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Article

Industrial policy: a tale of innovators, champions, and B52s

EIB Papers

Provided in Cooperation with:

European Investment Bank (EIB), Luxembourg

Suggested Citation: Riess, Armin; Vålilä, Timo (2006) : Industrial policy: a tale of innovators, champions, and B52s, EIB Papers, ISSN 0257-7755, European Investment Bank (EIB), Luxembourg, Vol. 11, Iss. 1, pp. 10-34

This Version is available at:

<https://hdl.handle.net/10419/44864>

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ABSTRACT

Recognising and discussing the elusiveness of industrial policy as a distinct policy concept, this paper argues against what probably is the most extreme type of so-called ‘vertical’ industrial policy, that is, support for national or European champions. It also critically reviews the rationale for one of the economically most appealing so-called ‘horizontal’ industrial policies, that is, support for research and development. Although not disputing that there is a rationale for such support, we reason that it is not as strong as commonly assumed. In this context, we find that while competition is key for spurring innovation and growth, there is room for industrial policy – interestingly enough, not so much to encourage firms to extend the technological frontier, but to catch up with it. The paper also previews the other contributions to this volume of the EIB Papers.

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Industrial policy: a tale of innovators, champions, and B52s

The trouble with the world is not that people know too little, but that they know so many things that ain't so.

Mark Twain (1835-1910)

1. Introduction

Europe's economy continues to disappoint. Since the start of the new millennium, economic growth in the pre-enlargement European Union (EU-15) has averaged 1.6 percent a year. During the same period, other advanced industrial economies have been steaming ahead vigorously: in the United States, Australia, and New Zealand, for instance, economic growth has averaged 2.6 percent, 3.1 percent, and 3.4 percent, respectively. Europe also performs poorly in terms of total factor productivity. More specifically, over the last decade, productivity in the EU-15 is estimated to have grown at an annual rate of 0.7 percent, while it increased by 1.1 percent a year in the United States – and it has always been higher there to begin with. Productivity is key for ensuring the material wellbeing of Europe's citizens, especially in an era of population ageing. Equally, if not more important are jobs – again a field where Europe performs badly. Unemployment in the EU-15 has remained stubbornly high, currently amounting to some 8 percent of the labour force, and it is especially in industry where jobs disappear without enough new ones emerging elsewhere in the economy. To be clear, a number of EU countries (and regions) are doing nicely: growing fast, innovating steadily, and creating jobs. Alas, this does not apply to the large continental European countries, and without progress there, sustaining prosperity in Europe as a whole will remain elusive.

Europe's policy makers are fully aware of the challenge. In March 2000, the European Council announced the so-called Lisbon strategy, which aims at making the EU the "world's most competitive and dynamic knowledge-based economy, capable of sustaining economic growth with more and better jobs and greater social cohesion" by 2010. To this end, the strategy calls for a variety of actions by Member States, notably measures to promote knowledge creation and innovation and investment in physical and human capital. Halfway into the journey, the Council acknowledged in March 2005 lack of progress in meeting the Lisbon goals, refocused the strategy on growth and employment, and called on Member States to step up their efforts.

There are many reasons for lack of progress towards Lisbon, including too many and conflicting goals (for details see, for instance, High Level Group (2004), Sapir *et al.* (2004), and Pelkmans and Casey (2004)). Perhaps more fundamental: while the actions for achieving the Lisbon goals seem innocuous, they require a variety of reforms (of product and labour markets, for instance), which – although beneficial for society at large – create losers, not only winners. This makes implementing the Lisbon strategy politically risky, a risk well summarised in the famous quip attributed to Jean-Claude Juncker, Prime Minister of Luxembourg: "We all know what we need to do, but we don't know how to win elections after we have done it."¹ But do they really know what to do? Or is it possible, perhaps, that policy makers, like other people, "know so many things that ain't so"?

This paper and the other contributions to this volume of the *EIB Papers* certainly do not intend to answer this question. This would be presumptuous anyway. Rather, the purpose is to find out what is known about the role of industrial policy in creating a dynamic, equitable economy and to what extent misconceptions about the workings of the global economy lead to overly ambitious, if not erroneous, industrial policy propositions.



Armin Riess



Timo Väilä

¹ Financial Times, February 2, 2005.

Depending on how industrial policy is defined, it can achieve a great deal or precious little, or result in a waste of resources.

Before embarking on this task, it is more than useful to clarify upfront that the verdict on what industrial policy can achieve very much depends on what we think industrial policy is. Depending on how one defines industrial policy, or the school of thought one adheres to, it can achieve a great deal or precious little, or result in a waste of resources. The B52s mentioned in the title of this paper refer to a school of thought that sees industrial policy, as defined by this school, in a rather positive light.² Likewise, believers in national or European champions (that is, firms big and strong enough to take on other big players in the global economy) see industrial policy as essential for creating and nourishing them. And then, inventors and innovators seem to merit industrial policy support under all schools of thought. Although this is true, it is also true that some see a need for considerable budgetary support for innovators whereas others argue that getting the fundamentals right suffices to foster innovation.

The remainder of our tale of innovators, champions, and B52s unfolds as follows. Section 2 sets the scene: it highlights the elusiveness of industrial policy and sketches the evolution of state aid, which is perhaps the most visible and easiest to measure industrial policy instrument, though it is not necessarily the most important one. Section 3 previews key findings of the various contributions to this volume of the *EIB Papers*. Section 4 puts the spot on what we have chosen to call the 'beauty' and the 'beast' of industrial policy. The beauty is support for research and development – innovation for short. Promoting innovation is perhaps the industrial policy tool that all schools of thought consider worthy. The justification for it is the perceived failure of the market mechanism to deliver as much innovation as society wants. We admit that we, too, have fallen for the beauty, but we have come to learn that the market is much better at stimulating the creation and diffusion of innovation than we thought. In contrast, we were never fond of the beast of industrial policy, which we consider to be the creation and nourishment of national champions. With this view, we are in good company, as few economists find national champions a useful policy tool in practice, and none of the contributors to this volume comes out strongly in favour of them. Nonetheless, we plan to meet the beast because many policy makers and the wider public seem to find it attractive. Section 5 further develops a theme related to the beauty of industrial policy, namely the effect of competition on innovation and growth. Section 6 concludes.

2. Setting the scene

2.1 Elusiveness of industrial policy

Industrial policy is something of an oddity among the various areas of economic policy. On the one hand, industrial policy is usually considered as just another policy area, on par with monetary, fiscal, competition, trade, and other economic policies. On the other hand, as opposed to those other policy areas, industrial policy lacks a clearly identifiable set of goals, policy instruments, and institutions, such as a legislative framework to delineate the scope for industrial policy or designated public agencies to execute it. In other words, while denoted a 'policy', industrial policy lacks most defining features thereof.

Perhaps as a result of its oddity, industrial policy has never developed into a distinct area of economic analysis and research. For sure, many economic papers and books carry the concept 'industrial policy' in their title. Even the classification system of the Journal of Economic Literature

2 To spill the beans now: the term 'B52s' could be associated with something rather terrifying (bombers), entertaining (the "world's greatest party band"), or intoxicating (cocktails) – and possibly more. Here it simply refers to the classification system used by the economics profession to identify the subject matters of published work in economics.

(JEL), universally used to identify the subject matters of published work in economics, has a code for 'Regulation and industrial policy' (L5), with the sub-codes for 'Industrial policy; sectoral planning methods' (L52) and 'Government promotion of firms' (L53). However, economists using these codes to classify their own work tend to be trade economists, competition specialists, or scholars of the microstructure of markets. To label oneself as an 'industrial policy economist' is unheard of.

The ambiguity of industrial policy as a field of economic policy making and of economic analysis has, of course, not prevented the emergence of rival schools of thought regarding the scope and impact of industrial policy. This volume is a testimony to such rivalries, but it is also a testimony to the seldom-articulated common ground underneath the apparent differences of opinion. In what is to come, we hope to attain at least some convergence not only by including contributions that are non-mainstream in character, but also by including contributions that explicitly seek to identify differences and similarities across the schools.

As it will turn out, it is practical to frame the discussion about the different schools of thought around the labels 'mainstream' and 'non-mainstream'. Mainstream economists writing on industrial policy would likely use the JEL-codes cited above to classify their work, thus including it among the contributions to the neoclassical, industrial organisation literature. Non-mainstream economists, in turn, would more likely use JEL-classification codes like B5 ('Current heterodox approaches') or B52 ('Institutional, Evolutionary').

To narrow down the difference between the rival schools of thought to the choice between L52 and B52 is, of course, excessively crude and unfair (especially to the B52s), so let us take a first, introductory glimpse beyond the codes.

It is fairly easy to delineate the scope and impact of industrial policy according to the mainstream view. For such an intervention to be economically sensible, it has to address a failure of free markets to allocate resources optimally, and the economic benefit from the intervention has to exceed its cost. Prime examples of market failures warranting public 'industrial policy' intervention include spillovers between firms from knowledge creation or location choices, and the coordination of structural change in the capital stock and the labour market. As these examples illustrate, the distinction between industrial policy and more general public sector intervention is somewhat blurred; after all, the criteria are the same for both. Thus, the primary difficulty in analysing industrial policy in a neoclassical set-up is one of identifying how industrial policy differs from other public intervention.

In contrast, the 'non-mainstream' label lumps together a wide variety of fundamentally different approaches. As will be elaborated in this volume, they include everything from 'pragmatic' interpretations of the fundamentally neoclassical new trade and new growth theories to systems-of-innovation (SI) approaches, which focus on the institutional environment for knowledge creation and dissemination. While the former operate within the mainstream optimising framework, the latter reject the notion of optimality altogether, emphasising instead that an economy evolves constantly along a path, and while it is meaningless to talk about an equilibrium or an optimal path, as they do not exist, the public sector does have a role to play in determining the economy's actual development path.

The juxtaposition of the 'pragmatic' and SI approaches is just meant to give a flavour of how different approaches can be hidden behind the JEL-code B52. This diversity makes it meaningless to try to summarise how non-mainstream industrial policy analysis would differ from or be similar to the neoclassical industrial policy analysis. Instead, suffice it to conclude for the time being that

'Mainstream' economists judge industrial policy against the neoclassical notion of optimality. Many 'non-mainstream' economists consider this notion irrelevant.

the starting point for the economic analysis of industrial policy is common to all schools considered: there is a role for the public sector to play in determining the production structure of the economy. Against this starting point, the interesting question then becomes, what are the circumstances under which the public sector should exercise that role, and what it should aim at in so doing.

Having considered a few alternative ways to view industrial policy, it should be obvious that the concept of industrial policy itself is as elusive as the alternative ways to view it. Many authors before us have concluded that there is no universally accepted definition of industrial policy, and simply considering how the contributors to this volume have delineated the concept shows that there might be as many industrial policies as there are contributors.

One way to span the universe of definitions is to consider some of its extreme points. Some contributors would undoubtedly sign off on the JEL-classification code L52 ('Industrial policy; sectoral planning methods') or L53 ('Government promotion of firms'), as their industrial policy is primarily preoccupied with supporting selected individual sectors or firms. Others, including both neoclassical economists concerned about knowledge spillovers and proponents of the SI approach, would define industrial policy in terms of public support for selected economic activities (knowledge creation and dissemination and innovation) rather than specific economic sectors or firms. And yet others see merit in applying the Humpty-Dumpty principle when nailing down industrial policy (see Baldwin and Martin, this volume, for details).

While there is no agreement on what exactly industrial policy is, there is some consensus about what types of industrial policy exist.

While there is thus no universal agreement on what exactly industrial policy is, there is some consensus about what types of industrial policy exist. Thus, it is quite customary to use the concepts of 'horizontal' and 'vertical' industrial policy. Horizontal industrial policy is primarily concerned about supporting selected economic activities, such as innovation, without any selectivity regarding economic sectors. Conversely, vertical industrial policy is primarily concerned about supporting specific economic sectors, such as shipbuilding, coal mining, or aerospace.

One merit of the horizontal-vertical split is that it allows a classification of different types of intervention in a way that is relatively neutral *vis-à-vis* different schools of thought and definitions of industrial policy. Mainstream economists would hardly have a problem if intervention to address knowledge spillovers were called horizontal or if intervention to smooth out structural change in a particular sector were called vertical. Similarly, a proponent of the SI approach would likely accept that innovation support be labelled horizontal.

Although there is some agreement about the concepts of horizontal and vertical industrial policy, some scholars dispute the practicality of that split, arguing that most of the time even horizontal support is, in fact, specific, as not all sectors and firms will end up receiving it. Nevertheless, the split is commonly used and useful as a conceptual benchmark, even when its practical use can be disputed.

2.2 Evolution of state aid

With the horizontal-vertical split in mind, let us now turn to examining the significance of industrial policy in practice. To this end, we use data on state aid from DG-Competition of the European Commission. The data cover national state aid as defined in the EC Treaty. Consequently, state aid refers to a transfer of public resources to grant economic advantage on a selective basis, thereby affecting competition and trade. The data focus on fiscal support, which is easy to measure. Structural policy measures (such as tax, trade, or competition policy), while important as industrial policy instruments, are excluded due to difficulties in quantifying them.

This definition of state aid encompasses aid to agriculture and fisheries; manufacturing and services (to promote both horizontal objectives and vertical, sector- or firm-specific objectives); and regional aid. Horizontal objectives include, for example, research and development (R&D); environment; support for small and medium-sized enterprises; and training aid. Sectors included among the recipients of vertical aid are steel; shipbuilding; other manufacturing; tourism; financial services; media and culture sectors; coal mining; and transport³. Notably, sectoral aid also comprises so-called *ad hoc*, or rescue and restructuring aid extended to individual firms in difficulties. Below, the term vertical aid is used to denote the sum of sectoral, rescue, and restructuring aid.

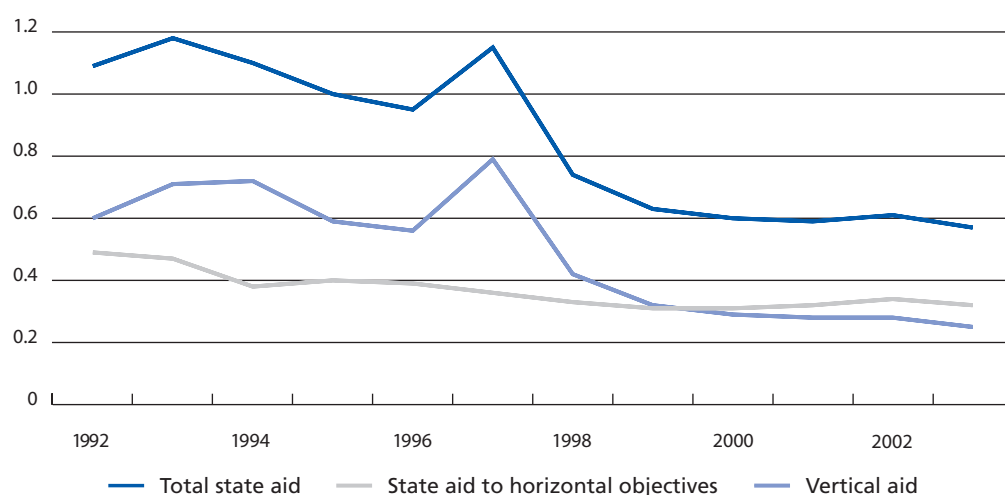
In contrast, aid not covered by the data includes aid to recipients other than enterprises (households, educational institutes, and so on); aid from supranational organisations (such as the EIB); European Commission funds and instruments; and general aid measures (differences in national tax systems or technical standards). Also, national state aid that does not need to be reported to the Commission is excluded.

As shown in Figure 1, state aid has trended down, at least when measured in relation to GDP. Consequently, total state aid has more than halved, from a peak of 1.2 percent of GDP in the early 1990s to 0.6 percent of GDP in recent years. Excluding aid to agriculture, fisheries, and transport would reduce these figures by 0.2 percentage points – a difference that has slowly shrunk. Note that the jump in 1997 is aid from the French government to Crédit Lyonnais, with a smaller contribution from *ad hoc* support to the financial sector in Portugal.

Breaking down total state aid into horizontal and vertical aid, as is also done in Figure 1, suggests two conclusions. First, the downtrend in total aid is due to a downtrend in vertical aid, which has declined from 0.7 percent of GDP in the early 1990s to 0.3 percent in the 2000s. Meanwhile, horizontal aid has remained flatter. Second, the current levels of horizontal and vertical aid are close to identical at about 0.3 percent of GDP.

Total state aid handed out by EU member states has trended down due to a decline in vertical aid.

Figure 1. Horizontal and vertical state aid in the EU-15 (in % of GDP), 1992-2003



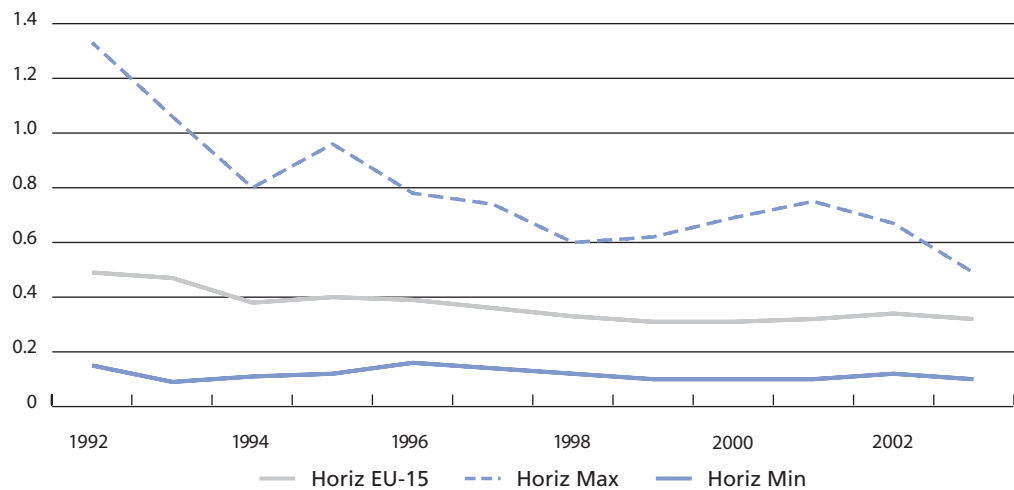
Source: European Commission, DG-Competition.

The stability of horizontal aid at the aggregate level reflects a fairly small degree of variability across countries, as shown in Figure 2, with the bottom line depicting the lowest and the upper line its

³ Transport sector comprises rail, airlines, inland waterways, maritime, and road sectors.

highest level in any individual country among the EU-15. Countries at the upper end of the interval have in recent years included Denmark and Germany (both at or over ½ percent of GDP). At the lower end are the Netherlands, Portugal, and the United Kingdom (all below 0.2 percent of GDP).

Figure 2. Average, highest, lowest horizontal aid in the EU-15 (in % of GDP), 1992-2003



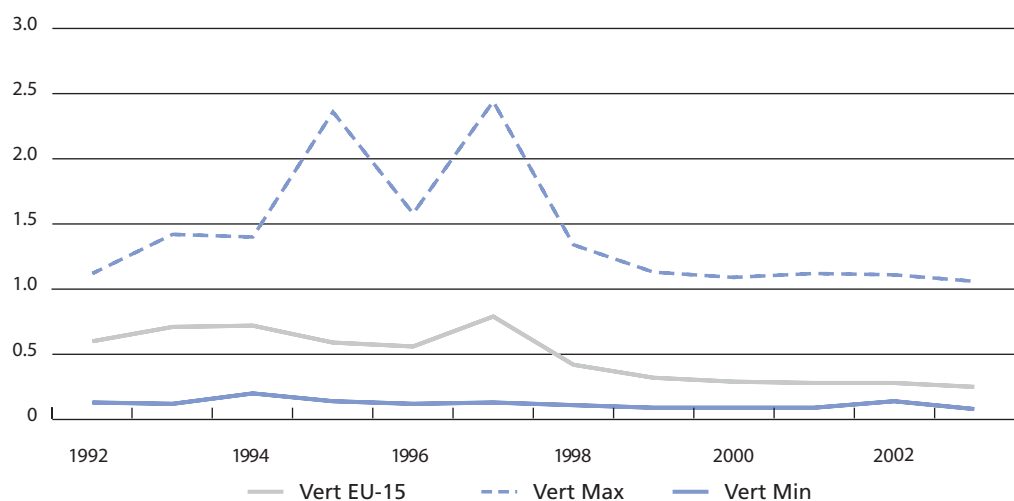
Note: 'Horiz EU-15' denotes average horizontal aid; 'Horiz Max' denotes highest; and 'Horiz Min' denotes lowest among EU-15 countries.

Source: European Commission, DG-Competition.

Vertical aid varies much more across EU countries than horizontal aid.

Vertical aid, in contrast, has varied much more across countries (Figure 3). While the countries with the smallest vertical aid in relation to GDP have kept it at 0.1 percent, countries with the highest vertical aid have constantly extended more than 1 percent of their GDP in such aid. Countries at the upper end of the interval include Portugal and Finland (both over 1 percent of GDP), with aid to agriculture accounting for the bulk of vertical aid in Finland. On the other hand, Belgium, Italy, and the United Kingdom all report vertical support below 0.2 percent of their GDP.

Figure 3. Average, highest, lowest vertical aid in EU-15 (in % of GDP), 1992-2003



Note: 'Vert EU-15' denotes average vertical aid; 'Vert Max' denotes highest; and 'Vert Min' denotes lowest among EU-15 countries.

Source: European Commission, DG-Competition.

The twin peaks in vertical aid shown in Figure 3, reaching 2.5 percent of GDP of the respective countries, represent the Finnish support to its financial sector during the crisis of the early 1990s and the French support to Crédit Lyonnais in 1997 mentioned above.

In sum, while state aid extended by EU-15 has been on a downtrend for the past decade – owing to a downtrend in vertical aid – one should not jump to the conclusion that industrial policy, too, would be declining in importance. We saw that horizontal state aid has remained stable. But going beyond reported state aid, the past year alone has seen a significant number of initiatives by national governments that most observers would classify as vertical industrial policy, including support for national champions, an issue to which we return in Section 4.

The decline in state aid does not necessarily suggest a decline in the importance of industrial policy.

Thus, at least some types of industrial policy are clearly *en vogue*. How the different schools of thought regard different types of industrial policy is, of course, a central theme of this volume. To give a broad idea, let us make a brief tour through the contributions.

3. A guided tour of the contributions to this volume

The contributions to this volume address three broad issues, including the historical background to industrial policy, its conceptual underpinnings, and evidence about its effectiveness. In addition, given our ambition to study industrial policy from a distinctly European perspective, the European Commission's new industrial policy initiative is summarised.

Starting with an analytical overview of the history of industrial policy in Europe, **James Foreman-Peck** identifies several distinct phases in industrial policy over the past century. Following a period of relatively liberal industrial policies in the early years of the 20th century, the inter-war period was characterised by nationalist, interventionist, and autarkic economic policies. After World War II, the combination of high economic growth, expanding world trade in manufacturing goods, and improving public finances all contributed to a steadfast belief in state promotion of industry. This gave rise to state-led *grands projets*, including the development of jet aircraft, nuclear energy, and computers. But this optimistic and proactive view of industrial policy was radically transformed by the oil shocks of the 1970s, followed by a decline of many traditional industries. The oil shocks, subsequent growth retardation, and financial stringencies prompted both privatisation policies and more modest policy aspirations. Summarising both macroeconomic and case study evidence, Foreman-Peck concludes that industrial productivity has gained most from policies creating an environment favourable to competition, notably policies that have encouraged openness to trade and investment.

Olivier Debande considers industrial policy in its historical context, too, but zooms in on the last few decades. This period has been characterised as one of de-industrialisation, with reference to the steadily declining share of manufacturing in total output and employment in many industrialised countries, despite continuing high output growth. This relative de-industrialisation has been driven by a number of supply-side factors, such as improving labour productivity, trade liberalisation, and changing comparative advantage of countries. Demand-side factors have also played a role, with consumption patterns changing as a result of higher incomes and population ageing in advanced countries. Debande quotes empirical studies suggesting that factors internal to advanced economies, notably labour productivity growth and changing consumption patterns, explain as much as 70 percent of the downtrend in European industrial employment. External trade, including with low-wage countries, is less important, although its impact seems to have been strengthening in the past decade. All in all, Debande concludes that de-industrialisation has not been caused by

market failures, so it should not be resisted. However, its transitory negative economic and social impact may well warrant public intervention.

Having put industrial policy in a proper historical perspective, it is opportune to move on to consider its conceptual underpinnings. In an overview presentation covering various schools of thought on this topic, **Elie Cohen** presents the key arguments for and against industrial policy. Highlighting the revival of industrial-policy thinking in an era of globalisation and disenchantment with free trade, Cohen reviews alternative and, in part, competing theoretical foundations of industrial policy: neoclassical foundations, structuralist approaches, and pragmatic approaches inspired by new growth and development theories. One of the main conclusions is that the industrial-policy debate is no longer between advocates of horizontal and vertical policies, but between those who deny any potential for state intervention to make economies more dynamic and those who seek to clarify the specific conditions for appropriate intervention. Another salient conclusion is that the government and the private sector should work together to discover where countries should specialise, as neither has an obvious advantage in picking winners; rather, the key difference between them is the private sector's superior ability to terminate bad projects. In Cohen's view, the role of industrial policy is thus to facilitate technological breakthroughs and the creation of national comparative advantages.

The systems-of-innovation approach offers an alternative to the neoclassical view of industrial policy.

Offering an alternative to the neoclassical view of industrial policy, **Charles Edquist** and **Cristina Chaminade** look at it from the perspective of systems of innovation. They stress that because systems of innovation are evolutionary, an optimal or ideal system of innovation cannot be specified *ex ante*. From a systems-of-innovation perspective, industrial policy should only focus on promoting new activities, serving as a midwife for new innovative activities. Markets and firms perform the least efficiently with regard to new activities, where uncertainty and risks are large. Historically, large-scale and radical technological shifts have rarely taken place without public intervention. Such government support can take many forms, including financing, research facilities, a supportive regulatory environment, and investment in higher education. However, selecting the right set of industrial policy tools remains a challenge for governments, since their relative importance and effectiveness have never been properly determined.

Broadening the perspective from national to international aspects of industrial policy, **Richard Baldwin** and **Philippe Martin** address the question of whether there is a need for coordinating national industrial policies in order to take into account spill-over effects. Using the mainstream toolkit to tackle this issue, they suggest that spillovers from national industrial policies can cause helpful or harmful competition among policy makers and helpful or harmful interactions among the targeted industries. As a result, it is not in general possible to say whether industrial policy coordination is good or bad. However, Baldwin and Martin are convinced that reaching agreement at the EU level on any type of policy is very costly in terms of time and political goodwill. Thus, the contrast between the uncertain benefits of coordination and the surety of the decision-making costs suggests that the EU has no need to set up a new structure for coordinating industrial policy. In the few cases where the merits of coordination are obvious, they will be obvious to all and *ad hoc* cooperation will work.

Continuing in the mainstream line of reasoning, **Timo Völkl** considers industrial policy from the perspective of other economic policies and asks how the interaction between different policy areas affects the scope for economically sensible industrial policy. He assesses the goals of different industrial policies – such as innovation support, horizontal mergers, strategic trade policy, and structural adjustment policies – from the perspective of competition and trade policies, concluding that there is clear scope for conflict between the goals of industrial policy with free domestic

competition and free international trade. Moreover, Vällilä argues that another potential source of conflict between industrial and other policies is the fact that industrial policy does not possess a set of independent policy instruments but has to 'borrow' instruments from fiscal, trade, or competition policies. But using for instance tariffs to achieve industrial policy goals will also compromise free trade. The policy maker will thus have to consider first whether the goals of industrial policy are so valuable as to justify compromising other policy goals. Such trade-offs make industrial policy a particularly fine balancing act.

Andreas Strohm zooms in on the role of EU competition policy as an important complement to, if not substitute for, industrial policy. The European Commission's competition policy has seen quite significant changes over the past years, most notably the reform of merger control and the application of an 'effects-based, economic approach'. The 'economic approach' is being extended to two other areas of competition policy as well, namely to state aid control and to the application of Article 82 (abuse of a dominant position). Strohm reviews the neoclassical underpinnings of the Commission's 'economic approach', and he also points out problems in applying the theory to real-world cases.

Otto Toivanen shifts the focus from concepts to evidence by reviewing the effectiveness of horizontal industrial policies, more specifically R&D subsidies. As a starting point, he suggests that there is plenty of evidence for market failures that motivate public innovation and R&D support. However, the empirical evidence for the effectiveness of such support is generally mixed, partly due to pervasive methodological problems. To cast some further light on possible determinants of the effectiveness of innovation support, Toivanen considers Finland and Norway as case studies. Both have relied extensively on R&D subsidies, but Finland seems to have succeeded while Norway has failed. Different approaches to supporting R&D may account for some of this divergence. Finland's innovation system has been more horizontal in nature, with unsolicited applications and a review process that aims at achieving commercial applications of publicly supported R&D efforts. In Norway, by contrast, public support for innovation has been more vertical, concentrated on selected sectors and firms. This suggests that governments may have difficulty 'betting on the right horse' when concentrating resources to a few technologies whose success is uncertain.

Jordi Gual and **Sandra Jódar** analyse the effectiveness of vertical industrial policy in the EU. They define vertical industrial policy as government support of specific firms or industries ('picking winners' or 'supporting losers') and measure it as state aid granted by Member States to their manufacturing sectors. Gual and Jódar seek to analyse empirically to what extent this government intervention affects the growth of multifactor productivity (MFP) in manufacturing. The analysis is conducted with both sectoral and horizontal aid, since in many cases vertical aid is disguised as aid pursuing horizontal objectives. Controlling for the potential endogeneity of state aid policy, their results suggest that vertical state aid contributes positively to MFP growth. However, including other aspects of public intervention (administrative regulation and employment protection) in the specification lessens the magnitude and significance of the positive effect of vertical state aid on MFP growth, suggesting that a challenge for future work in this area will be to specify and estimate a structural model of vertical state aid.

East Asia has a long history of active industrial policy, some of which brings useful lessons for Europe. For this purpose, **Ha-Joon Chang** discusses the experiences of Japan, South Korea, Taiwan, and Singapore. While all these economies have had active industrial policies, the characteristics of these policies have not been identical. This makes it more difficult to draw strong general conclusions from these experiences, or to speak of a distinct Asian model for industrial policy. Still, there are a few general lessons to be learned. First, state-supported industries have often turned successful only after a very long time of questionable performance. Hence, one must be careful

Finland and Norway have both relied extensively on R&D subsidies, but Finland seems to have succeeded where Norway has failed.

not to make judgements about the effectiveness of industrial policy too quickly. Second, while governments do make mistakes in conducting industrial policy, it is still noteworthy that all the Asian economies with such policies have, at the end of the day, demonstrated impressive growth performances. Third, successful industrial policy has typically been part of an export-oriented strategy rather than one focussing on import substitution. And finally, Chang concludes that several East Asian countries demonstrate that active industrial policy continues to be useful even when they have already reached the technological frontier.

This volume ends with a description of the European Commission's new industrial policy, authored by **Chris Allen, Didier Herbert, and Gert-Jan Koopman**. While manufacturing industry remains a key building block of the European economy, it faces a number of challenges – as well as opportunities – in the form of rapid technological change; increasing trade and financial integration of the world economy; and the rise of new emerging market competitors. Some sectors are performing strongly, but the overall industrial structure of the EU economy makes it less than ideally positioned to face these challenges. The new industrial policy articulated by the Commission is to help the European economy adapt to the new circumstances. In contrast to old policies that sought to pick winners, the new approach starts from the screening of horizontal policies and framework conditions in terms of their implications for specific industrial sectors. Moreover, the Commission has integrated policy by bringing different policy dimensions of key relevance to various industries more closely together. Finally, the new approach attempts to achieve a greater consensus over policy, through the involvement at an early stage of key stakeholders and Member States in policy making.

Against the background of all these contributions, what can one conclude about the scope and effectiveness of industrial policy?

It is an ambition of this volume to bring together various views on the definition, conceptual underpinnings, and effectiveness of industrial policy.

A rather obvious and by no means novel conclusion is that industrial policy is elusive on several accounts. There is a wide variety of views on its definition, conceptual underpinnings, and real-world effectiveness. While it is fairly common to make this observation in the literature, it is rather uncommon to actually bring together the various views in order to examine the key differences between them – one ambition of this volume.

It is, however, difficult to be more precise about the impact of different industrial policies. Horizontal measures, such as R&D support, appear to be beneficial, but not massively so. Vertical measures, such as selective state aid, do not appear as negative as their reputation would have it. The bottom line of the empirical evidence reviewed is that no specific type of industrial policy is a safe bet but, at the same time, one cannot show that some type of industrial policy would be systematically harmful either.

We now turn to two issues where this paper wants to broaden the perspective offered by the contributions reviewed above. One concerns support for national champions and *grands projets*, that is, the vertical industrial policy *par excellence*. The other concerns support for research and development, that is, the horizontal industrial policy *par excellence*.

4. The beauty and the beast of industrial policy

4.1 The beast: support for national champions and grands projets

Diverting from the classic script, let us meet the beast first. Government support, financial or otherwise, for the creation of national champions – boldly called 'European' when they involve

firms from more than one EU country – is perhaps the most extreme vertical industrial policy aimed at picking winners: the support goes to one firm – existing or to be created, from scratch or through mergers and acquisitions. While national champions have always been popular with policy makers and the general public, their charm seems to have increased lately and, ironically, in many cases their goal is to block the formation of European champions.

The push for national champions seems to have increased lately, ironically often with the intention to block the formation of European champions.

This is most obvious in the energy sector. For example, E.ON – a German energy company – has encountered resistance in its attempt to acquire Endesa – Spain’s leading electricity utility, where the government apparently favours a merger of Endesa with Gas Natural, Spain’s biggest gas distributor. Across the border in France, a feared bid by Enel – the biggest Italian electricity firm – for Suez – the French water and electricity utility – seems to have given new impetus to a merger of Suez with Gaz de France. And then, the recently announced though quickly shelved merger between Austria’s oil company OMV and its electricity utility Verbund illustrates that the longing for champions is not the prerogative of big countries, but that small countries want to have them, too.

A run for national champions takes place in other sectors as well. In the pharmaceutical industry, for instance, a prominent case in recent years was the merger, promoted by the French government, of Sanofi-Synthélabo, a French company, with Aventis, a Franco-German firm. In essence, this merger put off a possible marriage between Aventis and Novartis, a Swiss firm. Controversy also surrounded the rescue deal in 2004 for Alstom, a French engineering firm, which effectively obstructed an interest by Siemens, a German competitor, to buy Alstom’s turbine business. The banking sector also had its cases – for instance, the failed attempt to prevent foreign banks from making inroads into Italian banking and recurring calls for the creation of a truly global German bank with Deutsche Bank at its core. Finally, one may mention the desire of Luxembourg and France to see Arcelor, the second largest steel producer in the world, to remain a European champion rather than to be taken over by Mittal, the world’s largest steel maker.

But efforts to form global players are not limited to forging them out of existing companies. There are also ideas about new *grands projets*, as Foreman-Peck (this volume) calls them, to repeat the ‘success’ of European Aeronautic Defence and Space (EADS) in lines of businesses that governments consider promising or of strategic importance. Perhaps the best-known recent venture in this regard is the creation of the Industrial Innovation Agency by France, proposed by Jean-Louis Beffa, chief executive officer of St Gobain, in a report on renewing French industrial policy. The agency is expected to provide grants or loans to around ten industry-led R&D programmes, each aimed at developing new products. In April 2006, the agency launched its first major projects, including Quaero, a Franco-German undertaking to develop an advanced Internet search engine to challenge Google and other non-European companies.

How could one explain the renewed interest in national champions and *grands projets*? Proponents of national champions in the energy sector emphasise the crucial importance of energy in any economy, thereby insinuating that one cannot leave the provision of energy to firms from other EU countries. However, given the large energy dependence of most EU countries on supplies from non-EU countries, it is a mystery why the conversion and distribution of imported energy by a national champion should be safer than the supply of energy by firms from EU partner countries.

More generally, proponents of national champions often argue their case on the basis of strategic trade theory, which is briefly discussed in this volume by Cohen and Väilä. Suffice it to note that, in principle, strategic trade theory supports policies in favour of national champions. However, the information needed for making strategic trade policy a success in practice is formidable, and surveys

suggest that such policy fails more often than it succeeds (Monopolkommission 2004). What is more, possible gains from strategic trade policy are liable to come at the expense of other countries, triggering foreign retaliation that might offset the initial gains of such policy.

But 'strategic' reasons aside, there is the much simpler and more influential belief that countries need national champions to prosper in an environment of mounting global competition. In what follows, we will briefly explain where this belief comes from and why it is wrong, costly, but nonetheless popular. In setting out the argument, we draw on Krugman (1994) and Monopolkommission (2004).

The belief in national champions rests on the fallacy that countries compete with each other in the same way as firms do.

The belief that countries need national champions reflects the view that a country competes with other countries in the same way as a firm competes with other firms.⁴ Arguably, a firm prospers only if it outperforms its competitors and, in fact, its very survival is at risk if it is uncompetitive. It is also true that a country's aggregate output is simply the sum of the production of all its firms. In this logic, then, a country competing with other countries needs internationally competitive firms that succeed in selling their output at home and abroad and, so the logic continues, big national firms surely have a better chance in taking on foreign firms, notably if they are big too. All this seems to be common sense, boiling down to the observation that a country is just a big firm. The trouble is that common sense can be wrong, and here it is.

The analogy between firms and countries is wrong because, in contrast to firms, countries do not compete with each other. Rather, they exchange – or trade – goods and services. To illustrate the difference between competing firms and trading countries, consider the soft drinks Coke and Pepsi. Undoubtedly, Coca-Cola and PepsiCo are competing in the same market and an increase in the sales of Coca-Cola largely comes at the expense of PepsiCo – and *vice versa*. Thus, although the market for soft drinks may grow over time, the competition between the producers is a zero-sum game for them (though not for consumers).

A classical insight of economics – theoretically sound and empirically well tested – is that trade between countries is not a zero-sum game but an exchange that makes all participating countries better off. What is more, the only reason for a country to export is to import from other countries. True, imports might not come from the country's export market or take place at the same time as exports,⁵ but the ultimate rationale for countries to sell goods abroad is to buy goods from abroad. This is in stark contrast to the situation Coca-Cola and PepsiCo are in. PepsiCo is not selling its soft drink to Coca-Cola with a view to buying Coke, and neither is Coca-Cola interested in buying Pepsi.

Another fact demonstrates the fallacy of the firm-country analogy and the notion that countries are just big firms. While countries sell part of their output abroad, most of them – certainly the larger countries – sell the bulk of their output at home. If the firm-country analogy were true, Coca-

4 This belief and the corollary that countries are rivals rather than partners in international trade clearly shine through many statements of European policy makers. To take just one of the most recent examples, here is an excerpt from the speech of President Chirac at the presentation of the Industrial Innovation Agency's projects mentioned above (April 25, 2006): *"Dans un monde où la compétition s'accélère, entre les entreprises, entre les nations, entre les continents, la science et l'innovation sont les clefs du progrès, de la croissance et de l'emploi. ... Les États-Unis et le Japon sont engagés dans une course mondiale à la primauté dans le domaine des nouvelles technologies. Ce grand défi, nous nous sommes mis en situation de le relever avec une politique nouvelle fondée ... avec la capacité d'investir dans des projets de dimension mondiale et hautement technologiques."* Further on in his speech, President Chirac expressed concerns that *"La Chine aura demain un million de chercheurs: cinq fois plus que la France."* (http://www.ambafrance-uk.org/article.php3?id_article=7147)

5 In addition to trade in goods and services there is then the acquisition of financial claims (liabilities) by net exporters (importers).

Cola and PepsiCo would each have to sell the bulk of their output to their own employees, which obviously they do not. Besides, uncompetitive firms will go out of business, countries never do.

The erroneous belief that countries, like firms, compete with each other would be harmless if it did not lead to costly policies aimed at helping specific firms or industries to compete internationally. Support for national champions or *grands projets*, for instance, might crowd out productivity-enhancing government spending – on education for example. Even when not absorbing public resources, public support for national champions is not costless.

Consider, for instance, government approval of a merger between two firms aimed at creating a global player. While this merger may enhance the international competitiveness of the enlarged firm, it is liable to reduce competition in the domestic market, possibly leading to higher prices. Not only does this hurt consumers, it also weakens the international competitiveness of firms for which the output of the national champion is an input. The German Monopolies Commission has stressed this adverse impact on the domestic economy in the context of the 2002 merger between E.ON and Ruhrgas (Monopolkommission 2004). The German Cartel Office ruled against this merger, the Monopolies Commission argued against it too, but the German government approved it nonetheless on the grounds that it would strengthen the security of energy supply while not hampering competition in the gas market.⁶

But why, then, has the belief in national champions gained so much currency given that they do not strengthen a country's competitiveness (an erroneous concept in the first place) and, worse, might undermine its productivity? One reason is that policy makers may truly believe in the merits of national champions, a belief reinforced through their interaction with businessmen, who have a natural inclination to think of a country as a big firm. But even if policy makers do not believe in national champions, they might consider support for them a politically expedient way of showing concern for the wellbeing of a society that perceives itself in competition with others. To the extent that national champions grow, create or maintain jobs, and take over foreign competitors, reality even seems to vindicate support for champions – at least as long as the economic costs discussed above remain out of sight. Likewise, even businessmen cognisant of the difference between competing firms and trading countries may have a vested interest in lobbying for support in favour of national champions. What is truly remarkable about the false firm-country analogy and its mercantilist implication is that Adam Smith and David Ricardo debunked it as economically illiterate some 200 years ago. That the fallacy lives on so vigorously clearly shows that economists have failed in explaining it well.

To conclude, support for national champions and *grands projets* is unlikely to raise living standards of European citizens and, in fact, considering the opportunity cost of such support, it is liable to be welfare reducing. Therefore, unlike in Leprince de Beaumont's *La belle et la bête*, the beast considered here remains wild and treacherous to the end of the story. That policy makers, businessmen, and a wider public often view them as key to the success of a nation rests on the mistaken belief that countries engage in a competitive race in which innovation, productivity growth, and employment of one country come at the expense of other countries. There are concerns that other countries, notably in the developing world, are beginning to succeed in producing talented people and sophisticated products. But there is no reason to worry about smart people and economic progress

The false belief that countries, like firms, compete with each other would be harmless if it did not lead to costly policies aimed at helping specific firms or industries to compete internationally.

⁶ The Monopolies Commission also discusses calls for a merger between German banks to create a 'strong' German bank. Government-sponsored mergers in banking are of greater concern than in other sectors since the economic costs of such mergers are likely to go beyond adverse effects on domestic competition. In general, there is a risk that national banking champions are perceived as 'too big to fail'. But when they emerge with a little help from the state, 'moral hazard' possibly resulting from the too-big-to-fail perception is bound to rise.

elsewhere in the world. On the contrary, while it will require EU countries to adjust, it will raise the demand for European products given that the only reason to export is to import.

The wording of the Lisbon strategy, that is, to make Europe the most 'competitive' economy in the world, might have led policy makers astray.

It seems that the wording of the Lisbon strategy, that is, to make Europe the most competitive economy in the world, has led policy makers astray.⁷ But the Lisbon objective can be interpreted in a meaningful way. From a policy perspective, the only thing that really matters is domestic productivity – not productivity relative to other countries. Raising productivity and employment can be achieved through a combination of measures such as product and labour market reforms and policies that remove obstacles to investment in physical and human capital. In addition, creating an environment conducive to research and development promises to be productivity enhancing. This takes us to industrial policy's apparent beauty.

4.2 The beauty: support for research and development

The contributions to this volume leave no doubt that some economists are more sympathetic to industrial policy than others. There is one type of industrial policy, however, that even sceptics consider favourably: support for R&D, provided it addresses and mitigates failure of the market to bring about the socially optimal level of innovation, new knowledge, or new technology.⁸ Leaving aside the important question of whether governments can mitigate this market failure (a question discussed in this volume by Toivanen and Väilä), let us critically review how much of a failure there really is. Our sketch follows Baumol (2002).

Concerns that markets fail in delivering the optimal level of innovation rest on various arguments. To begin with, it is argued that the fruits of innovation cannot be fully captured by the innovator but spill over to the economy at large, including competitors of the innovator. While the spillovers themselves are welfare enhancing, the innovator is not rewarded for creating them, implying that he underinvests in research compared to a situation where he would be rewarded for such spillovers. In these circumstances, the purpose of public R&D support is to raise innovators' return on R&D spending and thereby get such spending closer to its social optimum.

Second, the case is made that proprietors of innovations (i.e., the innovators) deny the use of their innovations to others, notably competitors. As a result, new knowledge does not disseminate through the economy as much as it could. And as there is no rivalry in the use of new knowledge, societies would certainly gain if it spread freely. As Cohen (this volume) observes, the market provides insufficient incentives not only for the creation but also the dissemination of new technology – a shortcoming an incentive-creating industrial policy tries to address.

Third, even if innovators make their technologies available to others – through licensing, for instance – they might overcharge other firms for using them, again causing a sub-optimal level of knowledge dissemination. But it is also possible that the license fee an innovator could possibly fetch is too low, thus providing too little incentive to license the technology.

Fourth, inefficiencies are suspected to arise if R&D is a 'winner-takes-all' innovation and patent race. To elaborate, suppose a number of firms pursue similar lines of research that result in the same product or process innovation. But obviously one firm gets there first, or at least is first in

⁷ Note the title of Krugman (1994): "Competitiveness – a dangerous obsession."

⁸ Strictly speaking, one should distinguish between invention (that is, the act of finding something new or better) and innovation (that is, the act of bringing inventions to the market or improving existing products and production processes). For the issues discussed here, the distinction is not crucial, and we thus use the terms invention, innovation, new knowledge, and new technology interchangeably.

getting a patent for the innovation. The efforts of the runners-up then turn out to have been in vain. This creates two problems: for one thing, since firms know that they may finish the race empty handed, they have too little incentive to spend on R&D; for another, with hindsight, the spending of the runners-up has been wasteful. Overall, the winner-takes-all view suggests that markets left to themselves result in too little R&D spending by individual firms but nonetheless excessive spending by the economy as a whole.

Fifth, an innovation possibly destroys the market value of existing products and processes. This possibility could distort incentives for innovation in different ways. For instance, the proprietors of current technologies may be reluctant to spend on R&D because the profit that R&D spending could generate would merely replace the profit associated with the use of current technologies. Of course, there are potential innovators other than the proprietors of current technologies, and their incentive to engage in R&D is not weakened by the effect that their innovation may have on current-technology owners. However, if firms see innovation as resulting in only a temporary lead over competitors, they may consider R&D futile and devote fewer resources to it than socially optimal. In sum, the possibility that profits from innovating are dissipated quickly may undermine incentives to innovate in the first place.

How compelling are these market-failure arguments? Let us look in one go at the first and second, that is, the observation that markets provide insufficient incentives for the creation (first argument) and diffusion (second argument) of new technology.

Market-failure arguments in favour of R&D support are not as compelling as commonly presumed.

The problem of insufficient incentives to develop new technologies is partly solved through the granting of patents, which give innovators a temporary monopoly for their innovations. The incentive problem is only partly solved because, in practice, patents give the innovator primarily the right to litigate over patent infringements rather than a guarantee for the exclusive use of his innovation. Another reason why patents only partly mitigate the incentive problem is their temporary nature. Obviously, the longer the life of the patent, the larger the incentive to innovate. But the longer the life of the patent, the slower the dissemination of new knowledge. There then seems to be a trade-off between increasing incentives to innovate and fostering the dissemination of new knowledge. Or – to put it differently – the more effective patenting is in reducing the first market failure (sub-optimal innovation), the more relevant seems to become the second one (sub-optimal dissemination of knowledge). On closer inspection, however, it turns out that the market itself contributes to relaxing this trade-off. This is largely for two reasons.

First, the proprietary right to an innovation is an asset the innovator can license to others, including competitors. Loosely speaking, licensing can be worthwhile for the innovator and licensees if the value of this asset to the innovator is smaller than its value to licensees.⁹ More specifically, for an innovator, licensing is profitable as long as the license fee exceeds the value of the innovation when used by him.¹⁰ For other firms, acquiring technology licenses is profitable as long as the license fee is lower than the value of the innovation when used by them. To illustrate, suppose an inventor of a new production technology (e.g., a new technique for manufacturing computer chips) is less efficient in using this technology than his competitors. Competitors are then able to generate a higher profit, by using the new technology, than the innovator could and there is, thus, scope

⁹ In sectors where technology changes fast (in information technologies, for instance), innovators may license their technology to other firms irrespective of what is discussed here because by the time other firms can use this technology it may not be state of the art any longer.

¹⁰ To be a little more precise here, as the licensing decision is not binary (i.e., to license or not to license), the comparison to be made is between the license fee and the marginal value to the innovator of using new knowledge himself. All other things being equal, this value declines with an increase in the use of this knowledge by other firms.

for a mutually beneficial transfer of technology from the innovator to his competitors. Licensing would thus foster the dissemination of new knowledge and, perhaps more important, channel new technologies to those firms in the economy that can make best use of them. And then, the fact that innovators might find it more profitable to exclusively let others use their innovation gives rise to firms that specialise in the creation and licensing of technologies. Obviously, the incentive for such firms to come up with something new is considerable, as they will go out of business if they do not.

The second reason why markets contribute to relaxing the trade-off between knowledge creation and knowledge dissemination is that it is profitable for firms to establish joint ventures in research and to create and exchange technologies in the framework of technology-exchange consortia. The motivation for doing this is twofold. For one thing, firms sharing knowledge might stand a better chance of discovering new products and processes than firms struggling alone. For another, joint ventures and technology-exchange consortia can be seen as arrangements that insure participating firms against the risk of missing out on an innovation that will give its owner competitive superiority.

Technology licensing, sharing, and exchange are profit-seeking business activities that help in bringing about an optimal level and allocation of innovation.

In sum, technology licensing, sharing, and exchange are profit-seeking business activities that help in bringing about an optimal level and allocation of innovation. Thus, market failures in the creation and diffusion of innovation might not be as serious as commonly presumed. That said, it remains unclear how close technology licensing and sharing get the economy to the state of bliss. A key issue here is the pricing of technology transfers – in cash, in the case of licensing, or in kind, in the case of technology-sharing consortia. This takes us to the third market-failure argument, namely that license fees could be too low, thereby stifling knowledge creation, or too high, thereby hindering knowledge dissemination.¹¹

In shedding light on this issue, two questions need to be answered. First, is there an efficient price for licensing new knowledge, that is, a price that provides the right incentives to innovate and allocate the innovation to different firms so that each firm contributes optimally to the production of goods using the innovation? Second, does the market mechanism lead to such a price?

The answer to the first question is affirmative. In setting out why, Baumol (2002) draws on the so-called efficient-component-pricing rule (ECPR), which helps determine efficient access prices for natural-monopoly bottlenecks in network industries (see, for instance, Laffont and Tirole (2000) and Baumol and Sidak (1995)). The rationale for drawing on this rule is straightforward: a patented innovation is a monopoly-bottleneck input in the production of other goods – just like tracks, pipelines, and transmission lines are in the provision of rail transport services, gas, and electricity, respectively. In network industries, ECPR-based access prices ensure the right incentives for investments in the network (tracks, pipes, and lines) and an optimal output of each final-good producer, which might include the owner of the network. In technology markets, ECPR-based license fees provide the right incentives to innovate and bring about the optimal output of each final-good producer, which might include the innovator.

There is also a fair chance, though no guarantee, that the market mechanism results in license fees not too far away from their efficient level. Suffice it to give an intuitive explanation. Licensing at the ECPR fee generates an extra profit for the innovator and licensees, or at least does not make them worse off than without licensing. In principle, the innovator could further increase his profit

¹¹ We skip pricing issues in the case of technology-exchange consortia and a discussion of why members of such consortia have strong incentives to comply with its agreement (see Baumol 2002, Chapter 7).

by raising the license fee above the ECPR level. But raising it too much drives out potential licensees, thereby destroying a profit opportunity. Likewise, in principle, licensees could further increase their profits by trying to push down the license fee below the ECPR level. But at too low a license fee, the innovator decides not to license, leaving potential licensees with no extra profit at all. In fact, the ECPR sets a price floor at which the innovator gains as much from licensing as from using his innovation; at a lower fee, it is not profitable for him to licence; hence, the ECPR fee is the lowest fee that could result from voluntary negotiations between innovators and potential licensees.

Therefore, concerns that the market mechanism might result in license fees too low to provide sufficient incentives for innovators are unwarranted. It is possible, however, that fees are too high, thus preventing an efficient dissemination and allocation of innovation to different uses and users. An outright refusal of an innovator to license can be considered an extreme version of an excessive license fee. Clearly, innovators asking for excessive license fees would act against their best long-term interest – an outcome we would not expect if innovators act rationally. But do they?

A look at the market for technology provides some hints. Arora *et al.* (2001) and Baumol (2002) describe the growing importance of markets for technology and their drivers. Specifically, there is evidence for an increase in intra-industry technology flows (i.e., 'horizontal' transactions – in cash or in kind – between competing firms) and a division of innovative labour (i.e., 'vertical' transactions between firms not competing with each other).¹² Interestingly enough, the supply of innovation comes not only from small firms but from big ones, too. Small firms often lack downstream financing, manufacturing, and marketing capabilities and, thus, licensing knowledge to firms that can make more out of it is especially profitable for small firms. In fact, there is evidence that small innovative firms with limited downstream capabilities evolve into providers of general-purpose technologies, i.e., technologies serving as inputs into a variety of applications. In fact, suppliers of general-purpose technology are not new on the scene. Noteworthy is the emergence of specialised chemical engineering firms in the 1950s and, more recently, biotechnology firms specialising in the development of general-purpose tools for a variety of applications in the pharmaceutical industry. That large firms, which have the capacity to turn their inventions into marketable products or processes, trade their technologies as well suggests that the positive revenue effect of licensing often outweighs its negative rent dissipation effect even for big firms. Indeed, the emergence of firms specialising in the supply of general-purpose technologies seems to force big, established producers that use such technologies as inputs to license their own technologies, too, rather than – as conventional wisdom suggests – treat them as 'family jewels'. All this being said, Arora *et al.* (2001) also point to surveys showing that many firms fail to see the virtue of marketing their technologies. Moreover, one of the authors' overall conclusions is that despite the growing importance of markets for technology, one should not expect external technology flows to largely replace the in-house creation and use of new knowledge.

Evidence suggests a growing importance of markets for technology, but they will not replace the in-house creation and use of new knowledge.

A variety of policy measures could enhance the efficiency of technology transfers and thus the diffusion of new knowledge (for details see Arora *et al.* 2001). Many of them relate to the protection of intellectual property rights, but there are also competition policy responses that we will sketch when discussing the link between competition, innovation, and growth in the next section. But for now, we continue our critical review of market failures commonly invoked to justify government support for innovation, and we turn to the 'winner-takes-all' argument.

¹² As to the exchange of technologies between competing firms, Baumol (2002) fittingly quotes from an advertisement by Novell in The Economist of September 21, 1991: "Conventional business wisdom says: Never let the competition know what you're doing. But at Novell, we believe the secret of success is to share your secrets. So we established the Novell Labs program to openly share our networking software technology with other companies."

Arguably, there have been inventions where the winner has taken all. Baumol (2002) reminds us of Alexander Graham Bell who defeated his rival, Elisha Gray, in the invention of the telephone by a few hours. But this example also indicates that the winner-takes-all problem is especially relevant for homogenous inventions, which are perfect substitutes. While Bell's and Gray's devices for transmitting speech electrically might have been perfect substitutes, this can hardly be said of many of today's inventions, or modifications to them – the variety of gadgets incorporated in modern telephony equipment being a good example. More generally, there is reason to believe that research efforts aimed at very similar goals lead to similar but not identical inventions. There is thus scope for product (or process) differentiation that exploits differences in users' taste or willingness to pay. The long and short of all this is: the race for discovering and marketing something new offers many prizes, not just one, and worries about too little R&D spending by individual firms are perhaps not as justified as they appear at first glance.

What, then, about concerns that, in aggregate, firms spend too much on R&D in cases where the winner takes all? It is true that there will be duplication of research effort. But whether this is wasteful from society's viewpoint is not clear because it increases the probability that firms will make privately and socially profitable discoveries.

We finally get to scrutinise the fifth market-failure argument, namely that fear of rapidly dissipating rents from new knowledge undermines incentives to innovate. The implicit assumption here is that firms succeed in the marketplace as nicely without as with innovations. While this may be so in some markets, it is not at all typical for the majority of them. On the contrary, in free markets and with increasing global competition among firms, discovering new products and processes – thereby gaining a competitive edge, if only temporarily – “becomes mandatory, a life-and-death matter for the firm” (Baumol 2002, p. 1). To escape death and competition, at least for a while, firms need to continuously invest in research and development and, in fact, make such investment a routine feature of their business strategy. Interestingly enough, the pressure to discover or go under seems to be particularly high in oligopolistic industries – that is, industries often perceived by layfolk as cosy settings in which firms collude to make profits at the expense of consumers.

Markets seem to be quite innovative in overcoming their own failures.

What shall we then take away from our review of market failures in the creation and diffusion of innovation? It is probably fair to conclude that support for innovation remains the beauty of industrial policy – though she might not be as stunning as often claimed. The market failures that there may be are perhaps not as grave as often feared. Indeed, economic reasoning and empirical evidence suggest that markets are quite innovative in trying to overcome their own failures. With reason, the title of Baumol's book is: “The free-market innovation machine”. In the next section, we will examine whether this machine always spurs innovation and growth, under which circumstances it might not, and what this all means for industrial policy.

5. Competition, innovation, and growth

If competition makes innovating a matter of life-and-death for the firm, as put forward in the previous section, the path to prosperity is fairly clear: keep firms sufficiently exposed to competition, and innovation and growth will fall into place! Although this Darwinian view of welfare creation is compelling, things are obviously more complex. Output in many countries grew rapidly when they pursued more protectionist and interventionist economic policies than today. This applies, for instance, to Latin America in the 1960s, Southeast Asia and Japan until the mid-1990s, and Europe until the early 1980s (Aghion and Griffith 2005). Of course, economic growth depends on factors other than competition – the level of output, saving and investment, and growth of the labour

force, for instance. Moreover, even without innovating, countries can grow rapidly by adapting and imitating technologies of more advanced countries. Still, is it not possible that competition while fostering innovation and growth in some circumstances might stifle it in others? What is more, when less competition is better than more, is there a rationale for industrial policy to promote innovation and growth?

The purpose of this section is to shed some light on these questions. Our sketch is an incredibly short synopsis of Aghion and Griffith (2005), which itself is a summary of the theoretical and empirical literature on the link between competition, innovation, and growth – a literature to which both authors have contributed (as co-authors) sixteen papers over the last decade or so. We will proceed in two steps: we will take a brief look at various factors that determine the degree of competition and then describe structural features of an economy and their role in influencing the impact of competition on innovation and growth.

The degree of competition in an economy depends on a variety of aspects. For our purpose, it is convenient to arrange them in two groups: one comprises factors that shape what the literature has labelled ‘product market competition’; the other includes factors that influence how fast the competitive edge of an innovator erodes.

Factors determining the degree of product market competition include: policies that protect firms against domestic or foreign competitors, state control of businesses, legal and administrative barriers to entrepreneurship, market behaviour regulations (such as shop closing hours, warranty regulation, and advertising regulation), impediments to market exit and entry (other than those resulting from policies and regulations mentioned so far), market concentration, pricing power of firms, and so on. An increase in product market competition is expected to result, for instance, from removing administrative barriers to competition, opening up domestic markets to the entry of foreign firms and products, and antitrust measures that succeed in reducing market concentration and pricing power of firms.

Factors determining the speed with which the competitive edge of an innovator erodes largely reflect laws governing the use of intellectual property such as patents, copyrights, trademarks, and so on. All other things being equal, competition is the less intense, the more generous the protection of intellectual property rights – patent protection for short – and *vice versa*. In fact, patent protection essentially grants a time-limited monopoly to the innovator and, thus, lowers the degree of competition.

To condense the typology pertaining to the degree of competition: competition rises (falls) as a result of measures that strengthen (weaken) product market competition or weaken (strengthen) patent protection. Note that real-world competition policy usually combines measures aimed at enhancing product market competition (e.g., through antitrust and removal of barriers to foreign entry) with competition-reducing patent protection. We will see soon why the co-existence of apparently contradictory policy measures could make sense.

Competition rises as a result of measures that strengthen product market competition or weaken patent protection.

Let us then take the second step. Implicit in the life-and-death argument of innovation is that firms innovate to escape their competitors. One of the insights from Aghion and Griffith (2005) is that the strength of the escape-competition motivation depends on certain structural features of the economy in question. In fact, in some circumstances, the escape-competition motivation might be very weak or non-existent. In what follows, we describe three such features, and for each of them, we outline how it affects the competition-innovation-growth nexus.

The impact of competition on innovation depends on the type of firm, whether or not firms in an industry are technologically similar, and on the economy-wide importance of industries with technologically similar firms.

The first structural feature is the relative importance of two types of firms in an economy: profit-maximising firms and 'satisficing' firms. The meaning of profit maximising is self-explanatory, and it is reasonable to assume that an economy comprises largely profit-maximisers if firms are managed by their owners or if owners succeed in making firm managers act in the profit-maximising interest of owners. By contrast, in satisficing firms, managers do not act in the profit-maximising interest of owners, but simply try to meet a minimum profit target, avoid bankruptcy, and otherwise have a reasonably quiet life.¹³ Managers are the more likely to be satisficing rather than profit maximising, the less control owners have over managers.

What, then, does the distinction between profit-maximising and satisficing firms imply for the role of competition in spurring innovation and growth? The theoretical models reviewed in Aghion and Griffith (2005) predict that growing competitive pressure discourages innovation by profit-maximising firms while encouraging innovation by satisficing firms.¹⁴ The intuition behind this hypothesis is as follows: competition reduces the rents from innovating; this makes innovation less profitable for profit-maximising firms; for satisficing firms, however, growing competition increases the risk of bankruptcy and an end to the quiet life of satisficing managers; to counteract this risk, they need to become more innovative. The empirical evidence suggests a positive link between competition and the efficiency of satisficing firms; competition thus reduces slack. However, there is only weak evidence that competition fosters innovation by satisficing firms. In any case, even if it did, this would stimulate overall economic growth only if the economy largely consisted of satisficing firms. It is probably fair to surmise that this is so in the large continental European countries, implying that, on the Continent, enhanced competition would raise efficiency and, possibly, innovation and growth.

The second structural feature with a bearing on how competition affects innovation and growth is the technological similarity (or dissimilarity) of firms. To elaborate, firms in an industry can be at roughly the same level of technological development, or there can be large gaps between leading and lagging firms. If firms are similar, an increase in product market competition tends to foster innovation and growth. By contrast, if there is great variety in firms' technological development, an increase in product market competition is detrimental to innovation and growth.

It is beyond the scope of this paper to detail the logic behind this hypothesis¹⁵, but here is the gist of it, which is easiest to explain for a closed economy. To recall, innovation is a means to escape competition. For each firm in an industry, the incentive to use this escape route is the higher, the more it feels its competitors breathing down its neck, which is rather likely if firms in that industry are technologically similar. In contrast, in an industry with large technological gaps between leaders and laggards, there is less need for leaders to innovate and, thereby, escape competition, because they are comfortably ahead anyway. More important, increasing product market competition stifles the incentive for technologically backward firms to invest in research and development. The reasons are as follows. Faced with a decline in innovation rents following from increased competition, backward firms reckon that it is not worth trying to close the technological gap with domestic front-runners, a gap that backward firms might consider insurmountable anyway. What is more, growing competition increases the probability of backward firms going out of business and, thus, reduces the expected return on R&D spending. Overall, in industries with large gaps between technologically leading and lagging firms, and in countries with a large share of such industries,

¹³ The concept of satisficing firms, more precisely: satisficing managers, was introduced by Hart (1983).

¹⁴ More specifically, theory predicts that (i) strengthening product market competition encourages (discourages) innovation by satisficing (profit-maximising) firms and (ii) weakening competition through better patent protection discourages (encourages) innovation by satisficing (profit-maximising) firms.

¹⁵ For details, see Chapter 3 of Aghion and Griffith (2005).

more competition does not entice leading firms to innovate more, but it might cause backward firms to innovate less and resign to supplying products that are not state of the art, but for which there might be nonetheless demand at lower prices.

Empirical studies support the hypothesis that product market competition fosters innovation and growth in technologically homogeneous industries, but stifles it in heterogeneous industries. The policy implications of this are twofold. First, enhancing product market competition in industries with similarly well-advanced firms promises to foster innovation and growth. The stimulus can be increased through appropriate patent protection. The latter would also help mitigate the possibly negative impact of product market competition on innovation in industries with technologically diverse firms. Second, there is a rationale for industrial policies aimed at helping laggards to upgrade technologically as this would lead to more industries that respond positively to stronger product market competition.

Let us finally turn to the third structural feature that affects the workings of competition on innovation and growth, namely the distance of a country (and its firms) from the world technological leader. As this global benchmark suggests, we now consider the exposure of domestic firms to foreign competition. More specifically, the question is how liberalising foreign entry affects innovation and growth. Again, the escape-competition motivation to innovate takes centre stage, with innovation by domestic firms now being a means to escape foreign competitors or to foil their plans to enter the domestic market.

The hypothesis is that foreign entry, or the threat of entry, stimulates innovation in countries that are close to the world technological leader – the frontier for short. Being close to the frontier themselves, domestic firms reckon that while growing foreign competition tends to reduce innovation rents, innovating is nonetheless the best response as they stand a chance to leap ahead and escape their foreign competitors. What is more, not innovating would be penalised by the market. The response of firms far from the frontier is likely to be very different, however. For them, innovating with a view to escaping foreign competition seems futile given the far bigger technological gap they would have to close. Even worse, anticipating bankruptcy after stronger foreign competitors have entered the domestic market, technologically lagging firms might innovate less than they would have without the threat of foreign entry. In sum, economic reasoning suggests that increasing openness to foreign competitors boosts innovation in advanced domestic firms and dampens it in lagging firms. This also implies that lowering barriers to entry promises to spur innovation and growth in countries close to the technological frontier, while it might have a negative impact on countries far from the frontier.

Empirical studies corroborate this hypothesis. They show a significant effect of reducing barriers to foreign entry on overall productivity growth of the liberalising economy. The positive effect has been found to be especially large for firms and industries already close to the technological frontier. With increasing distance from the frontier, the effect dwindles and, in fact, might become negative for firms and industries far below the frontier. In sum, the closer countries are to the frontier, the more they have to gain from reducing barriers to foreign entry, but even when a country benefits overall, there will be losers and not only winners.

In addition to the obvious policy lesson that countries close to the technological frontier have a lot to gain from keeping their firms exposed to foreign entry, it seems opportune to support the technological upgrading of lagging firms and industries – not only to minimise the number of losers, but also to maximise the overall positive impact of liberalising on innovation and growth.

Industrial policy aimed at helping backward firms to upgrade technologically could strengthen the positive impact of competition on innovation and economic growth.

The stimulus of foreign entry on innovation might vary across the EU, and the need for technological upgrading, aimed at enhancing the positive impact of competition on innovation, is larger in the least advanced countries of the EU.

Moreover, there is a normative implication that links the case in favour of enhancing competition through open markets with the discussion of national champions and markets for technology of the previous section. In that section, we have stressed that the emergence of firms specialising in the supply of general-purpose technologies is instrumental for creating and disseminating new knowledge. In their study on markets for technology, Arora *et al.* (2001, p.166) note that “the ‘closed’ domestic markets of many European countries often feature only few large producers, especially in basic industries (e.g., the so-called national champions)” and they go on to emphasise that this hinders the creation and efficient utilisation of such technologies.

The role of foreign entry (or threat thereof) on innovation and growth invites another distinct European interpretation, notably in light of EU enlargement. The distance from the technological frontier differs across the EU, with some countries being relatively close and others further away from it. This implies that the stimulus of foreign entry on innovation and growth might vary across EU countries, too, and could in fact be negative in the technologically least advanced countries. A corollary of this is that the scope and justification for policies to support the technological upgrading of lagging firms and industries is larger in the least advanced countries, and possibly minimal in others. We shall leave it at this and offer a few concluding remarks next.

6. Conclusion

One of the observations of this paper has been that the very concept of industrial policy is difficult to pin down and that it means whatever its friends (or foes) want it to mean. To illustrate, bearing in mind the risk of government failure in designing and implementing industrial policy, a plausible interpretation following from the previous section is that competition policy – intelligently blending measures that strengthen product market competition with patent protection – is all it takes to foster innovation and growth. Indeed, this is precisely the view of the German Monopolies Commission: “Experience proves that the classical dictum which states that active competition policy is the best form of industrial policy is absolutely correct” (Monopolkommission 2004, p.580). With this interpretation, industrial policy and competition policy would be one and the same, rather than at war with each other – a possibility raised by Strohmer (this volume).

An equally plausible though less radical reading of the previous section (and of Section 4) suggests that while competition in and for markets is crucial, there remains a rationale for government intervention, such as encouraging backward firms to catch up with the technological frontier, reinforcing firms’ incentives to carry out R&D and to license and trade new knowledge, and helping the private sector to coordinate standards.

An even greater role for the state would follow from what Cohen (this volume) has labelled the pragmatic approach to industrial policy, which is inspired by new growth and development theories. According to this approach, the key tasks of industrial policy are: first, to elicit information from the private sector on significant externalities and their remedies and, second, to help firms and the government to learn about a country’s underlying costs and opportunities and, thus, identify economic activities that are more promising than others (Rodrik 2004).

All in all, industrial policy continues to be hotly debated, with different schools of thought disagreeing on the extent to which governments should directly influence the allocation of resources. But despite controversy about what the state can and should do, it is fair to say that economists have reached some consensus on what it should not do. For example, attempts at

picking winners seem to have fallen out of favour, though the idea of creating such winners on a grand scale in the form of national champions lives on among policy makers and the public at large. There is also some consent that government support must not be too generous in scope and duration (notably when aimed at rescuing, restructuring, or upgrading firms), and that the state should refrain from interfering when the risk of government failure seems to be unusually big. Finally, the state should resist throwing good money after bad. Indeed, as Rodrik (2004) emphasises, both the private sector and the state inevitably make mistakes, but the state, for political-economy reasons, scores far worse in terminating failed projects and policies.

The last point worth highlighting is that the ultimate purpose of industrial policy, however defined, is to raise domestic productivity – not productivity relative to other countries. In other words, to promote economic growth and create jobs, Europe must become more innovative and productive even if it was the only place in the Universe. Against this background, the focus on growth and employment of the re-launched Lisbon strategy signals a sensible departure from the obsession to make Europe more ‘competitive’ than the rest of the world. Whether industrial policy can contribute to stimulating growth and employment remains contentious. Assuming that it can, still leaves the question whether we need “An industrial policy for Europe?”

Writing an overview paper always involves the risk of pre-empting the messages of subsequent contributions. We shy away from taking too much risk and, thus, from here on let the other contributors speak, including on the question we have left unanswered.

The refocused Lisbon strategy signals a sensible departure from the obsession to make Europe more ‘competitive’ than the rest of the world.

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