectors

However, rankings by industry also reveal that leading-edge sectors are clearly dominated by American and Japanese companies. The aerospace industry, where EADS shares the leadership with Boeing, is the only exception. Europe is conspicuously absent in computer equipment (dominated by Japan and the US), computer services (dominated by the US), and semiconductors (US). European companies have leading positions in manufacturing sectors such as engineering and building, machinery equipment, chemicals and petroleum

[43] Rankings of large companies depend on the criteria applied: number of employees, turnover, profits, market capitalisation, value added. The one drawn up by Fortune is based on revenues. Another popular ranking, by Business Week (The Business Week Global 1000), is based on the market value of the companies. The ranking on this basis is somewhat less favourable to European companies since, of the top 50, only 16 are European and only 11 from the European Union. The fact that different rankings rely on different criteria can lead to awkward comparisons. Microsoft for instance ranks second in the world with respect to market value, but obtains only the 130th position in the revenues-based Fortune ranking. This illustrates that information provided by such rankings should be treated with caution.

(see annex 2). These are, however, also the sectors where Chinese companies are most rapidly gaining ground.

Exploring in detail the nature of the relationship between the presence of large companies and sectoral performance is beyond the scope of this paper. However, the marked absence of large European companies in leading-edge sectors -like information technologies or electronics- is most likely to be closely related to Europe's lagging competitive performance in such high-technology industries[44].

One of the conclusions of research by O'Mahony and Van Ark (2003) is that the weaker labour productivity growth of certain European sectors over the past decades – computer equipment, optical and scientific instruments, insulated wire – explains much of the worsening of the productivity gap vis-à-vis the United States[45]. In fact, although overall EU productivity growth is significantly lower than in the US, in nearly half of all industries EU productivity growth is actually higher. Europe displays higher productivity growth in most medium and low-tech capital intensive manufacturing industries (e.g. chemicals). This type of specialisation is not without risk as Asian and Eastern European competitors gradually make inroads into higher value-added segments. In stark contrast, the US remains firmly in the lead in sectors at the technology frontier.

4.3. How is Europe's industrial structure evolving?

i) Many of the largest companies in both sides of the Atlantic are a century-old…

Most of the European companies on the list above are about a hundred years old. The sectors in question – mining, petroleum, motor vehicles – are those that were involved in the industrial revolution at the end of the 19th century, and it is therefore hardly surprising to find companies that were set up around that time[46]. The same phenomenon can also be observed in the United States, where most of the top 20 companies are a hundred or more years old.

Table 4: Date of establishment of the companies ranked at world level

World Ranking	European companies	Date of creation	World Ranking	American companies	Date of creation
2	BP	1889/1909	1	Wal-Mart Stores	1962
4	Royal Dutch Shell	1907	3	ExxonMobil	1882
7	DaimlerChrysler	1900/1908	5	General Motors	1900
10	Total	1920/1939	8	Ford Motors	1903
13	Axa	1816	9	General Electric	1876
14	Allianz	1890	12	ChevronTexaco	1879
15	Volkswagen	1937	14	ConocoPhillips	1875
17	ING Group	1963/1991	18	Citigroup	1812
21	Siemens	1847	19	AIG	192
22	Carrefour	1959	20	IBM	1911
29	Assicurazioni	-	26	McKesson	1833

[44] See the analyses by the European Commission: Industrial Policy Communications (2002 and 2004) and various Competitiveness reports by the Enterprise DG.

[45] If we focus on manufacturing. Certain services sectors like retail and wholesale trade and financial services were also largely responsible for the productivity gap.

[46] Many of these were involved in mergers during the 20th century, which helped to increase their size.

	General				
30	Fortis		28	Hewlett Packard	1939
33	ENI	1926	32	Berkshire Hathaway	1977
35	Aviva		34	Home Depot	1979
36	Hsbc Holdings	1990s	27	Verizon Communic.	2000*
38	Deutsche Telekom	End XIXe	44	US Postal Services	XIXe
39	Peugeot	1810	48	Cardinal Healty	1971
41	Metro	1964	50	Altria Group	XIXe

* Merger of Bell Atlantic and GTE. Bell Atlantic resulted from the break-up of AT&T in 1984

ii) …but in Europe it is much harder to grow big

It is more interesting to note that the leading American companies in high-tech sectors were set up recently. For instance Intel was created in 1968, Microsoft in 1975 and Dell in 1984 (see annex 2)**.** These firms started very small, with a few employees, but did not take long to grow and start competing on a global scale. They have become world-leaders in a relatively short time span**.** In Europe, "new" champions have followed a completely different path. In the telecommunications sector for instance, Nokia and Ericsson were both created in the late 1800s. And while Ericsson was a telecommunications company from the beginning, Nokia was a multi-industry conglomerate that only gradually focused on telecommunications and consumer electronics during the 1980s.

Cohen and Lorenzi (2000) stress the difference between Europe and the United States by looking at the number of large companies that were established after 1950 or 1980[47] (see table 5). These "young leaders" are far more numerous in the United States, particularly in emerging sectors. Around 80% of new large enterprises in the US were created in fast-growing sectors such as telecommunications, business services or electronics. In comparison, the number of new entrants in Europe was very low and evenly distributed among sectors. This would also suggest that Europe has taken a long time to fully be a player in new technological sectors.

Table 5: New ("Greenfield") entrants since 1950

	Creation after 1950		Creation after 1980	
	US	Europe	US	Europe
Electronic-computers	30	3	16	2
Telecommunications	19	1	13	1
Business services	27	5	16	2
Distribution	11	5	4	1
Pharmaceuticals/Biotechnology	7	0	2	0
Communication	8	2	5	1
Food	4	2	1	1
Electricity	5	1	3	1
Petroleum/energy	1	1	1	0
Automotive	0	1	0	0

[47] From the top 1000 of Business Week. See Cohen and Lorenzi (2000).

Health services	3	2	2	0
Others	5	3	1	0
Total	120	26	64	9

Rouguet (1999), quoted in Cohen and Lorenzi (2000).

It results from table 5 that the majority of large European companies were created a long time ago. More recently, Europe has not been able to stimulate the emergence of key players.

Paradoxically, the volatility of the enterprise population (birth rate plus death rate) is rather similar in Europe and the US[48]. Other studies confirm the similar degree of churning in the US and Europe[49]. However, post entry performance is significantly different. While many US entrants expand rapidly and reach a high average size most European newcomers do not manage to make it beyond the start-up phase. This is an indication of persistent obstacles to firm growth in Europe. In most sectors the average European company remains smaller than in the US.

Relatively high entry rates may thus be a misleading measure of the structural dynamism of the European marketplace. Unless new firms reach a critical size to challenge incumbents in established markets or compete globally in emerging sectors, the Darwinist process of selection by which more competitive companies take the place of less efficient ones does not take place. As a result, European firms are not best placed to take advantage of the opportunities opened by new technologies and rapidly changing market trends.

iii) …and the "best" European firms seem to underperform their US competitors

Recent evidence also seems to indicate that lagging average productivity growth in Europe, and more specifically in high-tech and services sectors, could be largely due to the fact that the *best* US firms significantly outperform their *best* European counterparts. On the other hand, the performance of the average European firm in any given sector is not significantly different from the average US one. Bart van Ark and Bartelsman (2004) find that in most industries the productivity performance of the top quartile of US firms is considerably better than that of the best performers in Europe (by 34%). The share in employment of the top US quartile is also higher than in Europe (34% versus 31%). Moreover, the top quartile of US-based companies has grown faster than the equivalent European group: +6,2% of employment on average per year between 1995 and 2000 in the US compared to only 0,3% for the European top quartile. At the opposite end, the quartile of the least productive US firms is responsible for a decrease in employment of 1,6% whilst in Europe, the least productive companies still account for a positive employment growth of 2,2%. This confirms a certain rigidity of Europe's industrial structure that results in a slower reallocation of resources.

[48] See "The Enterprise Scoreboard", 2004.

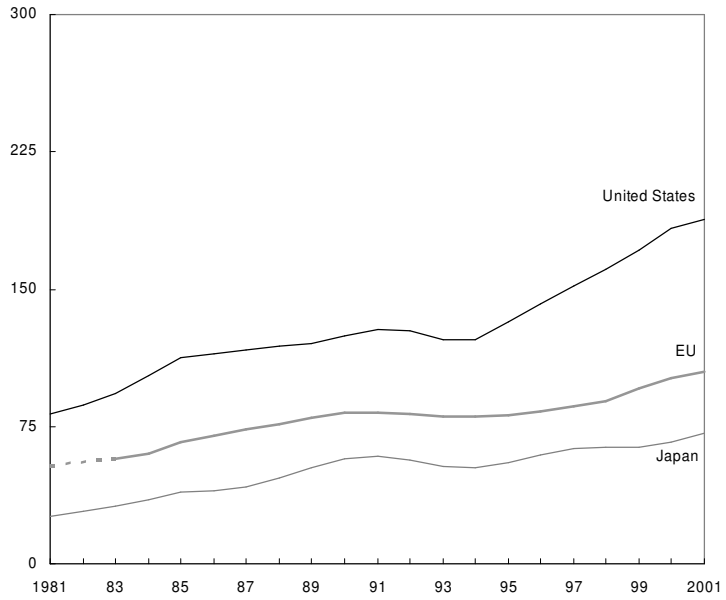
[49] Bartelsman, Scarpetta and Schivardi (2003).

4.4. What's the contribution of large and small firms to Europe's technological base?

i) Business R&D investment in Europe is very concentrated in a small group of very large firms

It is well-known that Europe is lagging behind its main competitors in terms of R&D expenditures: R&D investment in the EU-25 was 1,9% of GDP in 2003, compared to 2,6% in the US and 3,15% in Japan[50]. Perhaps even more worrying, the relative gap is even wider for business R&D expenditure. In 2003, 55.9% of domestic R&D expenditure came from industry in the EU, compared to 63.1% in the US and 73.9% in Japan. Graph X shows the trend in industry-financed R&D expenditure for the EU, the US, Japan and the OECD. In 2003, in absolute terms the difference in the amount of resources devoted to R&D between the EU and the US was roughly €110 billion.

Graph 5: Evolution of business R&D (billions of 1995 PPP dollars) 1981-2001



Source: OECD, STI 2003

As it happens in most developed countries, large companies account for the largest share of business R&D investment**.** In the EU, firms with more than 250 employees constitute approximately 1% of the total enterprise population but undertake about 78% of total business R&D expenditure. Interestingly, there is a clear positive correlation between the share of large companies' business expenditure in research and development (BERD) and the percentage of BERD in national GDP (See Graph 6). In those countries with a high-intensity of business R&D –i.e. the US, Japan, Sweden or Finland-, research is particularly concentrated in large enterprises.

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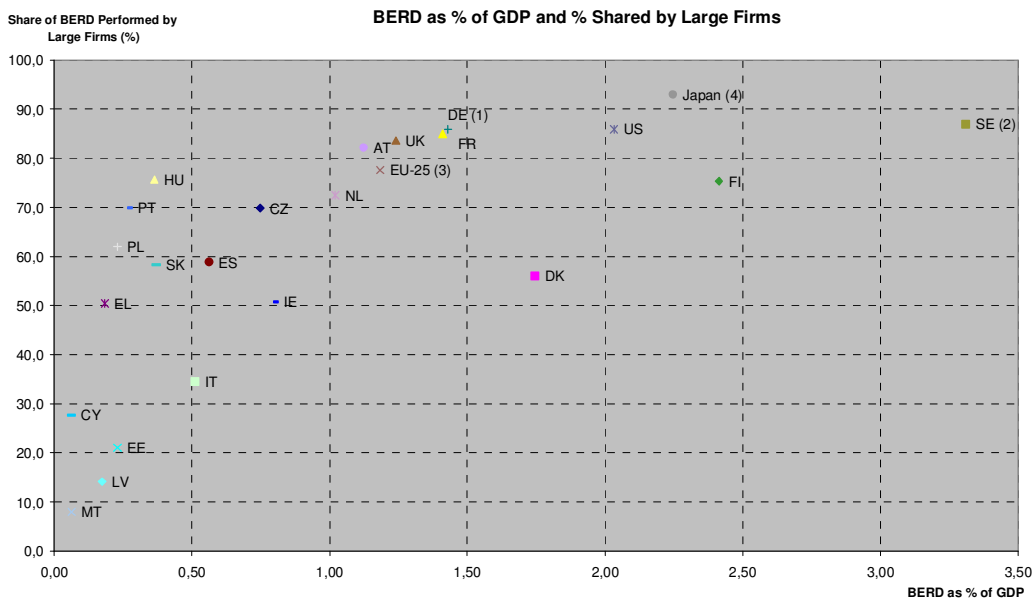
[50] Key figures, DG Research. The situation seems unlikely to change in the foreseeable future: at present trends R&D investment in the EU-25 is estimated to increase only to about 2.20% of GDP by 2010.

Graph 6: BERD as % of GDP and % shared by large firms



Source: OECD

On top of this, amongst large enterprises in Europe a small group accounts for a disproportionate amount of aggregate research. The top EU companies in terms of research investment (Daimler Chrysler, Siemens, Volkswagen, Nokia and Glaxo Smith Kline) are amongst the top 12 globally and hold their own with respect to their largest competitors.

Table 7: Top 5 EU and non-EU companies in the four largest R&D sectors

	Companies	R&D investment (bn €)		Companies	R&D investment (bn €)
	Automobiles and Parts			**Electronics & Electrical Equipment**	
1	Ford Motor	5,9	1	Matsushita Electric	4,3
	Daimler Chrysler	5,6		Siemens	5,5
2	Toyota Motor	4,9	2	Sony	3,3
	Volkswagen	4,1		Philips Electronics	2,6
3	General Motors	4,5	3	Samsung	2,4
	Robert Bosch	2,7		Schneider	0,5
4	Honda Motor	3,2	4	Canon	1,9
	BMW	2,6		Alsthom	0,5
5	Nissan Motor	2,2	5	Sharp	1,1
	Peugeot	2,1		Thomson	0,3
	Pharmaceuticals & Biotechnology			**IT Hardware**	
1	Pfizer	5,7	1	Intel	3,5
	GlaxoSmithKline	4,0		Nokia	4,0
2	Johnson & Johnson	3,7	2	Motorola	3,0
	Aventis	2,7		Ericsson	3,2
3	Roche	3,1	3	Hewlett-Packard	2,9
	AstraZeneca	2,7		Alcatel	1,6
4	Novartis	3,0	4	Hitachi	2,8
	Sanofi-Synthelabo	1,3		InfineonTechnologies	1,1
5	Merck	2,5	5	Toshiba	2,5
	Boehringer Ingelheim	1,2		ST Microelectronics	0,9

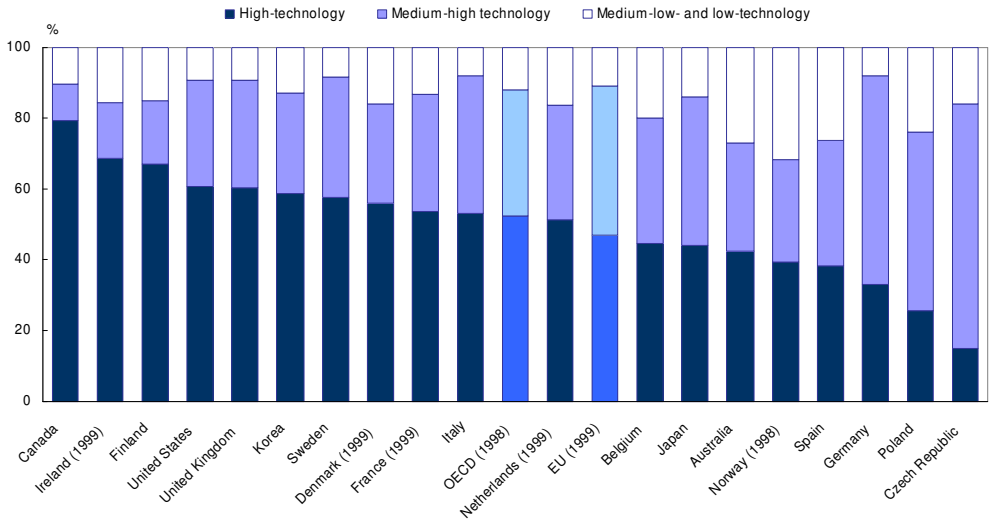
Source: R&D Scoreboard (2004), DG Research

But below these top few performers, the EU lacks a critical mass of large and medium-sized companies that invest strongly in research and innovation. The ranking of companies by R&D/sales ratio shows that in third countries the most research-intensive firms are small and medium high-growth enterprises – Allergan, Biogen, Amgen. This is the opposite of Europe, where the firms which invest relatively more in research are also the largest and well-established companies – Ericsson, AstraZeneca, Aventis and Nokia.[51] The gap between R&D investment by private firms in Europe and private firms in the US largely reflects this lack in renewal of high growth firms in Europe.

ii) Business R&D investment in high technology sectors is insufficient

In addition, in the US business R&D is more concentrated in high technology industries than in Europe. Within the EU, the countries with the highest business research intensity are also those where research spending is more concentrated in high-technology sectors. But for the EU as a whole, R&D expenditure is evenly distributed between medium and high-technology industries.

Graph 7: Share of business R&D in manufacturing sector by technology intensity, 2000



Source: OECD, STI scoreboard 2003

Also in line with Europe's specialisation pattern and the size of different sectors, automobiles and parts represent the largest share of the EU's R&D investments by large firms (24% of the EU's 500 largest). Conversely, for non-EU countries the largest share of R&D investment corresponds to the IT hardware sector (23%).

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[51] See the 2004 EU industrial R&D investment scoreboard. This ranking only takes into account firms that are members of FTSE global 500, which ranks companies by market capitalisation. The ranking by R&D sales ratio also shows the capacity of US small and medium firms for having a larger market capitalisation.

Table 8: EU and non-EU R&D investments by sector

	Sector R&D Investment as % of all sectors	
FTSE Sector	**EU Top 500**	**Non-EU Top 500**
Automobiles & Parts	23.8	15.7
Pharmaceuticals & Biotechnology	17.0	18.5
IT Hardware	12.4	22.9
Electronic & Electrical Equipment	10.3	10.9
Chemicals	7.2	4.2
Aerospace & Defence	6.8	2.1
Engineering & Machinery	4.6	2.5
Telecommunication Services	2.8	2.0
Software & Computer Services	2.6	7.8
Oil & Gas	1.9	1.2
Others (21 sectors)	10.6	12.2
Total (31 sectors)	**100**	**100**

Source: The 2004 EU Industrial R&D investment Scoreboard

Particularly in R&D intensive sectors like pharmaceuticals & biotechnology, IT hardware or electronics and electrical equipment, the aggregate size of R&D investments is lower than that of other major countries. In the groups of 500 largest EU and non-EU firms investing in R&D, the proportion of US companies in IT hardware and electronics & electrical equipment is twice that of EU companies. In software and computer services, the proportion of US firms is almost four times as large.

***

To conclude, **the presumed absence of large firms does not seem to be the most salient weakness of the EU industry**. Large firms hold a prominent position in Europe's industry. Many EU-based firms rank amongst the world largest and hold leading positions in capital-intensive medium-high technology industries. However, the leadership of large European firms in many medium-high technology and traditional manufacturing is under strain, as new competitors, notably from Asia, are gradually gaining market share.

On the other hand, Europe has a weak specialisation in emerging high-technology sectors. **The patterns of European investments in R&D confirm that Europe has a small number of well-positioned champions in knowledge-based industries, while at the same time it lacks a critical industrial fabric of fast-growing R&D-intensive "not-so-large" and medium-sized companies**. Newly created companies in Europe find it hard to expand and reach the critical size necessary to be competitive in the global marketplace. Most European entrants either stay small or do not survive. **This clearly hampers Europe's capabilities to compete in fast-growing sectors of the economy, where scale is most often a critical source of comparative advantage**.

5. HOW CAN PUBLIC POLICY STIMULATE THE COMPETITIVENESS OF EXISTING GLOBAL PLAYERS AND FACILITATE THE DEVELOPMENT OF NEW ONES IN EMERGING SECTORS?

The debate for or against supporting industrial champions mirrors different views on the role of governments, and more concretely on the role of various economic policies. As we have discussed in the introduction, the interventionist view is associated with lenient competition policy and defensive trade instruments. Conversely, the market approach puts the emphasis on the single market coupled with tough competition and free trade.

However, beyond this opposition, we have seen that Europe already has quite a number of mature industrial champions. As far as these are concerned, the role for public policies should be to ensure that they evolve in a competitive environment so that they have the appropriate stimuli to continuously innovate and thrive in the global market. On the other hand, in the newest and fast-growing sectors of the economy there are few, if any, EU-based global players. In these sectors, small and medium-sized undertakings rarely manage to reach the size necessary to challenge competitors at the world level. Here, the role of public policies should be rather to facilitate and accompany the emergence of competitive players.

The various economic policies should be complementary in achieving this twin objective to provide a stimulating environment for well-established companies while facilitating the development of young ones in growing sectors. First, efforts to complete the internal market, which should be pursued, must be complemented by actions aimed at supporting the growth of young innovative firms. As for competition policy, we analyse its role -in combination with trade policy- in stimulating or hampering EU champions and would-be ones. Merger control has been the favourite "enemy" of most advocates of industrial champions[52]. We also discuss the state aid regime which has been often pointed to as a brake to research and innovation policies. We end up analysing the critical role of technology and research policy and the need for more committed and focused efforts in this area.

5.1. Advancing the internal market as a means to promote firms' growth

The implementation of the internal market has been a success to a large extent. By expanding market size and increasing competitive pressure, it has undoubtedly stimulated efficiency, increased productivity and contributed to the emergence and consolidation of numerous EU-based global players[53].

Deepening the Single market remains important both to promote the competitiveness of existing champions and to facilitate the emergence of new ones. In most sectors increased company size happens naturally when the necessary conditions for a smooth-running internal market are met. The liberalised telecommunication sector in the EU illustrates how competitive forces in previously protected sectors lead to lower prices, increased variety of services and expanded job opportunities.

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[52] See for instance the Quote of the Straus-Kahn report in footnote 5.

[53] Empirical estimate that mark-ups have decreased while firm size have increased on the whole. See European Economy (1996).

But there are still significant areas of shortfall in the integration of European markets. In a number of industries -–including for instance energy, transport, defence, financial services, distribution or postal services- a market structure more conducive to competition and effective access to markets could still bring enormous benefits. Completing the internal market is particularly pressing in the field of services[54]. Insufficient competition in services markets explains much of the poor productivity performance of the EU relative to the US.

The financial environment of business, and SMEs in particular, could also benefit significantly from deeper, more liquid, efficient and integrated financial markets. The slow progress that has been made in a number of other important areas such as public procurement is not conducive either to the emergence of global players. Completing the internal market would entail eliminating the remaining barriers, establishing European company law, European patent and clear rules on cross-border European law on acquisitions (i.e. take-over bids etc.).

Fragmented markets keep national champions protected from foreign competition. Furthermore, when the pace of liberalisation is different between Member States, protected national champions might be tempted to benefit from the openness of other markets by shopping around and gaining best positioning ahead of full implementation of the internal market. The energy market provides numerous examples of such situation where the fragmentation of the market tends to favour national incumbent.

The fragmentation of financial markets and the resulting difficulties in access to finance is an important hindrance on the survival and sustained growth of small and medium-sized enterprises. Particularly in high-tech sectors the levels of equity finance provision remain too low. The fragmentation of finance markets limits the exit prospects for Venture Capital investments and renders it particularly difficult for young innovative companies to attract funding. Apart from easing access to finance, creating a good climate for enterprise growth requires action on a wide array of areas from improving the regulatory environment to lowering administrative burdens. For instance, the high costs of complying with the diversity of tax systems or labour rules prevailing in the Union weigh particularly on SMEs.

If progress on the above areas is slow, few would argue that it does not need to be done. However, many of the pending issues are in the hands of Member-States (adoption and implementation of directives). The internal market Scoreboard regularly publishes these indicators and shows how different Member-States are lagging behind in the process of implementing internal market directives[55].

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[54] See the Commission's "Report on the state of the internal market for services", COM (2002) 441, 30 July 2002.

[55] See Internal Market Scoreboard (2005).

5.2. Competition and trade policy as a means to stimulate large firms

5.2.1. The role of merger control

i) High merger activity in the EU contributes to the creation of large European firms

The development of the single market coupled with the globalisation of trade, has been pushing many firms to combine in order to realise economies of scale or scope and reach a size that allows them to remain competitive in extending markets. Mergers and acquisitions are also a way for companies to tap into complementary assets, technologies and know-how, or to have access to new distribution channels.

Thus, mergers are also often associated with synergies in numerous areas, such as research and the development of new products, or restructuring measures that reduce production or distribution costs. Overall mergers and joint ventures generally lead to larger companies which can be more efficient and competitive in global markets.

But sometimes mergers are also driven by the desire to create or strengthen a dominant position, leading to increased market power. On occasions mergers may be a means for incumbent companies to oppress smaller competitors or to foreclose potential competitors present in similar markets. Against this background, policymakers need to scrutinise mergers so as to balance their pro-competitive effects with the risks of their hampering competition. Hence the potential conflict between merger control and the emergence of "champions". What does the evidence suggest?

Between the second half of the eighties and the year 2000, cross-border merger activity in the European Union steadily intensified. Ever since the entry into force of the Merger regulation in 1990, large cross-border transactions in the EU require the approval of the Commission[56]. The number of concentrations with a Community dimension notified to the Commission increased spectacularly throughout the 1990s. At the height of the recent merger boom, the total number of merger notifications to the European Commission reached 345 and 335 in 2000 and 2001 respectively, coinciding with the early years of the euro. In 2005, 313 mergers were notified, and 61 in the first month of 2006[57]. In terms of value of the deals there is evidence that merger activity is picking–up again.

Domestic operations however have been systematically more numerous than cross-border ones. Since the surge of cross-border activity in the second half of the eighties, the ratio of domestic to cross-border operations has stabilised at around 3 to 2. As one would expect though, many of the largest operations involve companies from two Member States or more. On the other hand, the share of mergers between the EU-25 and third-country firms is also larger than that of community mergers.

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[56] Large mergers do not have to be cleared in any national jurisdiction. The Commission has exclusive competence over deals involving companies with a combined, worldwide turnover of at least €5 billion, and where at least two of the companies involved also have more than €250 million each in sales in Europe, unless they each realise more than 2/3 of their European turnover in one and the same Member State.

[57] The statistics on merger notifications and decisions are available in DG Competition's Website: http://europa.eu.int/comm/competition/mergers/cases/stats.html

Table 9: Breakdown of total EU M&A into Domestic

Community and International Operations					
	Domestic	**Community**	**International**	**Bidder unknown**	**Total**
1995	58%	14%	20%	8%	100%
2000	55%	17%	22%	6%	100%
2004	57%	14%	24%	5%	100%

Source: Mergers and Acquisitions note, June 2005, DG ENCFIN European Commission.

ii) Merger control policy has rarely prevented the creation of champions

Merger control in the EU has not stood in the way of the creation of large European players. A large number of Europe's biggest companies are actually the result of merger operations that have been approved by the Commission. Amongst the most prominent European global players created through major -- mostly cross-border—mergers, we find EADS, TotalFinaElf, Arcelor, BNP Paribas, Suez, Vivendi Universal, DaimlerChrysler, Vodafone or Sanofi-Aventis. Many of the largest 50 European companies have reached their current size through approved operations.

Only a limited proportion of all notified mergers lead to intervention. In cases that it finds problematic, the Commission most often clears the deals subject to modifications -"merger remedies"-- such as divestitures of business divisions active in markets where competition would otherwise have been reduced. Outright prohibitions are very rare: they total 19 since 1990 which represent less than 1% of all notified transactions. Taking into account real prohibitions in addition to virtual ones (i.e. mergers withdrawn before a likely prohibition) would barely double this figure. In 2004 a new Merger Regulation entered into force to assess the competitive impact of European mergers. Evidence so far seems to indicate that the new regulation has not entailed significant policy changes[58], although it may be premature to come to a conclusion on this issue at this stage.

iii) … but could probably further integrate the dynamic evolution of markets and weigh broader policy considerations

In a few prohibition cases such as Volvo/Scania or Schneider/Legrand, Commission decisions have been criticised on the grounds that they were based on a restrictive interpretation of the rules, in particular narrow geographic market definitions.

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[58] The new Merger Regulation introduced a rewording in the test to assess the competitive impact of European mergers, switching from a structural test (the dominance test) to a more effects-based test. Theoretically this could, if applied rigidly and without due consideration to the industrial reality, lead to a higher number of prohibitions namely in view of the oligopolistic structure (i.e. a limited number of players) very often characterising the European industry, as well as in view of persisting non-regulatory barriers. But efficiency gains and a failing firm have been included among the factors mitigating possible anti competitive effects of mergers. The Commission has signalled that it is willing to give more emphasis to economic analysis and to the expected efficiency gains from mergers. Overall, the new merger control regime may have more scope for interpretation, but also requires higher standards of proof to justify an intervention.

Geographic market definition is a central issue in merger assessments by competition authorities[59]. Market definition determines the calculation of market shares and concentration indices[60]. Competition problems in connection to a merger (or an alliance) are more likely to arise when competition enforcers define markets narrowly, e.g. along the lines of national borders instead of in the EU or world-wide. By doing so, competition authorities may end up imposing divestitures in certain markets or simply preventing the creation of the merged entity. To avoid unjustified interventions merger control needs to take into consideration the dynamic evolution of markets and the progressive elimination of trade barriers.

A study by Copenhagen Economics[61] found that the completion of the Single Market Programme and the simultaneous elimination of regulatory barriers have not caused a widening of the relevant geographical markets in the Commission's decisions of EU merger cases. This is partly due to regulatory barriers having been replaced in most of the cases by strategic barriers. The proportion of cases where the Commission has defined the geographic market as national has not substantially changed. The authors argue that the "*delineation of the relevant geographical market in EU merger cases could be more systematic, consistent and empirically based"*. This seems to reflect some implicit primacy of product over geographic criteria in defining markets. The standard of analysis involved in geographic market definition could be improved without any modification of the relevant regulatory framework being required

In other cases, merger decisions have been criticised on the grounds that, by impeding the creation of large European players, they have facilitated the acquisition of European companies by foreign competitors. The Alcan/Pechiney merger is often cited as a controversial case. Following the failure of a first merger "among equals", withdrawn before a very likely prohibition, the French aluminium company Pechiney was later taken over via a hostile bid by its Canadian competitor (and former counterpart) Alcan, which now has the control of the group.

Box 7: Examples of merger prohibition decisions

Volvo/Scania

In March 2000 the acquisition of Scania by Volvo, both Swedish manufacturers of trucks, buses and engines was opposed by the Commission. The merger was prohibited due to the creation of a dominant position in some national markets (mainly, but not only, Scandinavian countries). In some of these "national" markets, the merger would have led to a quasi-monopoly situation. The Commission argued that Volvo and Scania had been each other's toughest competitors, and that barriers to entry were very high for foreign competitors. The merger could have further isolated the national markets and reduced competitive pressure.

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59 Geographic market definition also plays a role in antitrust and certain state aid decisions.

60 These structural indicators may not always be informative (e.g. high-tech/fast growing markets, bidding markets). In view of this, the recently adopted horizontal merger guidelines clearly state that these structural indicators only provide "useful first indications". However, these indicators and geographic market definition are going to lose importance in the most complex cases as soon as reliable alternative methodologies will be available allowing the analysis of the likely effects of the merger (effect-based approach) rather than what one could presume based on the pre-merger structure of the market (structural approach).

61 "The internal market and the relevant geographical market", Enterprise Papers n° 15, 2004

Following the abortion of the Swedish merger, Volvo went on to make a bid for "Renault Vehicules Industriels ("RVI"), an operation which was cleared by the Commission. The new cross-border merger therefore led to the creation of a pan-European player. The parties offered commitments to the Commission aimed to ensure that competition was maintained in all markets. Scania also ended up engaging in cooperation agreements with Volkswagen.

Alcan/Pechiney

Unlike the Volvo/Scania case, other merger prohibitions did not open the way for alternative deals that, while better safeguarding competition, led also to the creation of a large European player. The Alcan/Pechiney merger is a case in point.

In March 2000 the Commission prevented a merger between the French company Pechiney and the Canadian Alcan, both major players in the aluminium industry. According to the proposed deal both companies would have been equals in the merged entity. The merging parties refused to divest substantial parts of their business, which the Commission considered necessary to alleviate competition concerns. The transaction was then abandoned anticipating an inevitable prohibition following such a refusal.

According to commentators, the approach of the Commission in the first case was rather orthodox and the remedies made necessary under such an approach were considered rather disproportionate (and unacceptable by the parties) of difficult implementation in view of the magnitude of the investment necessary to buy such assets (only companies like US competitor Alcoa could have afforded it, which would have raised even worse competition problems). The approach in any case undermined the rationale of the merger.

A couple of years later Alcan simply took over Pechiney which had been badly hit by the stock market crisis and had thus become an easier target. The Commission cleared the second deal after even more important divestitures were accepted by Alcan alone, no longer needing Pechiney's agreement. Interestingly, the divested assets were not in the end sold to a third party, but rather spun off to create a new company called Novelis, which is not vertically integrated while Pechiney was so before the merger. Many commentators argued that Pechiney's intransigence drove to the failure of the first transaction with Alcan. The industry is now essentially left with three strong, vertically integrated, non-EU groups (a fourth player, the EU group Corus is striving to restore viability and implementing a restructuring plan). This may harm downstream customers (mainly EU-based SMEs, left with reduced choice of suppliers). Fears have also been expressed of a relocation of assets outside the EU. These factors certainly increase the regret for the failure of the peer transaction in 2000, which would have created a group with higher decision making power within the EU, and possibly weight in relocation decisions. Although in 2000 the Commission could not have anticipated the follow-up of events, the case raises the question of how to weigh in merger decisions the nationality of companies' ownership or likely scenarios that can follow a prohibition.

On merger control, it is also interesting to look at the US for inspiration. In the US, decisions on mergers are subject to the jurisdiction of federal agencies. These can attach great weight to industrial policy arguments, especially in sensitive sectors such as telecommunications and defence, even if anti-competitive concerns exist.

In the defence sector for instance, US firms have at times been encouraged to regroup by public authorities. A lenient approach in the assessment of merger cases during the '90s allowed the approval of a number of important consolidations in markets which were already oligopolistic. The government even subsidised mergers (directly or indirectly, via R&D programmes) and bore a large proportion of the restructuring costs, up to 50% in

some cases. In Europe the defence sector also clearly faces the challenge of much needed consolidation, which has already started but is still largely insufficient.

Overall, drawing the line between mergers that are likely to undermine competition and those where the efficiency-enhancing effects prevail is not an easy exercise. The EU merger control regime has approved most reorganisations and therefore allowed for the creation of global players. The request of remedies has allowed mergers that would have led to competition problems in one or various specific markets to go ahead without its rationale being undermined. Still there may be scope in complex cases to raise the standard of analysis involved in geographic market definitions, possibly further integrating the dynamic evolution of markets. The specific context of sectors like defence could also possibly be integrated in the analysis of individual merger investigations. The possibility to specify ad-hoc rules concerning the defence sector could also be considered.

Finally, it is worth highlighting that beyond the Commission's role as merger control authority, Member States have often interfered with cross-border takeovers. The banking and utilities sectors in particular have been the subject of determined efforts by European governments in the form of lobbying, regulatory hurdles or counter-bids to prevent the acquisition of national companies by foreign or EU-based competitors. In such sectors, misplaced economic nationalism has stood in the way of a true single market, preventing market consolidation and slowing down the growth of many would-be European champions.

5.2.2. Antitrust: a lenient approach to pro-competitive collaborations

The Union's antitrust policy governs agreements between enterprises and abuses of dominant market positions[62]. The internal growth of large companies is not affected by the Union's antitrust policy, provided it is based on competition on the merits.

Antitrust policy has no objections to firms that hold a dominant position on a market. Only abuse is prohibited, e.g. if a firm forecloses innovative actions by competitors, ties or bundles products. It needs to be demonstrated that a dominant position exists in the relevant market and then that it has been abused. In this context it is important for competition authorities to take a dynamic approach that is based on sound economic analysis, taking into account in particular that dominant market positions can only be temporary and that company size is often a source of efficiency, provided of course that there is sufficient actual or potential competition.

As regards agreements between firms, the EC Treaty prohibits agreements that, for instance, fix prices or share markets. All pro-competitive forms of co-operation are exempted from this general prohibition, provided they create efficiencies, pass benefits on to consumers, do not impose indispensable restrictions and do not substantially eliminate competition. Agreements on R&D and transfer of technology are prominent examples and have been actually encouraged. Such agreements usually increase the competitiveness of firms, for instance, by pooling expertise and avoiding duplication. Cooperation agreements are individually analysed and can only be prohibited when the potential anti-competitive concerns outweigh the efficiencies they create.

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[62] Unilateral conduct is governed by Article 82 of the EC Treaty, agreements between undertakings by Art 81.

5.2.3. The role of trade policy in complementing competition policy

Since the inception of the European Union, trade policy has been largely devoted to the aim of liberalising world trade and lowering customs barriers. As discussed above, these are not the type of measures that would match "old-style" industrial policies, which would rather rely on a certain complicity of trade and competition policies.

Calls for defensive trade instruments are limited and mostly confined to measures aimed to protect sectors in difficulty. Recently, the much politicised problems of the textile sector and the subsequent quotas agreed with China are a case in point. We have discussed in section 2the rationale of supporting ailing sectors and companies, or rather the absence of it. On the other hand, international WTO rules and common sense would today prevent most politicians from arguing in favour of trade protection or export subsidies as instruments to promote champions in strategic industries.

An open trade policy leads to lower prices and increased choice for consumers, as well as access to cheaper inputs and technologies for domestic companies. But it can also act as a stimulus for domestic companies and promote competition, especially in highly concentrated markets. Conversely, trade defence measures (antidumping measures, safeguard measures) can increase the market power of domestic firms[63] by disciplining imports from third countries. In some cases, protection through antidumping actions is thus likely to induce rent-seeking behaviour by the domestic companies, with the resulting social costs. Moreover, it can be a barrier to structural adjustments[64].

In order to improve the complementarities of trade and competition policy, the costs associated with defensive measures could be estimated, increasing the visibility of the impact of such measures on consumers and overall welfare. The situation has been improving recently as a few antidumping cases, for which the user's interests were well represented, have been terminated in the broad interest of the Community.

5.3. Research and innovation policies to focus on young firms and promising sectors

5.3.1. State aid control and its impact on research and innovation policies: a constraint or a matter of priorities?

In Europe, public support for the research and innovation efforts undertaken by private firms is particularly weak. Given the small Community research budget, public R&D expenditure in Europe is overwhelmingly financed at the national and regional level. This asymmetry results in the need to have a framework at European level to regulate R&D subsidies, which prevents Member States from granting a favourable treatment of certain national companies to the detriment of competitors in other Member States. A similar argument holds, with even more force, for other types of aids like investment subsidies or aid for restructuring granted to firms in difficulties.

It has been argued that State aid control places a constraint on Member States' abilities to support research and innovation. The EU is the only block where subsidies are subject to self-imposed regulation: third countries do not formally have a State aid control system. As for international trade rules, the WTO subsidies agreement only prohibits export

[63] These aspects have been analysed in empirical studies. See Messerlin (1990), Konings and Vandenbussche (2002).

[64] Maincent (1995)

subsidies and subsidies contingent upon the use of domestic goods. All other subsidies are permitted, although they remain *actionable*--that is, subject to a WTO dispute settlement panel or countervailing duties. But even if subsidies can lead to imposition of remedies by the WTO if they cause damage, the demonstration of adverse effects is a burdensome operation. The EU state aid rules are "WTO-plus" and place more stringent limits on the possibilities of Member States to support European companies.

Box 8: The Union's State aid regime

Article 87 1 of the TCE enshrines a general prohibition of all forms of aid that, by giving certain firms a favoured treatment to the detriment of other firms or products, distort competition and affect trade between Member States. Article 87 3 contains a number of derogations: the types of aids that are or may be "considered to be compatible with the common market". Such exceptions for which State aid is allowed are mostly justified by the aim to alleviate market failures or by equity considerations. The application of these derogations is clarified in a number of regulations and frameworks adopted by the Commission. A widely recognised market failure is for instance in Research and Development, addressed through the R&D State aid Framework, adopted on the basis of article 87 3 (c). Other derogations include aids for training, venture capital, employment, environmental protection, SME development, or investment in the less favoured regions. In addition, article 87 3 (b) provides another derogation for aid to important projects of common European interest. Subsidies or other forms of support below €100.000 are allowed since they fall under the *de minimis* ceiling and are not considered to be State aid.

However, the main reason behind modest support of private research by Member States seems to be rather a matter of priorities than the result of constraints imposed by State aid rules. This is clearly reflected in the distribution of subsidies. Aid granted by Member States for research and development accounted for only 13% of total aid in 2004, and aid to SMEs 12%[65]. By sector, agriculture (23% of the total) and coal (9%) take the lion's share of Member States' aid. These figures should be treated with caution as they do not include funding for research establishments that do not undertake market activities, including most public spending in universities or public research institutes. Still, they provide reason for concern regarding the allocation of scarce public resources between various economic activities.

Still, notwithstanding the fact that Member States are far from fully exploiting the possibilities offered by the prevailing derogations to the State aid prohibition, notably on research or SME support, there are a number of areas where the State aid regime can inhibit Member States from implementing legitimate support measures.

This is clearly the case for aid to innovation-related activities or investments. With the exception of research, no explicit derogation exists for aid to innovation, not even for small and medium-sized companies. Notably, aid to incubators, young innovative enterprises or to supporting emerging clusters, is not allowed unless it is below the *de minimis* ceiling. To support these types of companies and infrastructures Member States have often had to devise measures in a way that fits one of the existing derogations, even if these respond to different objectives –like SME development or "regional" aid"-- and

[65] State Aid Scoreboard 2005, European Commission. In 2004, the most generously funded horizontal objectives were environment and energy saving (25% of total aid), regional development (investment and employment aid in less favoured regions, 18%), R&D (12%) and SME aid (12%). Aid to specific sectors or ad hoc aid to individual companies, including aid to rescue and restructuring ailing firms, was 24% of the total.

do not always suit the needs of innovation-objectives. Occasionally Member States have also been brought to significantly downsize the scope of foreseen measures in order to get them to comply with the State aid guidelines or frameworks. In the Venture Capital field, the prevailing rules have also proved to be excessively rigid. Well-defined schemes by Member States, aimed to address demonstrated problems by SMEs in raising finance, have only been approved by the Commission after long investigations.

There is also room for reconsidering the application of the Treaty to aids to large-scale, highly innovative and risky projects, notably in the context of public-private partnerships. These projects are at present constrained by the prohibition to provide aid within the limits of the R&D framework rules. Article 87 3 (b) of the Treaty provides a derogation for aid to "important projects of common European interest". However, so far this provision has rarely been applied, and then exclusively to large research or infrastructure projects. The possibilities offered by the derogation of article 87 3 (b) could be further exploited, notably in the context of high-risk large industrial projects with large spillovers and affected by coordination or financial market failures of the type discussed in section 2.

A number of important State aid regulations and frameworks will come up for renewal in 2006. This includes notably the framework for aids to research and development, the guidelines on aids for risk capital or the SME regulation. In addition, in September 2005, the Commission has adopted a consultation document on concrete measures that could be allowed to support innovation. Following the results of the consultation, the new exceptions would be introduced in the revised guidelines and frameworks. This is an important window of opportunity to ease some of the constraints of the prevailing rules that hinder innovation support. In addition, well-designed exceptions at the European level could provide a strong signal to Member States to better target resources to measures that stimulate innovation and enterprise development.

5.3.2. Research policy: in need of focus and commitment

i) Public support for business R&D in Europe is insufficient and dispersed

As a percentage of GDP, publicly financed research in Europe is lower than in the US. But the gap is significantly smaller than for privately-financed R&D, and as far as research conducted by public institutions is concerned –mainly universities and other public research institutes- Europe is actually investing more than the US. In fact the gap in publicly funded research is due to lower government support to the R&D performed by the private sector. While in the US 10% of total business R&D is publicly financed, in the EU only 7.5% is.

But there is a more fundamental difference between the public funding of research and innovation in the EU and that of its main competitors. While in the EU public R&D expenditure comes mostly from the sub-European level --the Framework Research Programme is less than 2% of total European public expenditure in R&D-- in third countries the federal/central budget pays for 85-95% of the total public funding. This is not unrelated to the fact that Europe's public support to research is less focussed and more fragmented than that of major third countries.

On the one hand, the sectoral distribution of public research effort in Europe seems to be far from optimal. Soete (2004) argues that in the EU, policies on R&D, innovation and knowledge have been biased towards strengthening the competitiveness of existing firms, mainly in traditional scale-intensive industries, rather than focusing on growth-enhancing

investments and innovation. This is most remarkable as the market failures that would justify support for research are naturally more present in emerging high-technology sectors where uncertainty and risks are higher.

Country data on government R&D expenditure per sector is scarce but the figures available seem also to point to a stronger focus of the US in rapidly-growing high-technology sectors. Government R&D in the health sector for instance amounted to 0.23% of GDP in the US (with a strong emphasis on life sciences) compared to 0.05 in Europe, for the years 2002 and 2001 respectively[66]. In nanotechnology, until 2002 public R&D expenditure was also much higher in the US than in Europe. Recent data are more encouraging. The sector was identified as a priority area for the 6th Framework Programme, and in 2003, public expenditure on nanotechnology research in Europe was estimated at €1150Mn, compared to €1070Mn in the US[67].

Moreover, it is worth noting however that while in Europe two thirds of public research come from the national and regional levels, the proportion is exactly the reverse in the US where the Federal budget alone provides more than $120 bn in 2005[68].

On the other hand, R&D performed by universities and public research institutes is also considerably fragmented. Even within individual European countries public research establishments are not strongly specialised. The predominant policy in Member States has long been to stimulate competition amongst universities and research centres. This has lead to research duplication even at the national level as different establishments engage in those research fields where public authorities are most inclined to provide funding[69]. When looked at from a European perspective, research in most areas is still inevitably scattered amongst relatively small research teams. This is also reflected in the characteristics of European clusters. As numerous Member States aim to have successful clusters in similar sectors, none can reach the critical mass in terms of number and size of companies, research facilities or specialised university departments.

Research investments by the public and private sector are also insufficiently connected. Public research only gradually seeks to strengthen the links with the needs of private firms. Enterprises, particularly small and medium-sized ones, have difficult access to public research results which rarely find their way to the market.

ii) but increased support to large-scale R&D-intensive initiatives could help

The US federal R&D policy is also marked by large, concentrated and focused technology initiatives[70]. One important feature of these initiatives is the emphasis on the transfer of developed technologies to private industry. This is clearly the case of NASA and the space sector, which despite the apparent lack of commercial use of many space technologies has been strongly focused on transferring results into commercially usable applications. More generally, large public-private partnerships have provided numerous opportunities for academia and industry to integrate new technological developments. Examples include the

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66 OECD Science, Technology and Industry Scoreboard 2003.

67 Source: European Commission Communication "Towards a European Strategy for Nanotechnology" COM(2004) 338

68 In the President's 2007 budget, total Federal R&D investment would amount to $137,2 bn.

69 See also Soete (2004)

70 Debackere and Veugelers (2004).

Hydrogen Fuel Cell and Infrastructure Technologies Initiative, the Broadband Technology Initiative or the above-mentioned Federal efforts in the nanotechnology sector.

These initiatives contrast with the situation in Europe, where research investments are scattered, lack focus on leading-edge technology projects and are not sufficiently geared towards diffusing newly created knowledge to the private sector. It is not surprising that publicly funded research in Europe has a feeble downstream impact on the technological capabilities of European companies.

Because of the radical nature of technological advancements, investments in new sectors are highly risky and can normally only pay-off over the long-term. Against this background, European enterprises need to benefit from more committed and focused public support to research if they are to tackle the challenges and opportunities of new technologies.

In the context of the 7th Framework Research Programme the Commission has proposed to launch a number of Joint Technology Initiatives that involve public-private partnerships in large-scale research programmes. The Commission has identified six strategically and industrially important areas that could be the object of one of these initiatives[71].

Joint Technology Initiatives could become a catalyst for private and public resources to concentrate on a limited number of fields with high potential. At the same time, in rapidly developing new technologies strong commercial "bets" on individual firms or specific development paths have little chances to succeed. Consequently the scope of large Technology Initiatives should be broad enough so that it gives place to experimentation of a variety of applications for diverse markets. This means that they should rather be trans-sectoral in order to bring benefits across various sectors. Section 2 has also emphasised the risk of coordination failures in such large scale R&D project whatever the firm size. Therefore, these projects should also be attentive to fostering spillovers and knowledge transfer to both large and small companies. Ideally they should be limited in time, and most importantly, stimulate competition downstream by enabling various enterprises to develop the market application of new technological findings.

Properly designed large private-public partnerships at the European level could be an effective way to enhance the technological potential of European industry in leading technological areas.

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[71] European Commission Services, "Report on European Technology Platforms and Joint Technology Initiatives: Fostering Public-Private R&D Partnerships to Boost Europe's Industrial Competitiveness", SEC(2005) 800. The six identified areas are: Hydrogen and Fuel Cells, Aeronautics, Innovative medicines, Nanoelectronics, Embedded Computing Systems.

6. CONCLUSIONS

Following Airbus' commercial success and a certain degree of disappointment with the results of fifteen years of horizontal industrial policies, interventionist instincts are making a comeback. Recently, some European governments have been recurrently tinkering with measures directly or indirectly aimed to support national industrial champions.

We argue that, within very specific circumstances, targeted industrial policies are likely to succeed in fostering the growth of national companies. However, these are not suited to strengthen the competitive situation of Europe's industry, particularly in the fast-growing high-technology sectors where it is lagging behind. This is why the various economic policies should be complementary in order to provide a stimulating environment for well-established large firms while encouraging and facilitating the development of young ones in growing sectors.

We have explored the theoretical justifications and empirical evidence behind policies aimed to support industrial champions. Strategic trade and infant industry arguments point out that, in oligopolistic industries, committed Governments can successfully support the development of domestic firms. Clearly such policies are associated with the risk of potential retaliation and can become self-defeating. But in practice, this seems to have rarely been present in the mind of determined industry-minded politicians. *Indirect* public support in the form of massive research subsidies or targeted public procurement can also undoubtedly accelerate the development of national firms. Finally, the market failure literature shows that spillovers, coordination externalities and financial market failures associated with high-risk large-scale projects can occasionally provide an additional justification for public support.

To be sure, governments can also fail, or be misguided by rent-seeking domestic firms when allocating resources. Examples of failed publicly financed large industrial projects abound. But empirical evidence also points to a non-negligible number of successful cases of targeted industrial policies, from the electronic or semiconductor industries of Japan and other East Asian countries, to Europe's aerospace, energy or transport sectors. China's determination to have world-champions seems also to be starting to pay off as its companies gradually take prominent places in Fortune500 rankings.

The likelihood of success in supporting industrial champions seems to be closely linked to certain industry characteristics. For a domestic industry at the technological frontier or in sectors plagued with technological and market uncertainties the risk of making the wrong choices is much higher. Conversely, supporting a domestic industry catch-up towards a foreign technological leader can be a safer option. Even in high-technology sectors, if a *safe path* exists, scale matters, and radical demand or technological changes are unlikely; making the right "bet" may not be so difficult. Airbus is a good example. Large (Boeing) commercial airplanes had already been flying for a long time when European governments took the firm commitment to develop a successful domestic competitor. In an industry with such large economies of scale and a clearly defined target public commitment was everything. The same could apply to producing high-speed trains or, probably, satellites.

But most high-technology industries are of a completely different nature. Companies in the biotech, nanotech or medical devices sectors are constantly faced with new challenges. They must continually readapt and reinvent themselves to respond to sudden, unforeseen

developments. It is harder to tell what the most successful products will look like, not to mention how to get there. Scale also matters, but in many cases the small or medium-sized enterprises, more flexible and reactive, have a better chance of seizing critical markets.

European industry does already have its champions in scale-intensive medium-to-high tech industries. There, European companies rank amongst the world's largest and best performing. Conversely, Europe has a worryingly weak specialisation in the fast-growing emerging sectors and has hardly any world-class companies in these fields. In some cases, champions of traditional industries have succeeded in refocusing into new high growth activities. But newly created companies rarely grow enough to challenge foreign leaders. Europe lacks a new breed of small and medium-sized innovative and fast growing companies. Young European companies in knowledge sectors face numerous hurdles and obstacles hindering their growth opportunities. Fragmented finance markets stand in the way of their growth. They have less access to available knowledge or research support. European clusters and poles of excellence lack the critical size.

The targeted industrial policies that have succeeded in aerospace are not transferable to the new, rapidly changing sectors. Circumstances are different and there are not any large European firms that could be the object of public support. Europe has been traditionally better at strengthening century-old companies than helping the young and innovative to succeed. Public authorities, at all levels of government, have a key role to play, but in a different way. Nokia would not have emerged without committed public support for research, the ICT sector and the Helsinki cluster in particular. Industrial policies in emerging sectors need to ensure a dynamic environment and remove barriers to firms' growth, reinforce the most competitive clusters, promote access to finance for deserving young firms and provide committed and focused support to research and innovation.

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Annex 1 – Distribution of value added by size of firms in manufacturing sectors

Répartition de la valeur ajoutée selon la taille des entreprises (2001)

Total Industrie manufaturière

	EU-25	EU-15	CEE-10
Total (Mn €)	1534510	1450140,9	84368,8
Entre 1 et 9	7,4%	7,6%	3,2%
Entre 10 et 499	50,2%	49,9%	55,8%
Entre 500 et 999	12,4%	12,2%	14,8%
1000 ou plus	30,0%	30,3%	26,2%

Industrie du caoutchouc et des plastiques

	EU-25	EU-15	CEE-10
Total (Mn €)	71451	67091	4360,3
Entre 1 et 9	5,1%	5,0%	6,9%
Entre 10 et 499	64,0%	63,6%	69,6%
Entre 500 et 999	11,0%	11,2%	8,4%
1000 ou plus	19,9%	20,2%	15,2%

Industrie textile et habillement

	EU-25	EU-15	CEE-10
Total (Mn €)	63135	58105,2	5030,1
Entre 1 et 9	12,9%	13,3%	7,7%
Entre 10 et 499	71,2%	72,0%	62,4%
Entre 500 et 999	8,8%	8,4%	13,7%
1000 ou plus	7,1%	6,3%	16,2%

Fab. d'autres produits minéraux non métalliques

	EU-25	EU-15	CEE-10
Total (Mn €)	69227	63534,7	5692,4
Entre 1 et 9	7,1%	7,3%	5,6%
Entre 10 et 499	59,3%	59,2%	59,8%
Entre 500 et 999	14,8%	14,7%	16,1%
1000 ou plus	18,8%	18,8%	18,4%

Industrie du cuir et de la chaussure

	EU-25	EU-15	CEE-10
Total (Mn €)	13569	12691,8	876,9
Entre 1 et 9	17,5%	18,0%	11,6%
Entre 10 et 499	67,5%	67,4%	68,8%
Entre 500 et 999	8,7%	8,6%	11,3%
1000 ou plus	6,2%	6,0%	8,3%

Métallurgie et travail des métaux

	EU-25	EU-15	CEE-10
Total (Mn €)	193895	186376,6	7518
Entre 1 et 9	10,5%	11,8%	21,8%
Entre 10 et 499	63,7%	63,3%	72,2%
Entre 500 et 999	9,0%	8,7%	15,5%
1000 ou plus	16,8%	16,1%	34,2%

Travail du bois et fabrication d'articles en bois

	EU-25	EU-15	CEE-10
Total (Mn €)	32423	29385,9	3036,6
Entre 1 et 9	22,2%	23,0%	14,0%
Entre 10 et 499	66,2%	66,5%	63,3%
Entre 500 et 999	6,5%	6,0%	11,4%
1000 ou plus	5,1%	4,4%	11,3%

Fabrication de machines et équipements

	EU-25	EU-15	CEE-10
Total (Mn €)	167568	161142,1	6425,4
Entre 1 et 9	6,3%	6,3%	5,7%
Entre 10 et 499	58,3%	58,2%	61,0%
Entre 500 et 999	11,5%	11,4%	14,2%
1000 ou plus	24,0%	24,2%	19,1%

Ind. du papier et du carton; édition et imprimerie

	EU-25	EU-15	CEE-10
Total (Mn €)	141076	134704,6	6371,9
Entre 1 et 9	10,2%	10,2%	10,3%
Entre 10 et 499	56,2%	56,1%	60,0%
Entre 500 et 999	14,0%	14,1%	13,0%
1000 ou plus	19,5%	19,7%	16,6%

Fab. d'équipements électriques et électroniques

	EU-25	EU-15	CEE-10
Total (Mn €)	181827	172850,6	8976,9
Entre 1 et 9	6,0%	6,0%	5,8%
Entre 10 et 499	41,7%	41,7%	42,5%
Entre 500 et 999	14,5%	14,3%	19,8%
1000 ou plus	37,8%	38,1%	32,0%

Cokéfaction, raffinage, industries nucléaires

	EU-25	EU-15	CEE-10
Total (Mn €)	27219	25704,3	1514,3
Entre 1 et 9	0,5%	0,5%	0,2%
Entre 10 et 499	17,2%	17,6%	9,2%
Entre 500 et 999	24,8%	25,4%	13,4%
1000 ou plus	57,6%	56,4%	77,3%

Fabrication de matériel de transport

	EU-25	EU-15	CEE-10
Total (Mn €)	168582	161204,3	7377,8
Entre 1 et 9	1,4%	1,4%	1,5%
Entre 10 et 499	18,8%	18,2%	31,8%
Entre 500 et 999	8,5%	8,1%	17,4%
1000 ou plus	71,4%	72,4%	49,4%

Industrie chimique

	EU-25	EU-15	CEE-10
Total (Mn €)	162326	155293,9	7032,3
Entre 1 et 9	1,3%	1,3%	2,2%
Entre 10 et 499	39,1%	39,3%	35,3%
Entre 500 et 999	16,3%	16,4%	14,4%
1000 ou plus	43,2%	43,0%	48,0%

Autres industries manufacturières

	EU-25	EU-15	CEE-10
Total (Mn €)	56902	53343,7	3558,7
Entre 1 et 9	18,2%	18,8%	9,6%
Entre 10 et 499	66,8%	66,8%	68,1%
Entre 500 et 999	8,1%	7,9%	10,6%
1000 ou plus	6,9%	6,5%	11,8%

Source : Eurostat, New Cronos

NB: According to Eurostat, large enterprise refer to companies with more than 250 employees. Here, size classes are based on the analysis of Cohen et Lorenzi (2001.

Annex 2 : 3 top companies – sectoral ranking

Company		**2004 revenues** ($ mn)	**Profits** ($ mn)
Beverages			
Coca-cola	US	21962	4847
Coca-Cola Enterprise	US	18158	596
Anheuser-Busch	US	14934	2240
Food Consumer Products			
Nestlé	Switzerland	69826	5405
Unilever	EU (UK, NL)	49961	2333
Pepsico	US	29261	4212
Food production			
Archer Daniels Midland	US	36151	495
Tyson Foods	US	26441	403
Bunge	US	25168	469
Forest and Paper Products			
International Paper	US	26722	(35)
Weyerhaeuser	US	22665	1283
Georgia-Pacific	US	19876	623
Stora Enso	EU (Fin)	15417	920
Building materials, glass			
Saint-Gobain	EU (F)	39831	1347
Lafarge	EU (F)	17955	1080
CRH	EU (Irl)	15274	948
Chemicals			
BASF	EU (DE)	46687	2342
DOW Chemical	US	40161	2797
Bayer	EU (DE)	37012	750
Pharmaceuticals			
Pfizer	US	52921	11361
Johnson&Johnson	US	47348	8509
GlaxoSmithkline	EU (UK)	37304	8095
Engineering, Construction			
Bouygues	EU (F)	29107	1067
Vinci	EU (F)	25106	910
Halliburton	US	20466	(979)
Industrial and farm equipment			
ThyssenKrupp	EU (DE)	48756	1100
Caterpillar	US	30251	2035
Mitsubishi	Japan	24106	38

Metals			
Arcelor	EU (Lux)	37532	2878
Nippon Steel	Japan	31537	2053
JFE Holdings	Japan	26088	1489

Motor Vehicles and Parts			
General Motors	US	193517	2805
Daimlerchrysler	EU (DE)	176687	3067
Toyota Motor	Japan	172616	10898

Aerospace and Defense			
Boeing	US	52533	1872
EADS	EU (NL)	39503	1281
United Technologies	US	37445	2788

Computer services and software			
Microsoft	US	36835	8168
Electronic Data Systems	US	21033	158
Computer Sciences	US	15849	810

Electronic, Electrical Equipment			
Siemens	EU (DE)	91493	4145
Hitachi	Japan	83994	479
Matsushita ELEC INDL	Japan	81078	544

Network, other communications equipments			
Nokia	EU (Fin)	36401	3989
Motorola	US	35349	1532
Cisco Systems	US	22045	4401

Scientific, photo, control equipment			
Fuji Photo Film	Japan	23516	786
Eastman Kodak	US	13829	556

Semiconductors, other components			
Intel	US	34209	7516
Flextronics	Singapore	15908	340
Onex	Canada	13615	27

Energy			
E.ON	EU (DE)	55652	5397
RWE	EU (DE)	50952	2658
Suez	EU (F)	50670	2244

Source: Fortune (2005)

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