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No policy is an island - on the interaction between industrial and other policies

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ABSTRACT

Considering industrial policy from the perspective of other economic policies, this paper seeks to identify the sources and consequences of conflicts between industrial, competition, trade, and fiscal policies. The goals of industrial policy, even when economically justified in isolation, are in certain circumstances in an intrinsic conflict with especially competition and trade policy goals. Industrial policy also lacks its own independent instruments, and fiscal policy instruments are frequently used and often economically optimal to implement industrial policy, which can create a policy conflict even when the goals themselves are independent. For these reasons, the cost of industrial policy is often the sacrifice of some other policy goal. This interdependence narrows the scope for economically sensible industrial policy.

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No policy is an island – on the interaction between industrial and other policies

There's nothing remarkable about it. All one has to do is hit the right keys at the right time and the instrument plays itself.

Johann Sebastian Bach

1. Introduction

Industrial policy action is economically justified under certain circumstances, as reviewed by Cohen (this volume). Focussing on the neoclassical case for industrial policy, a number of market failures can justifiably prompt the public sector to intervene in the process of allocating resources among economic activities or sectors. In other words, the presence and identification of market failures is a necessary condition for industrial policy action to be economically sensible.

If industrial policy were implemented in isolation, addressing a market failure would also be a sufficient condition for the policy intervention to be welfare enhancing. However, industrial policy is seldom, if ever, implemented without any repercussions on other areas of economic policy. Therefore, an assessment of how much scope there is for economically sensible industrial policy has to account for the wider costs and benefits that an industrial policy intervention has by affecting other policies and their goals.

To draw a musical parallel, Bach spoke about how to play the organ in the quote above. The organ is a solo instrument, and with a talent like Bach's, there is presumably little else to worry about, apart from hitting the right keys at the right time. If industrial policy could be played solo, it would suffice for the policy maker to design and implement the intervention right, and there would be applause at the end, at least by the economists in the audience. However, when surrounded by an orchestra of strings, woodwinds, brass, and percussion, even a technically faultless and aesthetically pleasing solo organ performance can be completely out of place, and the audience would be better off if the organist left his keys alone and let the audience enjoy an organ-free symphony.

Thus, this paper will focus on industrial policy as part of an orchestra of economic policies. To set the stage, Section 2 recapitulates the most important goals of industrial policy that have an economic justification to them. These goals are then contrasted against the goals of other policies in Section 3, with the aim of identifying the circumstances where industrial policy is compatible with other policies and where there is a conflict. The focus shifts from goals to instruments in Section 4, where the aim is to map out the possible and the optimal instruments of industrial policy and to see how the choice of policy instruments affects the compatibility of different policy areas. At the end of this exercise, we hope to have gained a more nuanced and more comprehensive idea of just how much scope for economically sensible industrial policy there is.

2. Industrial policy nailed down

Industrial policy differs from most other areas of economic policy in several important respects. First, as opposed to, e.g., monetary, fiscal, trade, or competition policies, industrial policy does not have an established and permanent institutional framework. There is in general no public agency devoted to industrial policy, nor is there a legal framework for industrial policy¹. Second, and again in contrast with



Timo Väilä

¹ National legislation or international treaties (such as the Treaty of Rome) may well (and do, in fact) contain a negative list of prohibited industrial policy measures, but this is different from there being a positive legal framework, such as a central bank law in the case of monetary policy, that outlines the competencies of the agencies involved in executing that particular policy.

most other areas of economic policy, industrial policy does not have a well-identified and universally recognised set of goals to achieve. Industrial policy has goals, such as innovation support or protection of sectors in decline, but those goals change over time and from country to country. And finally, as elaborated in Section 4 in greater detail, industrial policy does not possess a clearly identifiable tool kit of policy instruments that would be devoted exclusively to achieving the goals of industrial policy.

Consequently, it has proven difficult to define industrial policy unambiguously. In the broadest sense, Caves (1987) defines industrial policy to encompass public sector intervention aimed at changing the distribution of resources between economic sectors and activities. This could, in principle, encompass 'vertical' policy measures targeting individual firms or sectors as well as 'horizontal' policy measures focussing on specific economic activities, such as innovation. While it is indeed customary to include both horizontal and vertical policy measures in industrial policy, some authors – such as Chang (this volume) – emphasise vertical policy measures in their definition of industrial policy, whereas others – such as Edquist (this volume) – only focus on horizontal measures, notably innovation support.

Against this background, it is hardly surprising that the quest for a rock-solid definition of industrial policy is often abandoned in favour of a looser delineation of the concept or even in favour of outright agnosticism, as exemplified by Geroski (1989):

“'Industrial policy' is the label that has come to be used to describe a wide-ranging, ill-assorted collection of micro-based supply-side initiatives which are designed to improve market performance in a variety of occasionally mutually inconsistent ways.”

Even in the absence of a definition, industrial policy has been recognised as a policy area in its own right.

Even in the absence of a universally agreed definition, industrial policy has nevertheless been recognised as a distinct area of economic policy in its own right, so there has to be a way to characterise it, if not define it. To nail down industrial policy by characterising it, this section focuses on distinct types of industrial policies, each with a distinct set of policy goals. To be clear, the goals considered are limited to those that have a clear economic justification, i.e., where intervention by the public sector makes the economy better off by alleviating the markets' failure to allocate economic resources in an optimal way for the economy as a whole. Goals often associated with industrial policy but that do not address a market failure and therefore have no economic justification – such as supporting sectors with high value-added or promising future growth potential – are not considered.

2.1 Types and goals of industrial policy

The goals of industrial policy with a (neoclassical) economic justification have been examined by Cohen (this volume). This section presents such goals from a slightly different perspective to allow an explicit comparison of the goals of industrial policy with those of other policy areas in subsequent sections. To link this theoretical discussion more closely with practical policy making, this section concludes by raising some key difficulties in designing industrial policy measures.

The classification of industrial policy goals to be presented here and followed subsequently is based on the taxonomy introduced by Caves (1987) and Gual (1995a, b). They identify three distinct types of industrial policies aimed at enhancing economic efficiency: horizontal (e.g., innovation support extended regardless of economic sector to address knowledge externalities); vertical (e.g., strategic trade policy support to a certain industry or firm to capture rents); and structural change (e.g., temporary support of a declining industry to prevent too abrupt adjustment to changes in technology or comparative advantage). In addition to enhancing economic efficiency, industrial policy can also aim at improving equity (e.g., support to uncompetitive sectors or firms on grounds of social or regional income distribution, rather than economic efficiency). Each of these four types is discussed in detail below.

2.1.1 Horizontal industrial policy

'Horizontal' in the context of industrial policy denotes the absence of selectivity in terms of the individual firms or sectors supported. In other words, horizontal industrial policy support concerns a wide range of firms and sectors.² In the broadest sense, as employed by European Commission (2005), horizontal industrial policy encompasses the broad framework conditions under which the entire enterprise sector operates, including macroeconomic stability, rule of law, protection of property rights, absence of administrative barriers and red tape, good public sector governance, and so on. More narrowly, horizontal industrial policy refers to measures targeting economic activities that are common to many sectors and firms and that are plagued by market failures, notably the presence of spill-over effects in the production process.

Horizontal industrial policy is non-selective.

The most common example of horizontal industrial policy targeting a specific economic activity is innovation support. Knowledge is a public good (i.e., it can be shared among an unlimited number of consumers), and its creation is associated with positive externalities (i.e., one firm's investment in it can benefit other firms too). Private companies, left to themselves, would invest too little in innovation because they would choose a level that would maximise their private profits, thus ignoring the wider spill-over benefits to the economy as a whole. This being the case, public innovation support would be warranted to account for spillovers – provided the public support does not discriminate between sectors or firms and hence does not create distortions.

As illustrated by the case of Finland (see Toivanen in this volume), public innovation support can be extended using a wide range of fiscal policy instruments. Such fiscal support aims at encouraging the early stages of the innovation process, especially underlying research and the subsequent development of commercially viable products.

In addition to supporting research and development of new knowledge and products, the public sector has traditionally offered temporary protection of intellectual property rights embodied in products that are ready to enter the market. The granting of patents to inventors (and copyrights to artists) entails a granting of a temporary monopoly to the inventor, so as to allow him to appropriate the benefits and monopoly profits associated with his invention. These monopoly profits would improve his incentive to innovate, thus benefiting society as a whole. Of course, the success of a system of intellectual property rights depends on finding the right balance between temporary protection and subsequent competition.

While common in all industrial countries, the patent system has been criticised as unnecessary or even harmful. An inventor will enjoy temporary, if short-lived, market power and monopoly profits even without patent protection, which should provide sufficient and cost-effective incentives to innovate, especially compared to the burdensome machinery that patent approval and administration necessitates. Worse, the excess monopoly profits offered by patent protection can lead to overinvestment in innovation, as firms compete against one another in patent races. And, perhaps most fundamentally, the establishment of market power to spur innovation appears to contradict

2 The distinction between *ex ante* availability of support and *ex post* distribution of support can be important. It is sometimes argued that there is no such thing as horizontal support, because no support can reach all sectors and firms but is bound to be selective to some extent (see Gual and Chang, this volume). This argument relates to the distribution of support actually extended by the public sector. However, one may use instead as a criterion for the horizontality of support the eligibility of firms in different sectors to apply for public support. As an example, as discussed by Toivanen (this volume), the extension of innovation support in Norway was based on the authorities' discretion, while that in Finland remains based on unsolicited applications. The former can hardly be characterised as horizontal, while the latter can, based on its general availability, despite the fact that not all sectors and firms end up receiving it.

squarely the observation that more competitive economies tend to be richer and grow faster, as observed by Aghion and Howitt (2005).

2.1.2 Vertical industrial policy

Spatial externalities and rent shifting have been used as justifications for selective industrial policies.

In contrast to the non-selective horizontal industrial policy, vertical industrial policy targets support to a specific sector or an individual firm. Three different economic justifications for such selectivity are reviewed below. They include spatial externalities; rent shifting by means of strategic trade policy from foreign competitors with market power to a domestic producer; and rent shifting by means of a domestic merger to a domestic producer.

The first case of economically justifiable vertical support to be considered here concerns spatial externalities, consider – following Krugman (1993) and Baldwin *et al.* (2003) – a sector that is characterised by economies of scale in production and by market size effects. Economies of scale imply that each producer wants to concentrate production geographically, preferably where there are few other competitors. To minimise transportation costs, producers would locate where demand is largest. But the demand is largest where the majority of producers locate. The relative strength of agglomeration and dispersion forces will determine the geographical distribution of production in the economy. From the perspective of economic efficiency, agglomeration is desirable in sectors where positive spatial externalities are important. However, agglomeration is not desirable if it gives rise to excessive negative externalities, such as congestion.

Based on such spatial externalities – which are distinctly different from the technological externalities discussed in connection with public innovation support – Krugman (1993) argues the case for industrial policy support of selected industries such as semiconductors, software, and scientific instruments. The task for industrial policy in this case is to encourage agglomeration in sectors where geographical proximity increases demand and production without, however, giving rise to too much congestion or other negative externalities. Without public support, firms' location decisions would not account for the positive spillovers of proximity on other firms' demand and production, resulting in too little agglomeration. With public support of agglomeration, the market size effects can be captured, resulting in higher allocative efficiency in the economy. Moreover, vertical industrial policy facilitating sectoral specialisation based on spatial externalities can, as interpreted by Martin and Sunley (1996), help create national comparative advantage and thus influence international specialisation and trade.

While spatial externalities constitute a reasonably uncontroversial case for industrial policy intervention, at least conceptually if not in practice (see section 2.2), the same is not true for rent shifting by means of strategic trade policy, to which we now turn. The goal of vertical support in the form of strategic trade policy is to capture excess profits of foreign producers in a market with imperfect competition, and thereby raise domestic income at the expense of other countries. Originally developed by Brander and Spencer (1983, 1985), the strategic trade policy literature considers a sector with economies of scale as a starting point, with only foreign producers in the market.³ The presence of scale economies is accompanied by market power and excess profits for the incumbent foreign producers, as they deter potential new entrants by threatening to undercut them (for example, by deliberately maintaining excess capacity) whenever they attempt to enter the market, which makes entry seem unprofitable at the outset.

³ The reasoning would also apply to economies of scope; that is, to efficiency gains from increasing the scope of product variety, marketing, and distribution. For brevity, the concept of economies of scale (or scale economies) is used henceforth to denote economies of scale and scope.

To shift some of the excess profits to the home economy, the home government commits to support a domestic rival (a 'national champion') to the incumbent foreign producers. The role of public support is to lend credibility to the new entrant and to signal that he has staying power in the market even if the incumbents launch a temporary price war. The entry of the domestic producer increases competition in the market, which reduces excess profits and benefits consumers worldwide. Moreover, to the extent that excess profits still remain, they will in part be shifted to the home economy. If the gain to the home economy is larger than the subsidy extended by the government, the home economy will be better off with such public intervention than without.

This type of strategic policy is controversial on several accounts. First, the global welfare implications of such rent shifting are unclear. As already pointed out, it entails domestic gain at the expense of other countries, so the assessment of the desirability of rent shifting depends on one's viewpoint and cannot be made objectively. Similarly, while the increased competition benefits consumers worldwide, it will reduce the global producer surplus by reducing producers' profits, leaving thus the net effect undetermined and dependent on how one values consumers' gain in relation to producers' loss. Second, to be beneficial to the home economy the public subsidy must be calibrated so that it is large enough to make the domestic producer's entry credible, but it should be small enough in relation to the gross gain to the domestic economy from the rent shifting. As elaborated in Section 2.2, such calibration can only be done in the unlikely event where the policy maker possesses very detailed knowledge about the market structure, incumbent's behaviour, production costs, and so on. Finally, even when strategic trade policy succeeds in its mission in the static setting described above, its efficacy is less clear in a more dynamic setting. Strategic trade policy by one country may well prompt counteraction by other countries, and the resulting subsidy war can make everyone worse off compared to the initial situation with no public support to the domestic entrant.

Strategic trade policy is controversial on several accounts.

A classical example of rent shifting that has received ample attention from economists concerns state aid to the aircraft industry. There are only a handful of big airplane producers worldwide, and the limited competition implies the presence of excess profits, or rents, in the market for airplanes. In an attempt to capture some of those rents, European governments have supported Airbus to become a major producer alongside Boeing and McDonnell Douglas. This vertical support to Airbus is analysed in detail in Box 1.

As a final goal of vertical industrial policy, let us consider rent shifting from a foreign producer by means of a merger of domestic producers. Consider, as above, a sector characterised by imperfect competition internationally and the presence of excess profits. In contrast to the Airbus example above, assume now that there are two domestic producers, in addition to a foreign firm. Also, let us relax the assumption about scale economies for the time being to show that the results can be obtained even if production technology exhibits constant returns to scale. In this set-up, the two domestic firms would have no obvious incentive to merge. On the contrary, a merger between them may be objectionable to the home competition authority, as it results in a dominant domestic market position for the merged firm.

Huck and Konrad (2001) demonstrate that industrial policy can be used to raise national income in this set-up. By supporting the merger, thereby creating a 'national champion', and by subsequently subsidising the merged firm to strengthen its competitiveness *vis-à-vis* the foreign producer, the home government can contribute to rent shifting that benefits domestic producers and the home economy. As in the case of strategic trade policy discussed earlier, this gain comes at the expense of foreign firms and the foreign economy. Also as above, the industrial policy intervention – merger combined with public subsidies – is economically sensible, for the home economy at least, if its cost falls short of the benefit (rents shifted home).

Box 1. Causes and consequences of industrial policy support to Airbus

The aircraft industry is characterised by significant economies of scale, as the development of a new aircraft model requires large up-front investment long before actual production can start. As a consequence of this large fixed cost, the average cost of producing an aircraft declines only slowly with the number of aircraft produced. The presence of scale economies means that only a limited number of producers can be profitable. This, in turn, gives rise to market power and rents. Producers gain at the expense of consumers, and the economy as a whole is worse off because the quantity of production and consumption is suboptimally small.

In the 1980s, Airbus entered the competition for the market for medium-range medium-body aircraft that was dominated by Boeing (McDonnell-Douglas, a third major producer, chose not to compete in this particular market segment). By supporting Airbus to compete against Boeing by granting it 'launch aid' to develop a medium-range medium-body aircraft, European governments wished to shift some of the rents enjoyed by Boeing to Europe.

For such public 'launch aid' to be economically justifiable, it should have addressed a market failure, in this case Boeing's market power. To this end, public support may have been necessary for the credibility of Airbus's presence in the market. Without such support, the argument goes, Boeing could have threatened with a temporary price war, making the market look too unattractive for Airbus to enter in the first place. In addition to securing Airbus' entry and a shift of part of Boeing's rents to Europe, the rents themselves should have fallen as a result of increased competition, thus benefiting consumers. In addition, European economies should have benefited from spillovers emanating from Airbus' R&D investment. However, the loss of market share by Boeing would have made it less efficient in the long run.

Seabright and Neven (1995) sought to quantify the various effects of such launch aid to Airbus. They concluded that entry by Airbus did indeed benefit Europe by shifting some of Boeing's profits there, and that it benefited consumers worldwide by increasing competition in the market. This gain by consumers was, however, quantitatively smaller than the loss of overall producers' profits due to increased competition and a reduction in cost efficiency at Boeing. The latter was a result of an increase in variable costs following from a decline in the scale of production, and not so much related to fixed costs (production capacity), which for Boeing was a sunk cost.

The results of Seabright and Neven cast also some light on firms' entry decisions. By deterring McDonnell-Douglas from entering the medium-range medium-body aircraft segment, the entry by Airbus facilitated its entry into the long-range segment, where Boeing had also become less competitive due to loss of scale economies. Thus, the entry by Airbus hurt Boeing across the board, but allowed McDonnell-Douglas to enter another market segment.

The parallels between strategic trade policy and strategic merger policy can be drawn even further. Consider the example used above with Airbus and Boeing, but account now explicitly for the presence of the third player in the market, McDonnell-Douglas. From the US perspective, the merger of Boeing and McDonnell-Douglas, in response to the entry and public support of Airbus in Europe, can constitute an effective retaliation strategy. While the merger, that took place in 1997, has given rise to only a little analysis in the literature, it is nevertheless a vivid example of strategic merger policy, as shown by Huck and Konrad (2001).

Finally, to make the parallel between the two cases complete, let us consider how introducing economies of scale affects the consequences of a strategic merger. With scale economies, the domestic firms have a stronger incentive to merge to start with. If this incentive is strong enough, the merger will take place even in the absence of public subsidies. Moreover, the merger might be less objectionable to the competition authority, provided the gains in productive efficiency from the merger outweigh the loss in competition and allocative efficiency.

However, as pointed out by Neven *et al.* (1993), the trade-off between allocative and productive efficiency is not entirely straightforward, as market power can also have the opposite effect and raise, not reduce, production costs. This may happen because firms are prepared to incur costs to obtain market power and excess profits. Such costs may take the form of advertising, investment in excess capacity, or lobbying to gain protection through quotas or licences – to name but a few examples. Alternatively, market power may be associated with declining productive efficiency if managers and workers of a firm seek to extract some of the excess profits from the firm's owners, thereby inflating production costs. This is especially the case, as the absence of product market competition and benchmarks complicates the owners' monitoring of the firm's managers and workers.

2.1.3 Industrial policy to support structural change

It was mentioned in the opening paragraphs of this section that industrial policy is often associated with influencing the sectoral structure of the economy. Indeed, both horizontal and vertical industrial policies discussed above would imply an allocation of resources among sectors that is different from the free market outcome. In both cases, industrial policy seeks to alleviate some market failure (knowledge or spatial externalities; market power), and doing so will imply a sectoral redistribution of resources.

However, industrial policy can also play a more direct role in facilitating structural change in the economy. That role can be change inducing in character, whereby public intervention seeks to alleviate market failures that slow down or prevent the development of new 'sunrise' sectors. Or it can be change resisting in character, whereby public intervention seeks to prevent market failures from resulting in too disruptive an exit of declining sectors. Both cases are considered in turn below.

Industrial policy can induce or resist structural change.

Perhaps the best-known argument in favour of public intervention to support sunrise sectors is based on the idea that they need protection in the early stages of their life cycle so as to become large and strong enough to withstand competition by established foreign firms. This 'infant industry' argument – which can be traced back to Alexander Hamilton and Friedrich List of the 18th and 19th centuries, respectively – is taken to justify the protection of an emerging manufacturing sector where it constitutes a potential comparative advantage for the country in question. A more recent version of the infant industry argument, articulated initially by Bardhan (1971) and extended by Young (1991), focuses more explicitly on the role that public sector protection can play in enhancing economic efficiency. The argument has it that young firms gain in efficiency as they 'learn-by-doing' and need protection early on to reach a level of efficiency that allows them to compete internationally.

Apart from learning effects, failures in financial markets and education have been suggested as justifications for industrial policy targeting sunrise sectors by, among others, Begg *et al.* (2002). Start-ups may be denied finance or only get it at excessive cost because of their inherent riskiness and informational asymmetries between them and investors. By improving start-ups' access to finance, public loan guarantees or seed capital can promote the emergence of new viable sectors. Education may also fail to support the emergence of new production, as skills necessary for new production will only be demanded if the production is there, but there will be no production without the skills. By providing relevant training, the public sector can similarly promote the emergence of new sectors.

The distinction between this type of industrial policy and innovation support discussed in Section 2.1.1 is somewhat blurred. After all, in both cases industrial policy targets primarily young sectors and firms, and it is not entirely obvious whether structural change is the goal or a consequence of industrial policy action. However, innovation support has traditionally been treated as a separate subject in its own right, if only for the reason that it is more tractable both theoretically and empirically than other types of support to sunrise sectors.

Leaping then from the beginning to the end of firms' life cycle, industrial policy support to declining sectors that has potential to improve economic efficiency concerns situations where market failures hamper the adjustment of industries or firms to technological change or to change in comparative advantage. As explained by Gual (1995a, b), such market failures may include capital specificity – productive capital accumulated by existing firms is not readily usable for the production of other, more profitable goods – or rigidities in labour market adjustment. In the presence of such rigidities in capital and labour markets simultaneously, the private sector response to changes in technology or comparative advantage may be too abrupt, and the economy may be better off with the government coordinating the pace of change in the capital and labour markets. Such coordination may be achieved through temporary subsidies or trade protection, for example.

In the case of sunset sectors, industrial policy support aims thus to offset the impact of a failure (rigidity) in the markets for inputs. This is clearly only the second-best policy response to such market failures, the first-best response being the removal of the failures (rigidities) that cause the inefficiency in the first place. However, first-best solutions in cases like this are often unattainable.

In concluding the examination of the types of industrial policies aimed at improving economic efficiency, suffice it to emphasise that the second-best character of industrial policy action is not limited to the case of sunset industries. Removing any of the market failures discussed earlier in connection with horizontal, vertical, or structural adjustment-related industrial policy would be the efficiency-maximising course of action. In the absence of that option in most cases, the best industrial policy can do from the perspective of economic efficiency is to resort to second-best measures, such as mergers that reduce competition or temporary protection of industries in decline.

2.1.4 Industrial policy to support equity objectives

Socially desirable income distribution may, too, be an industrial policy objective.

Having covered three types of industrial policies to promote economic efficiency, it is now time to consider industrial policy with equity objectives. In the broadest sense, industrial policy support may target inherently unviable sectors or firms to obtain a socially desirable distribution of income among individuals or geographical regions. The assessment of the efficacy of industrial policy in achieving equity objectives is less straightforward than in the case of efficiency objectives and, as a consequence, less attention has been devoted to this topic in the literature.

It was concluded earlier that the presence of spatial externalities necessitates agglomeration from the perspective of economic efficiency. From an equity perspective, however, agglomeration may not be desirable. As discussed in Baldwin *et al.* (2003), market outcomes in terms of firm location are determined by the geographical distribution of purchasing power. Whenever the distribution of purchasing power differs significantly from the distribution of population, there will be too much agglomeration to the richer regions. By subsidising relocation to relatively poorer locations, industrial policy can enhance equity, albeit at the cost of efficiency.

Clearly, equity-oriented industrial policy support is prevalent in practice. When assessing the merits and failures of industrial policy – be it theoretically or empirically – it is important to distinguish between

industrial policy that aims to boost efficiency and industrial policy that serves equity objectives. Gual (2000) considers industrial policy support (state aid) in the EU to steel, shipbuilding, and coal sectors as being extended solely on equity grounds. Aid to railways and regional aid may have both equity and efficiency objectives. Support of innovation, SMEs, and external trade objectives, in turn, may be justified on efficiency grounds.

2.2 Difficulties in executing industrial policy

The conclusion of this section so far has been that it is possible to identify economically legitimate goals for industrial policy and that it is possible to identify the types of industrial policies that can serve to achieve these goals. This is, however, still a long way from demonstrating that industrial policy is welfare enhancing. Establishing that intervention can be beneficial is just a necessary, but not sufficient, condition for industrial policy to enhance welfare. Sufficiency requires that the benefit from intervention exceeds its cost, which – in this case – come in two forms. First, intervention is not without risks, which can eat up the benefits if they materialise. Second, intervention involves opportunity cost, to be discussed in subsequent sections, that may also outweigh the benefits.

The risks involved in executing industrial policy are not different in nature from the risks involved in executing other types of economic policies, but they are arguably greater in magnitude. Public intervention to alleviate a market failure, or to serve an equity objective, always risks evoking a government failure that makes the situation worse than before the intervention. Such government failures can arise because of policy makers' self-interest; electoral pressures; capture by special industrial interest groups; or incomplete information about individuals' preferences and behaviour.

That industrial policy is especially prone to political cycles and capture by vested interests is hardly surprising. A rich political-economy literature suggests, as reviewed by Neven and Röller (2000), that the risk of political capture is particularly high in sharply partisan political systems; at times of weak governments; and in the absence of transparency, which makes it easier to redistribute resources without scrutiny and sanctioning by the public at large. But even at times of consensual, strong, and transparent governments industrial policy is prone to capture because industrial lobbies are among the most focused, best organised and hence most powerful in any economy.

Another possibly important source of government failure in the case of industrial policy is the gap between necessary and available information. To calibrate an industrial policy intervention – say, a strategic trade policy subsidy – the policy maker would need to possess detailed knowledge about production costs, future demand, market structure, and rivals' response to the support in order to assess with any degree of precision how large the subsidy should be to achieve its goal. In other words, the policy maker would need to possess at least as much information about the market in question as any private firm operating in the market. This is a tall order, especially given the agency problems traditionally attributed to the relationship between policy makers and firms, be they public or private.

Apart from the risk of government failure, some types of industrial policies are subject to the risk that their impact is much less favourable in a dynamic setting than in a static one, which has been the focus of most of the analysis so far. It was mentioned in passing above that mergers to promote productive efficiency and strategic trade policy are both associated with static gains and dynamic losses. In the case of mergers, it was argued that the resulting market power may have a negative impact on productive efficiency, thus offsetting the benefit from the merger. In the case of strategic trade policy, retaliation by foreign countries may ignite a subsidy or tariff war that can leave everyone worse off.

Industrial policy intervention can result in a government failure or negative effects in a dynamic setting.

All in all, the dynamic risks and, in particular, the risk of government failure have potential to inflict high costs on industrial policy intervention. In addition, as alluded to above, industrial policy action involves opportunity costs, as pursuing industrial policy goals can necessitate the abandoning of other economic policy goals. Such opportunity cost is the topic of the remainder of this paper.

3. Goal conflicts between industrial and other policies

To recast the discussion above in a somewhat different light, one possible way to see the current undertaking is in terms of a cost-benefit analysis of industrial policy intervention. In Section 2 the main focus was on the benefit side, and a number of market failures to allocate resources efficiently or equitably were identified as economically justifiable grounds for industrial policy intervention. Yet, the section concluded with remarks about the risks associated with such intervention – risks that can cause direct costs, thereby reducing the net gain from the intervention. In the present section and next, the focus will shift to indirect costs of industrial policy in terms of what has to be foregone to achieve the goal of an industrial policy action. Once all costs, both direct and indirect, have been identified, it is possible to specify, if not quantify, the cost-benefit analysis facing the policy maker contemplating industrial policy action. In other words, it is possible to formulate sufficient conditions for industrial policy to enhance economic welfare.

Even when sensible in isolation, industrial policy may be costly if it means missing other policy goals.

In order to consider the indirect, or opportunity, costs of industrial policy, it is necessary to broaden the perspective and consider industrial policy from the viewpoint of other areas of economic policy, instead of just considering it in isolation, as was done in Section 2. The issue at hand is to examine the trade-offs between industrial and other economic policies. Even when industrial policy is economically sensible in isolation, it may conflict with other policies, thus raising the question of whether the achievement of industrial policy goals is worth missing other goals.

The two areas that will be the focus of this section are competition and international trade policies. These two areas of economic policy are subjected to special scrutiny here because they are most closely linked with industrial policy, as should be clear from the characterisation of industrial policy in Section 2. The goals of industrial policy articulated there will be assessed below from the perspective of the goals of these two policies, with a view to examining when the pursuit of industrial policy goals is compatible with them and when there is a conflict between industrial policy and competition and trade policies, respectively. When a conflict between the goals is identified, the opportunity cost of undertaking industrial policy action becomes obvious.

Before embarking on the analysis, it is perhaps worthwhile giving the discussion a more practical spin and linking the concepts with reality by means of a concrete example. In essence, the issue of policy trade-offs can be illustrated by considering industrial policy support to domestic textile producers in Europe facing competition from low-wage countries that will render the sector unviable over the medium term. To avoid excessively abrupt adjustment in the form of wholesale plant closures and mass layoffs, the public sector may choose to support the domestic textile industry temporarily, either by extending subsidies or by erecting protective trade barriers against foreign competitors. The benefit of such support can be a more efficient adjustment process, with gradual redeployment of labour and capital to more profitable uses.

However, as discussed earlier, the support is subject to the risk of political capture. It is also difficult to calibrate: should the subsidy amount to €10 million, €100 million, or €1 billion? Should it be extended during 1 year, 5 years, or 10 years? The support may also prompt retaliation by other countries, thereby increasing its costs. Finally, to converge to the topic of this section, the support may distort domestic

competition among textile producers if it is extended selectively, and it may also distort foreign trade by raising trade barriers or by giving domestic producers an artificial competitive advantage *vis-à-vis* foreign ones. Both these distortions compromise allocative efficiency in the domestic economy and raise the question whether the gain in terms of a smoother adjustment process is greater in magnitude than the direct cost of such intervention and the partial loss of free domestic competition and free international trade. This and next sections will deal with exactly that trade-off.

3.1 Goals of industrial and competition policies

3.1.1 Normative view of competition policy

The discussion of industrial policy goals in Section 2 suggested, at least implicitly, that industrial policy action will have repercussions on competition and competition policy. Such repercussions are made explicit below, with the aim of assessing the various goals of industrial policy from the perspective of the goals of competition policy.

As a starting point, let us articulate the goals of competition policy. In so doing, we focus on competition policy from a normative perspective, considering what competition policy should aim at in order to enhance welfare. Moreover, the only concern for the time being is domestic competition, so the economy is assumed to be a closed one. The international dimension of competition will be analysed in connection with trade policy below.

The welfare costs of market power are well articulated in the economic literature and well known in a positive sense (see, e.g., Tirole 1988). In an imperfectly competitive market, firms set prices above marginal costs of production, thereby maximising their profits but inflicting a social loss, as the quantity produced and sold falls short of what would be the case under marginal cost pricing. That is, imperfect competition is associated with lower allocative efficiency than perfect competition, because there will be consumers willing to pay the marginal cost, or more, who will walk out of the market exchange empty-handed. The loss in consumer welfare constitutes a deadweight loss from imperfect competition.

Consequently, to avoid such social loss, the normative goal of competition policy is to ‘promote and protect competition’ (European Commission 2004). In practice, it involves antitrust regulation and control; merger control; state aid control; and liberalising potentially competitive markets.

The promotion and protection of competition is a rule of thumb for maximising welfare, with some exceptions. First, as mentioned in connection with innovation support, temporary market power (patent) may enhance welfare if it helps address the market failure arising from knowledge externalities. Second, as alluded to in connection with vertical industrial policy, it may not be possible to introduce perfect competition and marginal cost pricing due to economies of scale. In this case, the second-best solution is to allow the increase in market power as long as the gain in productive efficiency from the larger scale of production exceeds the loss in allocative efficiency from reduced competition. However, as also mentioned above, the emerging market power may in itself lead to lower productive efficiency in a dynamic setting.

Another case where it is not clear that free competition can maximise social welfare concerns markets with spatial product differentiation. In this case, there is a trade-off between providing the widest possible product variety to all consumers and the cost of supplying a wide variety of goods to the geographically spread-out consumers. Theoretically, as elaborated by Tirole (1988), it is not clear that free competition between producers will result in higher social welfare in terms of consumed product variety than a regulated market.

The promotion and protection of competition maximises welfare, with some exceptions.

3.1.2 Compatibility of industrial and competition policy goals

Having thus concluded that competition policy should aim at promoting competition, except when there are sufficiently large gains to reap from economies of scale or when product variety is an issue, let us now consider the compatibility of the goals of industrial policy with competition policy goals. In what is to come, the presentation follows the structure introduced in Section 2, starting with horizontal industrial policy and ending with industrial policy supporting equity objectives.

Truly horizontal support does not conflict with competition policy.

Consider horizontal innovation support to, say, domestic car manufacturers to help them develop hybrid engines. Under what circumstances is such support compatible with the goals of competition policy? If the support only aims to alleviate market failures arising from knowledge externalities, and if it is truly horizontal in character, that is, available to all domestic car producers, then it does not distort competition and hence does not conflict with competition policy. Conversely, any selectivity in extending such support will distort competition and conflict with competition policy goals.

Fast forwarding to vertical industrial policy, and starting with the case of spatial externalities, policies to encourage agglomeration and competition policy are likely to be compatible if product variety is not of concern. Agglomeration is likely to be associated with more competition, not less, as geographical dispersion is conducive to local monopoly power, which clustering eliminates, at least to some extent. While it could also be argued that agglomeration makes collusion and cartels between firms easier, this risk is likely small compared to the expected benefit from increased competition. However, if product variety is a concern, then the support of agglomeration may actually reduce welfare by reducing the supply of variety in the periphery, as production is concentrated in the core and not all products will be shipped to the periphery due to transportation costs.

Strategic trade policy, in turn, cannot be unambiguously assessed from the perspective of competition policy. From the perspective of domestic competition, subsidies to a 'national champion' do not make any difference when the firm is a 'natural' monopolist anyway. Of course, in the presence of other domestic producers – actual or potential – such subsidies to a selected firm would be distortionary and conflict with the goals of competition policy.

As regards strategic mergers, there is a clear conflict between industrial and competition policies if the production technology is characterised by constant return to scale. In this case, the merger results in less (domestic) competition, with no gains in productive efficiency. Support for the merger to achieve the industrial policy goal (rent shifting) would be at odds with optimal competition policy.

In the presence of economies of scale, on the other hand, the criterion for the compatibility of industrial and competition policy has already been spelled out. A horizontal merger of two domestic car manufacturers, as an example, is unambiguously welfare enhancing and compatible with competition policy if it results in higher productive efficiency (for example, because the combined production costs of the two firms fall as a result of reaping scale economies in product development) such that the gain exceeds the loss in allocative efficiency possibly resulting from reduced competition in the domestic car market.⁴ Conversely, if industrial policy promotes a merger where the gain in productive efficiency falls short of the loss in competition and allocative efficiency, there is a conflict between industrial and competition policies.

⁴ A merger can also lead to an increase, instead of a decrease, in allocative efficiency. If the merger results in more, not less competition, the cost reduction due to scale economies can be passed on to consumers, the economic deadweight loss would diminish, and allocative efficiency would increase. This could be the case in a market comprising originally two large and many small firms, where the small firms are allowed to merge into, say, two new large firms.

Finally, industrial policies to support structural change or equity objectives is compatible with the goals of competition policy if they are non-selective in character. Temporary public subsidies to smooth out the winding down of the domestic textile or mining industry do not distort domestic competition if they are available to all firms in those sectors. Also, if the industry only comprises a 'natural' monopolist, industrial policy support to that monopolist on grounds of structural change or equity would not distort domestic competition.

To sum up, all types of industrial policies have conflict potential with the goals of competition policy. This conflict potential does not materialise, however, in the case of truly horizontal innovation support; vertical strategic trade policy support to a domestic 'natural' monopolist; strategic merger policy support if the gains in productive efficiency exceed the possible loss in allocative efficiency; and support of structural change or equity objectives to the whole sector or to a 'natural' monopolist. In contrast, the conflict is always present in strategic merger support in the absence of scale economies and in any industrial policy support that targets specific firms in a potentially competitive sector.

3.2 Goals of industrial and trade policies

3.2.1 Normative view of trade policy

Broadly speaking, trade policy involves the use of economic policy instruments to influence the pattern of trade of a country with the rest of the world. Policy instruments mobilised to this end include taxes, subsidies, quotas, other non-tariff barriers, trade-related foreign investment measures (such as local factor content requirements), preferential financing arrangements (such as export credit subsidies), or national procurement policies (Gual 1995a).

Any use of the policy instruments mentioned above changes the allocation of resources from what free trade would imply. However, as with free domestic competition, the case for free international trade is well articulated and well known. Intervention to restrict free international trade will, as a rule, reduce economic efficiency and cause the economy to forego 'dynamic' gains from scale economies and incentives to innovate.

Again as with free competition, there are exceptions to the rule where the economy is better off restricting international trade. First, a large country able to affect prices in international trade may benefit from imposing an import tariff. If the import tariff leads to a reduction in the price of imports, the country experiences a gain in its terms of trade. If this gain is larger than the cost of the tariff in terms of distorting production and consumption, free trade is not optimal. This result may not hold, however, in a dynamic setting, as other countries may retaliate against the tariff, and the ensuing tariff war may make all countries worse off than free trade.

A second exception to the rule concerns failures in domestic input markets. As discussed, e.g., in Krugman and Obstfeld (1994) and Gual (1995a, b), tariff protection may be the second-best response to rigidities in the labour and capital markets, especially at times of structural change, as discussed in Section 2.1.3. While conceptually well articulated, this argument for trade protection has been of particular concern because of the difficulty in identifying the market failure and in designing an appropriate policy response to it. Besides, it is not obvious why trade policy should be optimal to mitigate domestic input market failures: is a tariff really the only available instrument to address, say, urban unemployment?

Third, economies of scale at the level of an industry, as opposed to a firm, can also justify tariff protection. Such external economies imply that the larger the sector in a country is, the more cost effectively it can

As with free competition, there are exceptions to the rule that free trade is optimal.

produce. As a rule, competition will drive all production to the country where production (per unit) is cheapest. However, historical accident may have located production elsewhere to start with, and because of the external economies, it will not relocate easily. As an example, Krugman and Obstfeld (1994) consider watch production, which has historically clustered in Switzerland, remaining strong to-date, although it would clearly be cheaper in numerous low-wage countries. Rather than importing expensive watches from Switzerland, such low-wage countries could be better off imposing an import tariff so as to promote local watch production, thus supplying their domestic markets more cheaply.

Finally, as already discussed extensively, strategic trade policy considerations may also suggest the optimality of trade protection. However, such protection is controversial, especially as its optimality is local, and as its global impact may even be negative.

3.2.2 Compatibility of industrial and trade policy goals

Having thus assessed international trade policy normatively, it is possible to contrast the goals of industrial policy with optimal trade policy. Again, the exposition follows Section 2, starting with horizontal industrial policy and ending with industrial policy in support of equity objectives.

Horizontal industrial policy, such as innovation support, does not distort free international trade, provided it just addresses the domestic market failure related to knowledge externalities. All countries are equally entitled to such policy, so no distortion to trade arises.

The same goes for vertical agglomeration support: no trade distortion is caused if policy just addresses spatial externalities.

Strategic trade policy, in turn, was already found to be controversial, as it can both increase and distort trade. Support to Airbus is a case in point: as a result of its entry, international competition and trade increased. However, especially from its competitors' perspective, increased trade came about as a result of policy intervention that induced a distortion by subsidising a producer who was arguably unviable without the public support.

Strategic merger policy will distort trade whenever there are no scale economies, as public support would give the merged firms an undue competitive advantage. In the presence of scale economies, and assuming that public support is needed to induce the merger, it can also be argued that trade is being distorted. The merger is again policy driven, and the public support will give the merged firm an undue competitive advantage.

Industrial policy to support structural change may be compatible with trade policy, but trade policy may be sub-optimal to that end.

Industrial policy in support of structural change may be compatible with trade policy goals, but trade policy may still not be the optimal instruments to extend such support. Sunrise sectors characterised by learning effects and external economies (sector-wide scale economies) may be justifiably protected from international competition on a temporary basis. Similarly, tariff protection may be justified for sunset industries to allow them to exit smoothly. However, as discussed by Caves (1987) and Gual (1995a, b), it is questionable in both cases whether trade policy is the best available instrument; instead, domestic subsidies may fare better at avoiding undesired side effects, such as consumption distortions.

Finally, industrial policy in support of equity objectives always distorts foreign trade by giving domestic producers an undue competitive advantage. In the absence of a market failure, industrial policy support would compromise allocative efficiency by supporting too high domestic production. Such support may, however, still be rational if the equity gain exceeds the efficiency loss.

To conclude, industrial policy goals are compatible with the goals of trade policy in the case of non-selective (horizontal) innovation support; vertical support aimed at addressing spatial externalities; and support of structural change. In the last case, trade policy may not be in conflict with industrial policy, but trade policy may also not be the optimal way to achieve the goals of industrial policy. In contrast, there is a direct conflict between industrial and trade policies in the case of strategic mergers and equity-based support. Finally, strategic trade policy can both increase and distort trade.

3.3 Summary and further issues

The above survey of the goals of industrial policy from the perspective of competition and trade policies, respectively, suggests that there is significant conflict potential between these policies. The only cases where the goals of industrial policy seem fully compatible with competition and trade policies include truly horizontal (innovation) support to address domestic externalities and temporary support to an entire declining industry to ensure smooth exit. However, in both these cases the caveat concerning the difficulty of identifying the underlying market failure and of designing and calibrating the support action applies.

On the other hand, industrial policy goals that always conflict with competition or trade policy goals include support to selected firms in a potentially competitive sector; strategic mergers in the absence of scale economies; and measures in support of equity objectives. In these cases, the pursuit of the industrial policy goal automatically implies the sacrifice of either free domestic competition or free international trade. This trade-off should determine the policy choice: if the gain from achieving the goal of industrial policy (e.g., higher productive efficiency and rent shifting through a strategic merger) exceeds the cost (loss of domestic competition and allocative efficiency, possibly foreign retaliation), then the industrial policy goal should receive priority. In the opposite case it should be abandoned.

Industrial policy should be pursued only when gains from it exceed its cost.

Similar reasoning applies for the remainder of industrial policy goals, which are sometimes compatible with other policies, sometimes not. Agglomeration support; strategic trade policy to shift rents; and temporary protection of sunrise sectors while they are moving along their learning curve all involve a trade-off with other policies. If the circumstances are such that one of these goals brings more benefit than it costs in terms of missing other goals, industrial policy should take precedent over other policies. And *vice versa*.

The trade-offs involved in industrial policy in terms of competition and trade policies have now been articulated. But there are obviously yet other areas of economic policy that experience repercussions from industrial policy actions. The repercussions may be less direct or less strong than in the cases examined above, but they exist and should therefore be accounted for when contemplating the economic impact of carrying out industrial policy.

While not even attempting to present an exhaustive list of such other policies, let us conclude this section by focussing on fiscal policy, which has already featured indirectly above as a source of public subsidies. While it is obvious that a link between industrial and fiscal policies exists, it is more difficult to examine for two reasons. First, it is difficult to articulate the goals of fiscal policy unambiguously. They include goals related to macroeconomic and cyclical management; longer-term policy sustainability; and equity, but their relative importance varies over time and across countries. Second, it is eminently feasible to use fiscal policy instruments, such as subsidies, to achieve industrial policy goals, while using other fiscal policy instruments, such as other expenditure or taxes, to make sure that fiscal policy goals (budget deficit or public debt targets; income redistribution) are nevertheless achieved. This feature of fiscal policy is not shared by competition and trade policies.

For these reasons, one cannot present a straightforward comparison of the goal compatibility between industrial and fiscal policies. Nevertheless, as will become clear below, it is still possible to say something about the desirability of industrial policy action from the perspective of fiscal policy.

4. Instruments of industrial policy

Policy instruments, too, create interaction between industrial and other policies.

When characterising industrial policy in Section 2 and when examining the goal conflicts between industrial and other policies in Section 3, the application of industrial policy has been cast in generic terms, with broad terms like ‘support’ and ‘protection’ used to denote industrial policy action. While this approach enabled us to examine the conflicts between policy goals, it is not enough to expose the full extent of interaction between industrial and other policies.

To that end, it is necessary to lift the veil of generic terms and study what exactly is meant by ‘support’ or ‘protection’. Put differently, the focus is shifted from what industrial policy aims to achieve to how exactly the goals are being pursued. This, in turn, can be examined by considering the instruments that are used to extend industrial policy ‘support’ or ‘protection’.

The issue of instruments has already been implicit in the discussion so far. It has been possible to read between the lines that horizontal support could be extended by means of budgetary innovation subsidies or tax breaks; that vertical strategic trade policy support could be extended by means of budgetary production, investment, or export subsidies; or that industrial policy to support sectors in decline could take the form of budgetary production subsidies or import tariff protection, to name but a few examples.

The purpose of this section is to present a more explicit and systematic analysis of the instruments of industrial policy. The issue at hand will be approached from two different perspectives. First, the array of possible instruments that could conceivably be used in industrial policy is mapped. Second, the question which possible instruments are optimal from an economic perspective is tackled. This approach, as will become clear, is helpful in elaborating how the choice of instrument to pursue an industrial policy goal will affect the trade-offs between different policy areas discussed above.

4.1 Possible instruments

Leaving the issue of economic optimality aside for the time being, let us simply consider which economic policy instruments could, in principle, be used to extend industrial policy ‘support’ or ‘protection’. It is, obviously, impossible to come up with an exhaustive list of instruments; after all, virtually any economic policy instrument can support innovation directly or indirectly, or be geared to protect a specific sector or firm. Thus, rather than aiming at exhaustiveness, the discussion below seeks to achieve the lesser goal of comprehensiveness, trying to cover the most important instruments for executing different types of industrial policies.

Starting with innovation support, it can be extended by a multitude of instruments, most of which are fiscal in character. Budgetary innovation or research and development (R&D) subsidies; loan guarantees; subsidised loans; as well as tax breaks promoting innovation and R&D are the most obvious examples. However, as discussed by Toivanen (this volume), a number of other instruments can be used, too, including government-run research centres, business support agencies, and even public venture capital funds. The common feature of all these forms of innovation support is that they rely on fiscal policy instruments – be they direct budgetary subsidies, indirect budgetary subsidies through government agencies, or tax policy instruments.

Agglomeration support can also be extended by means of direct budgetary subsidies; loan guarantees; soft loans; or tax breaks for relocating firms. In addition, regional policy instruments, such as construction of economic infrastructure (traffic and energy networks, educational and health care facilities, and so on) can promote agglomeration. Again, the key instruments are fiscal.

Strategic trade policy to shift rents to the home economy, in turn, can be effected using fiscal instruments – such as production, investment, or export subsidies to the domestic producer – and trade policy instruments. In the case of aircraft production, the latter could involve high import tariffs (or quotas) on foreign-made aircraft; low import tariffs on raw materials and intermediate inputs used by the domestic producer; or preferential financing arrangements in favour of domestic production.

Strategic merger policy would involve competition policy instruments (merger control), combined with budgetary subsidies (production-, investment-, or export-based) or tax breaks.

Finally, industrial policy in support of structural change or equity objectives can use any of the instruments mentioned above. Most notably, budgetary subsidies, tax breaks, and tariff (or quota or other non-tariff barrier) protection against foreign competition can help achieve the goals of these types of industrial policies.

This brief overview suggests two broad categories of possible industrial policy instruments: fiscal policy and structural policy instruments. The latter include trade and competition policy instruments, such as tariffs and non-tariff barriers to trade, as well as merger control, but also instruments from a number of policy areas not explicitly mentioned above. Examples include education policies; labour market policies; regulation of financial markets and foreign capital flows, and so on.

Industrial policy instruments can be broadly classified into fiscal and structural instruments.

While it is difficult to be more precise about the character, magnitude, and impact of structural policy instruments used to achieve industrial policy goals, it is easy – relatively speaking – to identify and quantify different fiscal policy instruments used to the same end. Data on state aid in EU member countries compiled by the Directorate-General Competition of the European Commission⁵ enables a brief detour to reality, to verify exactly which fiscal policy instruments are being used to extend industrial policy support in the form of state aid. The data are summarised in Table 1.

Budgetary grants are the most frequently used state aid instrument, accounting for about one-half of state aid extended Union-wide, but with significant cross-country variation. In some countries, such as Austria, Denmark, and Luxembourg, grants are almost the sole instrument used, while in others, notably the Czech Republic, Lithuania, and Portugal they account for only 10 percent or less of total state aid.

Tax exemptions are another major instrument, accounting for one-third of state aid extended Union-wide. Again, in some countries, such as Cyprus, Portugal, or the Slovak Republic, this is the main instrument, while it is not used at all in others (Austria, Estonia, Luxembourg).

The other state aid instruments – including equity participations, soft loans, tax deferrals, and government guarantees – are less important at the aggregate level, but nevertheless frequently used in selected countries. Most notably, guarantees are the dominant instrument in the Czech Republic; tax deferrals are a significant instrument in Italy and the Netherlands; as are soft loans in France, Malta, Spain, and the United Kingdom; and equity participations to some extent in Poland and the Slovak Republic.

⁵ Available at http://europa.eu.int/comm/competition/index_en.html

Table 1. Share of each aid instrument in total aid to manufacturing and services (in %), 2001-2003

	Grants	Tax exemptions	Equity participations	Soft loans	Tax deferrals	Guarantees
EU-25	48.1	32.3	1.3	5.0	3.1	10.2
Belgium	88.6	3.4	0.1	6.1	0.6	1.2
Czech Rep.	10.6	3.0	3.9	0.7	0.0	81.8
Denmark	92.0	8.0	0.0	0.0	0.0	0.0
Germany	40.3	39.3	1.9	1.2	0.0	17.4
Estonia	78.0	0.0	0.0	0.4	0.0	21.6
Greece	66.4	33.6	0.0	0.0	0.0	0.0
Spain	59.9	29.2	0.3	10.6	0.0	0.0
France	51.6	30.6	0.1	15.3	0.1	2.3
Ireland	38.9	58.6	1.3	0.2	0.9	0.1
Italy	66.9	9.7	0.7	3.9	18.7	0.1
Cyprus	24.2	71.6	0.0	0.0	0.0	4.2
Latvia	16.8	69.0	2.6	7.9	0.0	3.7
Lithuania	8.3	81.1	3.0	1.9	5.8	0.0
Luxembourg	95.8	0.0	0.0	4.2	0.0	0.0
Hungary	34.4	63.7	0.5	0.1	0.0	1.3
Malta	20.0	47.8	0.0	20.9	5.7	5.6
Netherlands	61.4	11.6	0.0	3.3	13.3	10.3
Austria	92.6	0.0	0.0	6.6	0.0	0.8
Poland	14.8	58.3	8.1	5.1	5.2	8.6
Portugal	8.3	83.3	0.1	6.7	1.6	0.0
Slovenia	59.7	31.1	1.1	4.7	0.0	3.4
Slovak Rep.	15.0	76.6	6.8	0.0	0.0	1.5
Finland	66.3	27.4	1.0	5.3	0.0	0.0
Sweden	33.7	63.4	0.6	2.2	0.0	0.1
United Kingdom	55.6	32.4	1.2	10.8	0.0	0.0

Source: European Commission, DG-Competition.

The simple exercise of listing possible instruments of industrial policy serves two purposes. First, it is a starting point for analysing which instruments are optimal, to be elaborated below. Second, it highlights an important feature of industrial policy – alluded to in passing in Section 2 – namely that industrial policy does not have its own, independent set of instruments, but that it has to resort to instruments of other areas of economic policy to achieve its goals.

The ‘Tinbergen rule’ says that the number of independent policy instruments must match that of policy goals.

This dependence of industrial policy on the instruments of other policy areas brings us back to a classic analysis of goals and instruments in economic policy making by Tinbergen (1955, 1956). The key insight in Tinbergen’s work – the so-called ‘Tinbergen rule’ – is that the number of policy instruments that are independent of one another must at least match the number of policy goals for the latter to be attainable. In other words, if economic policy aims to achieve, say, two goals (low inflation and protection of domestic textile production), it is imperative to have two independent instruments (money supply and import tariffs) for both goals to be achievable simultaneously.

Lacking its own instruments, industrial policy needs to borrow them from other policy areas.

The challenge arising from the lack of independent instruments of industrial policy is thus clear: as the achievement of any industrial policy goal necessitates the employment of a policy instrument that is there to primarily serve another area of economic policy, the policy maker may have to choose whether to employ the instrument to achieve the industrial policy goal or some other goal. Thus, budgetary subsidies may support innovation but be incompatible with fiscal consolidation, *ceteris paribus*. Tariff protection of a declining sector may smooth structural adjustment but be incompatible with free international trade. In both cases, the policy maker has to choose the instrument in question to be used to achieve one goal and abandon the other one.

The examples above are clear-cut insofar as the two goals are indeed in conflict with one another. In this case, it is obvious that using one instrument will imply that at most one of the two goals can be achieved. Thus, a goal conflict along the lines discussed in Section 3 is a sufficient condition for the Tinbergen rule to be violated.

If the two goals are complementary then, obviously, there is no problem and the Tinbergen rule is not violated. This is the case with strategic mergers that boost productive efficiency so much that competition is worth sacrificing, or whenever an industrial policy goal can be achieved by fiscal instruments at a time when fiscal expansion is desirable.

In addition to the clear cases of goal conflict and goal complementarity, it is possible that the goals are genuinely independent of one another. It can be argued that there is no inherent conflict between innovation support and fiscal consolidation. If there were an instrument to support innovation that had no impact on the fiscal stance, both goals could be achieved simultaneously. If, however, fiscal instruments (subsidies, tax breaks) are used to support innovation, a trade-off situation arises, as industrial policy would be associated with fiscal expansion, all other things equal, which would be in conflict with the fiscal policy goal of consolidation.

To sum up, three different situations can be distinguished. First, whenever there is an inherent conflict between policy goals (e.g., protection of a domestic sector *versus* free international trade), the Tinbergen rule is violated, and the policy maker will have to choose whether to use an instrument (tariffs) to achieve the industrial policy goal or another goal. Second, whenever the policy goals are complementary (rent shifting through a strategic merger in the presence of scale economies and enhancement of productive efficiency), one instrument (merger) suffices to meet both. Third, whenever the goals are inherently independent (innovation support and fiscal consolidation), the use of an instrument from one policy area (e.g., budgetary subsidies) to achieve the industrial policy goal will violate the Tinbergen rule, and again the policy maker will have to choose whether to use the instrument to achieve the industrial policy goal or the other goal.

4.2 Optimal instruments

Above, the choice of instrument to achieve an industrial policy goal was regarded from the perspective of the interaction between industrial and other policies. While that discussion completes the consideration of the interaction between industrial and other policies, it is opportune to conclude by asking which instrument is economically optimal to achieve the various industrial policy goals. Another way of thinking about the optimality analysis is to take the decision to pursue an industrial policy goal as given – either because it is compatible with other policy goals or because it is considered more valuable than other goals that may need to be sacrificed in the process – and to find the least distortionary instrument to achieve the goal.

The issue of instrument optimality has not been addressed systematically in the literature. There is some generic literature concerning the choice of instruments to address specific market failures, as exemplified below, and there are some rather specific contributions, also reviewed below, addressing the choice of instruments in a certain set-up, with little general applicability.

Subsidies tend to be optimal to target positive production externalities.

In way of generic analysis of instrument optimality, a situation characterised by the presence of externalities is well articulated.⁶ The instruments available to address them include budgetary subsidies; taxes (or tax breaks); government regulation; and the establishment of ownership rights allowing the taxation of gainers and compensation of losers.⁷ In the case of a positive production externality – such as knowledge spillovers or agglomeration externalities – a subsidy directly targeting the market failure is generally the most efficient (least distortionary) instrument. By reducing the private marginal cost of knowledge production, a subsidy will increase the amount produced towards the social optimum. A tax break, while indirectly encouraging higher knowledge production, does not directly affect its private marginal production cost and is therefore likely to be less effective and less efficient.⁸ Regulation, in turn, will not affect production costs or prices at all, and by requiring a certain level of research and development spending, for example, it would bypass the price mechanism as a source of economic information and implicitly assume any type of research and development spending in the required amount to be welfare maximising.

The establishment of ownership rights, in turn, is difficult in general because of high transaction costs and significant information requirements. However, as discussed in Section 2, a widely used shortcut to this end is the patent system, which grants its holder full property rights for a limited period, only to rescind them thereafter.

High transaction costs and significant information requirements plague the use of other policy instruments to address externalities, too (see Toivanen, this volume, for instance). After all, when trying to remedy an externality, the policy maker should always know the associated private and social costs and benefits in order to set the correct size of the subsidy, magnitude of the tax break, or regulatory limit on some activity. In effect, all this relates to the issue of how difficult it is to design and calibrate an industrial policy intervention, discussed in Section 2.2.

The use of a tariff as yet another instrument to encourage innovation is considered in Caves (1987). He concludes that a tariff cannot be the optimal instrument to encourage innovation, because tariff protection of a sector that underinvests in innovation (with a view to raising its profitability) would induce excessive entry by otherwise unviable firms and, moreover, it would create incentives for matching or imitating innovations, rather than original innovations. Besides, a tariff will cause a consumption distortion as it alters the domestic price relative to the international price; a subsidy would avoid distorting consumption.

6 See any intermediate or advance textbook on microeconomics or public economics, such as Stiglitz (1988) or Mas-Colell *et al.* (1995).

7 According to the so-called Coase Theorem, the presence of unambiguous property rights can alleviate market failures due to externalities. Specifically, any externality can in principle be internalised through appropriate price setting and transfers whereby those causing negative externalities, for example, compensate those suffering economic loss due to them. For such internalisation to be possible, however, property rights must be clear enough to allow the assignment and payment of the appropriate amount of compensation.

8 The tax break will leave the cost of undertaking innovation unchanged, while it reduces the overall production costs. Thus, while it creates an incentive to spend on innovation, that incentive will not act directly to equate private cost, social cost, and the benefits of innovation. Therefore, it is less likely than a direct innovation subsidy to be effective and efficient.

Turning to strategic trade and merger policies, aimed at shifting rents in imperfectly competitive markets to the home economy, a number of studies compare the use of tariffs and budgetary subsidies. As observed by Caves (1987) and Gual (1995a, b), an import tariff is the optimal instrument to extract rents from a foreign producer who is a monopolist before the entry of a domestic rival. The tariff is to make the foreign monopolist price at marginal cost. Enter the domestic rival, and the optimal policy instrument becomes a subsidy (production or export subsidy) to him if the two firms compete in quantities (Cournot behaviour) and a tax (export tariff) if they compete in prices (Bertrand behaviour; see Eaton and Grossman 1985). In both cases, the policy maker uses the instrument to expand the domestic producer's market share.⁹

Leahy and Neary (2001) consider the optimality of an investment subsidy in the strategic trade policy context. In the general case, the sign of the subsidy (positive or negative, i.e., subsidy or tax) depends on whether the two competitors' investments are 'friendly' in the sense that investment by one firm raises the other's profits, and on whether the investments are 'strategic substitutes' in the sense that one firm's investment raises the marginal profitability of the other firm's investment. In short, the general case is characterised by ambiguity, and no robust case for an investment subsidy can be made.

However, Leahy and Neary show that an investment subsidy is unambiguously optimal in certain circumstances. They include a situation where firms are symmetric and compete in quantities and investment reduces production costs (e.g., investment in research and development). Moreover, an investment subsidy is optimal when firms are symmetric and compete in prices and investment is market expanding (e.g., investment in marketing efforts) rather than cost reducing.

Industrial policy to support structural change is most often effected through subsidies on production factors. It would, obviously, be first-best to remove the rigidities in factor markets that prevent an efficient adjustment process, but if this is not possible, a subsidy tends to be preferable to tariff protection, as the latter induces a greater distortion by altering domestic prices relative to international prices. Rigidity in real wages, for example, would call for a (temporary) labour subsidy in the sector concerned, rather than tariff protection of the sector.

Finally, industrial policy in support of equity objectives can be extended by means of tariffs or subsidies, both causing similar distortions. A tariff on rival imports or a (production) subsidy to home producers will cause an efficiency loss, as domestic producers and consumers face distorted prices and hence make distorted production and consumption decisions. In the case of a large country, or a non-competitive sector, there is also a terms-of-trade gain, which can offset the efficiency loss, at least in part.

In sum, as far as the optimal instrument to execute industrial policy goes, it has been argued that a budgetary production subsidy is best to address knowledge or agglomeration externalities; to alleviate factor rigidities that hamper structural adjustment; and to seek rent shifting in an oligopolistic sector characterised by quantity competition. Price competition in similar circumstances would argue for an export tax (tariff). As regards investment subsidies, a subsidy to cost-reducing investment would seem warranted in quantity competition, while a subsidy to a market-expanding investment would be more efficient in the case of price competition.

Budgetary subsidies are often optimal instruments to execute industrial policy.

⁹ While the use of a subsidy to boost domestic production and exports is clear, the use of a tax in price competition deserves an explanation. A tax (or an export tariff) on the domestic producer will reduce his pre-tax product price, which will allow him to undercut the foreign producer and thereby gain market share.

4.3 Summary

To deepen the analysis of the interaction between industrial and other economic policies, this section has considered the set of policy instruments that can and should be used to implement industrial policy. Most importantly, it was discovered that the lack of 'own' instruments, and the associated need to 'borrow' instruments of other policy areas to achieve industrial policy goals, could create a conflict between industrial and other policies even when the policy goals are independent of one another.

***Instrument dependence
can create conflicts
between industrial and
other policies.***

In other words, this instrument dependence of industrial policy opens up another possible avenue for conflict with other policies. The case of outright goal conflicts was covered in Section 3, where it was concluded that in the case of a goal conflict, the cost of pursuing industrial policy is the inability to achieve the rival goal simultaneously. But even when the goals of industrial and another policy are not linked in any way, as was seen in this section, the use of other (fiscal, trade, or competition policy) instruments to achieve industrial policy goals can lead to a situation where the policy maker will have to abandon another policy goal (fiscal consolidation; free trade; or free competition) if he chooses to pursue an industrial policy goal.

So under what circumstances is this additional channel of conflict likely to be operative? It was observed that fiscal policy instruments are frequently both possible and economically optimal to pursue an industrial policy goal. Consequently, the use of subsidies and tax breaks – which are indeed the most frequently used instruments to extend state aid in EU countries – creates friction between industrial and fiscal policies whenever the optimal fiscal policy involves budgetary contraction. Arguably, this has been the case in most old member states of the EU for the past decades, so there has been a structural conflict between fiscal and industrial policies.

But could one not make the same argument concerning any government spending; after all, is there not a similar perpetual conflict between, say, education spending and fiscal consolidation?

The issue facing the policy maker contemplating industrial policy or any other action is one of productivity of public expenditure. In a world where economic efficiency guides the policy maker's action, the latter would prioritise spending so that the most productive expenditure are undertaken, while observing the budget constraint (short- and long-term fiscal targets). In this imaginary world, innovation subsidies; labour subsidies to smooth structural adjustment; and production or investment subsidies to capture rents would only be extended if they were not only productive (i.e., enhance social welfare) but also more productive than those expenditure that need to be curtailed so as to observe the budget constraint.

Thus, while there is an inherent conflict between fiscal spending to implement industrial policy and observing budget constraints, it is still possible to achieve both goals, provided the industrial policy spending is sufficiently productive. This result addresses the question of the compatibility of industrial and fiscal policies, which was left open at the end of Section 3. Having thus completed the circle that started with goal conflicts, passed through the choice of policy instruments, only to end up back at goal conflicts, it is high time to conclude.

5. Conclusions

When considered in its proper context, industrial policy appears somewhat more complicated than organ playing, at least by the standards of Johann Sebastian Bach quoted at the beginning of this paper. In addition to just hitting the right keys at the right time – which was sufficient for Bach's

masterly command of the instrument – the policy maker contemplating industrial policy action will also need to consider how it fits together with all the other instruments playing simultaneously. Even when industrial policy would seem fine in a solo context, it might be a real misfit as just another part of a bigger orchestra.

In this paper, two different sources of dissonance between industrial and other policies have been identified. First, the goals of industrial policy may conflict with those of especially domestic competition and international trade policies. Industrial policy, even when economically justified, has an element of 'favouritism' to it, with certain economic activities (innovation, agglomeration) or certain economic sectors or firms (domestic producers in internationally imperfectly competitive sectors; sunrise or sunset sectors; or socially weak and vulnerable sectors) receiving public sector support and protection. As is intuitively clear, such favouritism squares poorly with the general goals of free domestic and international competition. There are situations where industrial policy is compatible with competition and trade policies, as reviewed in Section 3, but in other situations there is an inherent conflict between the policies, meaning that the policy maker will ultimately have to choose whether to pursue industrial policy goals while sacrificing free competition or trade, or *vice versa*.

The second possible source of dissonance between industrial and other policies, it was discovered, is the fact that industrial policy does not have its own set of independent policy instruments. While this is not so much of an issue for competition or trade policies – after all, their goals are always either compatible or in conflict with those of industrial policy, no matter what – the issue of instrument dependence is an issue in the context of fiscal policy. Given the multitude of goals fiscal policy has, it is not straightforward to identify the circumstances where they conflict with industrial policy goals. That there is significant interaction between fiscal and industrial policies is however clear, as fiscal policy instruments are not only frequently used to implement industrial policy, but they are also in many cases optimal from an economic perspective.

Thus, the use of fiscal instruments to achieve two sets of goals creates interdependence between the policies, even when the policy goals *per se* were independent (such as the fiscal stance and innovation support). This interdependence is sometimes problem free (combining fiscal expansion with innovation subsidies), sometimes not. But the interdependence always means that there is a trade-off between fiscal spending for industrial policy and other purposes: given a certain fiscal deficit target, €100 million in industrial policy support is €100 million taken away from other spending. For industrial policy support through the budget to be economically sensible, it has to be more productive than the spending it crowds out. Again, the policy maker faces a choice: either he pursues an industrial policy goal while foregoing other goals, or *vice versa*.

While it is not directly novel to point out that there are trade-offs in economic policy making, it is important to articulate them clearly, especially in the case of industrial policy. First, the goal conflicts between industrial and other policies are there by the nature of the policies, so they are more fundamental in character than the sporadic conflicts between, say, monetary and fiscal policies. Second, instrument dependence as a source of conflict especially between fiscal and industrial policies is not obvious at first sight, but it confronts the policy maker with equally difficult choices as a goal conflict.

And, as a concluding thought, even when industrial policy would seem to play well together with other policies, it is still awfully difficult to get it right. Hitting the right keys at the right time is not as easy for a policy maker as playing the organ was for Bach.

Conflicts related to both policy goals and instruments create trade-offs between industrial and other policies, forcing policy makers to prioritise.

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