D SOME STATED OBJECTIVES OF GOVERNMENTS FOR USING SUBSIDIES

This Section discusses the main objectives governments claim to pursue with subsidies including industrial development, innovation and support for national champions, environment related objectives and redistribution. Under the broad category "redistribution", three more specific objectives are examined: the use of subsidies for regional policy purposes, adjustment support for declining industries and universal service obligations. This selection does not pretend to be exhaustive but it covers some of the most important objectives pursued by governments in developing and developed countries.

For each objective, the economic rationale for government intervention is discussed. The focus is on efficiency arguments, that is on whether an intervention may increase "the size of the pie", which does not mean that efficiency is the only criterion. Even if there is no efficiency argument, interventions might be justified for other reasons, such as to transfer income to certain disadvantaged groups within society or to augment national prestige. Economists have little to say about the weighting of other objectives relative to that of increasing efficiency. In each subsection, the effectiveness of subsidies with respect to the claimed objective is examined. Each subsection discusses the appropriateness of using accompanying and/or alternative measures. Reference is also made to the sectors in which subsidies are used to pursue particular objectives and some specific examples, e.g. of successful projects or failures are presented.

The first subsection discusses the use of subsidies for industrial development purposes from a developing country perspective. It considers how ideas and experiences have shaped approaches towards the role of government interventions and subsidies in particular in industrial development policies. The main efficiency-based arguments in favour of industry promotion, which are essentially variants of the "infant industry" promotion argument, are then analysed in some detail together with the role of subsidies in such policies. Given their importance in the debate on industrial promotion, implementation issues are addressed separately. A brief summary of the literature on the lessons from the Asian experience closes the discussion.

The second subsection examines the use of subsidies to support innovation and for strategic purposes. Innovations are an important driver of economic growth and support to innovation is a core component of industrial policies in emerging and developed countries. The discussion focuses on innovations at the global knowledge frontier, and not on the absorption of innovations that has to some extent been dealt with in the previous subsection. High R&D intensity is frequently associated with imperfect competition in the sectors concerned which might induce governments to use subsidies to shift rents or pursue other strategic policies. Subsidization of national champions is therefore also examined in this subsection.

The third subsection discusses the use of subsidies for redistribution purposes. A summary of the reasons why societies redistribute income is followed by an examination of the costs involved in transferring income from the rich to the poor. The effectiveness of different forms of subsidies is compared. The subsection then goes on to consider some specific examples of how governments use subsidies to achieve equity goals. While it is typically low-income groups who are the targets of redistribution programmes, subsidies to achieve more balance in regional development will also be discussed. Finally, the use of subsidies to assist declining industries to adjust to economic difficulties will also be considered in this subsection.

The fourth subsection compares instruments that can be used to support environmental conservation. The discussion focuses on the economic justification for the use of subsidies to conserve the environment, distinguishing between various causes of environmental degradation. A selective overview of the types of environmental subsidies that have been implemented by different countries is provided. Environmentally harmful subsidies – that is, subsidies that support activities that damage the environment – fall outside of the scope of this subsection, which addresses environmentally motivated subsidies.

The fifth and last subsection covers cases where subsidies to a certain sector are deemed justified on the basis of some specific characteristic of the sector, inherent to its very nature. Examples of this type of subsidies include subsidies to the energy or food sector justified by the specific role of these sectors in relation with national security, subsidies to agriculture justified on the basis of the so-called "multifunctional" character

of agriculture or of non-trade concerns, and subsidies to the audiovisual sector motivated by the perceived cultural value of the sector. As in previous subsections, the economic justification for the use of subsidies in these cases and the existence of possible policy alternatives are analysed.

1. INDUSTRIAL DEVELOPMENT

Policy-makers in developing countries often consider subsidies a useful tool to develop certain industries, with industries in this context referring to activities in the agriculture, manufacturing or services sectors. This objective has often been linked to the infant industry argument, i.e. the view that in the presence of more developed countries, less developed countries cannot develop new industries without state intervention. It has been argued that many of today's industrialized countries successfully applied infant industry promotion policies in early stages of their development. The role of government intervention in East Asia's industrial success has also received a lot of attention in the literature. Critics argue that the most impressive development records are related to a laissez-faire approach, keeping government intervention to the minimum. This subsection will survey the relevant literature and present examples illustrating both sides of the argument.

(a) Development strategies, industrial policy and subsidies

The approach to government-assisted industrial development and preferences for specific policy instruments have evolved over time as a result of changes in development thinking and the external environment. Ideas regarding the linkages between trade, development and the role of government have changed a good deal in the post-war period, influenced in part by country experiences.[42]

In the 1950s and early 1960s, development was equated with industrialization and import substitution was seen as the route to industrialization. The view that a more or less free market would not solve the development problem was widely accepted. Large-scale comprehensive planning was considered to be the appropriate policy instrument despite the fact that necessary data were largely missing and that neither planning nor growth were very well understood. The role of capital formation as the main source of growth was emphasized. As most capital goods had to be imported, overvalued exchange rates were seen as a means to encourage investment. But exchange rate overvaluation induced balance of payments pressures which were countered through a variety of trade restrictions. While protection was typically afforded mainly to consumer goods, in some large countries, domestic production of capital goods was encouraged by keeping out imports and by direct subsidies.[43]

The experience of the 1950s and early 1960s, sometimes referred to as the easy stage of import substitution, created considerable hope among economists and country leaders. Compared with the pre-war period, investment and growth rates increased as did the share of manufacturing in GDP. Life expectancy at birth and literacy rates rose and infrastructure developed. During the 1960s however, distortions became increasingly evident. Agriculture was penalized. Exports were penalized. Unemployment prevailed and, surprisingly, capital was underutilized. Two large collections of case studies published around 1970 carefully documented these distortions.[44] At the same time, estimates of total factor productivity growth became available showing very limited improvements, if any, in developing countries. It also became apparent that poverty was not declining at a significant pace.

By 1970, economists had started having doubts regarding import substitution as a development strategy. Doubts were not only fed by the facts. Developments of economic theory also contributed. While second-best theory had provided intellectual support to import substitution, the general theory of distortions, which refined it, reinforced the case for trade liberalization. Second-best theory suggested that trade liberalization could not be guaranteed to be advantageous in an otherwise distorted world. The general theory of distortions further developed the argument and showed that trade policy is usually neither first nor second best but rather *n*-th best. Another attack on the import substitution strategy came from Robert Baldwin's influential paper entitled

42 See Winters (2000), Bruton (1998).

43 See Bruton (1998).

44 See Balassa and associates (1971) and Little et al. (1970).

"The case against infant industry protection" published in 1969. In his paper, Baldwin showed convincingly that infant-industry duties do not only distort consumption, they may fail to correct the market failures they are intended to address and may even result in a decrease in social welfare. If, for instance, the acquisition of the socially optimal level of knowledge requires some direct outlays, imposing tariffs is no guarantee that these socially optimal outlays will be made. He also explained that what is required to handle the special problems of infant industries is a much more direct and selective policy measure than general import duties.

Doubts regarding the import substitution strategy were further fed by the exceptional export and growth performances of the Republic of Korea and Chinese Taipei in the 1960s. Chinese Taipei and the Republic of Korea had made substantial policy changes in the late 1950s and early 1960s that encouraged firms to export. In both cases, exchange rates were unified, currencies devalued and export incentives put in place. These policies were designed to ensure that producers were no longer rewarded primarily for selling in the domestic market – returns to exporting were made at least as attractive through the removal of the anti-export bias inherent in import substitution policies. Initially, these strategies were seen as export promotion with limited government intervention. However, this view was soon disputed. It is now largely acknowledged that governments intensively promoted specific sectors in the Republic of Korea and Chinese Taipei, as well as in Japan. Whether export promotion and trade policy interventions played a crucial role in the "East Asian Miracle" is an open question.[45] What is fairly clear, however, is that the circumstances leading to success in the Republic of Korea and Chinese Taipei were not typical. The policy instruments used were typically the same as those used elsewhere, including import quotas and licenses, export subsidies, public ownership and tax holidays. But the manner of implementing and monitoring trade policies were different. A political leadership fully committed to strong economic performance was firmly in place and government-business relationships were highly unusual. The extent to which government priorities and resources were organized around export performance in the Republic of Korea was striking.[46]

The lessons learned from the import substitution experience, and some learned from the export promotion experiences in the Republic of Korea and Chinese Taipei, contributed to the emergence in the 1980s of a new strategy relying on outward orientation with minimal government involvement.[47] The emphasis on exports as an engine of growth was drawn from the Asian experiences, while the strong scepticism *vis-à-vis* government interventions was largely inspired by the import substitution experiences. Anne Krueger's work on rent seeking and difficulties associated with the implementation of sophisticated policies supported the view that government failures were more likely than market failures and that an effective market mechanism would naturally emerge if policy-induced distortions were eliminated. Over the 1980s, the World Bank and the International Monetary Fund became strong advocates of an outward orientation strategy.

In the outward orientation strategy, the suspicion of targeted trade policy interventions was rooted in a general scepticism regarding the capability of governments to deliver appropriate policies. While most supporters of outward orientation would agree that some market failures provide a case for temporary intervention, they would stress difficulties with detecting and quantifying the externality, identifying the appropriate intervention and preventing the capture of policies, as reasons not to intervene. This scepticism was itself largely based on anecdotal evidence and stylized facts.

During the 1990s, the outward orientation strategy came increasingly under fire. Disappointing results in Latin America and Africa, unsatisfactory performance in the transitional economies and the financial crisis in Asia raised doubts regarding the capacity of outward orientation to promote development. Empirical work regarding the growth benefits of openness looked more promising initially, but this work has been challenged more recently on methodological grounds.[48] Interest in the linkages between trade reforms, inequality and poverty has also revived, and results have confirmed there can be no simple general conclusion about the relationship between trade liberalization and poverty.[49] The debate on the interpretation and the lessons to

45 See the detailed discussion in Noland and Pack (2003).

46 See Noland and Pack (2003), Bruton (1998) and Rodrik (1993).

47 The outward orientation development strategy is sometimes referred to as the New Orthodoxy or the "Washington Consensus".

48 See Hallak and Levinsohn (2004).

49 See Winters et al. (2004).

be drawn from the East Asian experience has intensified.[50] The presumption that governments typically lack the capacity to implement trade policies has also been questioned.[51]

With this background of growing doubts, new strategies have been slow to emerge. A number of trends however can be identified. First, multilateral, regional and bilateral trade agreements are imposing increasing disciplines on traditional trade-policy instruments. Tariffs are progressively being reduced, quotas are largely prohibited and subsidies are disciplined. Governments make an increasing use of new trade policy tools, in particular export promotion and FDI attraction.[52] Second, attention has progressively shifted from import policies to export policies. The World Bank's focus, for instance, has moved from the incentive framework associated with the tariff regime to removing policy and other obstacles that prevent producers from taking advantage of new market opportunities. This has been reflected in the Integrated Framework Diagnostic Trade Integration Studies. Third, the crucial importance of institutions and learning have been recognized. This has repercussions for the design of industrial development policies. Finally, economists are more nuanced and cautious with policy advice than they were before. Most importantly, the one-size-fits-all approach has been abandoned. A better understanding of the growth and poverty effects of specific trade and industrial policy interventions is warranted.[53]

Considerable divergence remains in views on the role of governments in industrial development strategies. Although the need in some instances for pro-active government interventions and industrial policies has been recognized, the World Bank continues to mistrust direct government selection of promising sectors and to favour the use of indirect mechanisms to promote technological upgrading, by means of attracting FDI and developing local technological capabilities.[54] At the same time, a new strand of literature is exploring novel approaches to industrial policy that take into account the traditional arguments against interventions. One approach emphasizes information externalities entailed in discovering the cost structure of an economy, and coordination externalities in the presence of scale economies, and sees industrial policy as a discovery process where firms and the government learn about underlying costs and opportunities and engage in strategic coordination.[55] Another approach emphasizes the role of recent shifts in the institutional mechanism of international trade such as the emergence of production and buyer-led networks and sees negotiations with multinational corporations as the main focus of industrial policy.[56]

(b) Arguments for industrial promotion

As explained in Section C above, for economists the case for government interventions rests on the existence of market failures. With perfect competition, small firms and well-functioning markets, prices give producers the appropriate signals for efficient resource allocation. Government support causes resources to be used in an industry beyond what is optimal. This is all the more so if part of the subsidized output is exported and contributes to a deterioration of the terms of trade. In the presence of market failures, the general theory of the second best applies. This theory argues that for every market distortion, there is an optimal policy intervention that addresses the distortion most directly and does not create additional distortions. If the optimal remedy is not available to the government for some reason, other measures can be taken which indirectly address the distortion. In general, industry-wide subsidies do not address distortions in a targeted way and would not be optimal. Thus, for each market imperfection, it is necessary to consider whether output or export subsidies would improve efficiency but also whether and which other measures might be available for achieving even greater efficiency.[57]

50 See Noland and Pack (2003).

51 See Rodrik (1995).

52 See Melo (2001).

53 See Hallak and Levinsohn (2004). Moreover, given the complex and ambiguous nature of the effects of certain interventions, careful impact assessments are recommended prior to the introduction of trade reforms. Such assessments may help design complementary and compensatory measures.

54 See de Ferranti et al. (2002).

55 See Hausmann and Rodrik (2003) and Rodrik (2004).

56 See Pack and Saggi (2006)

57 See Grossman (1990).

The main arguments that have been put forward to justify selective government interventions in developing countries involve information and coordination problems. Informational barriers to entry and learning spillovers among producers lie behind the most familiar variant of the classic infant industry argument. This is the case where productivity gains resulting from learning-by-doing accrue partly to firms other than the one that actually undertakes the manufacturing. More recently, spillovers associated with learning about the suitability of local conditions for production have drawn considerable attention in relation to diversification. Information problems faced by consumers have also provided arguments for interventions in support of infant industries. When consumers have imperfect information on foreign products, a firm's investment aimed at building reputation will benefit others.[58] Finally, information problems faced by lenders on capital markets have played a prominent role in the infant industry debate. Because of information asymmetries, equities markets do not finance much new investment. Credit mechanisms then become the primary vehicle for raising capital. But credit markets are often characterized by credit rationing.[59]

Coordination problems, which may justify an intervention, could arise in the presence of interdependent investments related to vertical linkages, large-scale economies and restrictions to trade. Entry by a new producer may be inhibited by the lack of a purchaser or of a low-cost producer for an important input.[60] More generally, markets play a central role in coordinating economic activities through the price system. But information is also conveyed to economic agents by various other institutions that are relatively well developed in the rich countries. Institutional arrangements for cooperation and information exchange are typically weaker in developing than in developed countries. Hence there may be a greater role for governments to create institutions and facilitate coordination.[61]

Other arguments for selective industrial policy interventions that have been considered but could be seen as less specific to development, relate to situations where research and development generate knowledge spillovers or where imperfect competition allows governments to pursue strategic trade policies. These cases are examined in subsection 2 below.

The first infant industry proponents at the end of the eighteenth century stressed that production costs for newly established industries within a country are likely to be initially higher than for well-established foreign producers of the same product, who have greater experience and higher skill levels. That alone, however, would not justify a government intervention for efficiency purposes. If costs are expected to fall sufficiently during the learning period to generate a discounted surplus of revenue over costs after a reasonable period of time, firms should be able to raise the funds they need to cover the losses incurred during the learning period in the capital market. If this is impossible, it is likely to be because of some failure of the capital market, a case that is considered below.

The infant industry argument must rest on the existence of knowledge spillovers or externalities associated with the learning process.[62] The theoretical case for government intervention in the presence of knowledge spillovers that arise from learning-by-doing is fairly straightforward. Such spillovers arise when the new producer who incurs costs in order to discover the best way to produce a particular product, cannot appropriate all the productivity gains that are generated. If information becomes freely available to potential competitors, competition will raise factor prices or compress the product's price to a point where the initial firm cannot recover its total costs. Without government intervention, individual entrepreneurs will not have adequate incentive to invest in knowledge acquisition. When private marginal costs of production exceed social marginal costs, because other firms benefit from a given firm's output, then an output subsidy is the policy instrument of choice. Trade policies are next best, as they promote learning but also introduce a negative volume of trade effect.[63]

58 See Grossman and Horn (1988) for instance.

59 See World Bank (1993).

60 Lall (2002).

61 See World Bank (1993).

62 See Noland and Pack (2003) for a list of externalities related to the learning process.

63 See Grossman (1990).

A variant of this argument applies specifically to exports.[64] In the presence of spillovers from "learning-by-exporting", producers will be reluctant to start exporting in the absence of government interventions. An export subsidy granted to pioneer exporters may improve upon the market outcome. Other than direct export subsidies, this argument has been used to justify programs to subsidize and coordinate the exploration of foreign markets.[65] Some examples of such policies are presented in Box 6.

The controversy over this variant of the infant industry argument does not centre on analytical issues but rather on empirical and practical matters. One question relates to the pervasiveness of such situations. While learning-by-doing spillovers are often assumed to be pervasive, available evidence is relatively scarce and does not provide a very clear picture. The small existing body of work on the estimation of learning effects suggests that the importance of such spillovers might differ among industries. There is evidence that learning spillovers are present in nuclear power plant construction, wind-turbine production, the production of various memory chips and the chemical processing industry.[66] On the other hand, evidence suggests that there were little or no spillovers in Japanese steel in the 1950s and 1960s and across American shipbuilding yards.[67] Another empirical study, which examined learning-by-doing in the early American rayon industry shows that there can be considerable differences across firms in their ability to benefit from other firms' learning-by-doing.[68] Evidence regarding less developed countries is even more difficult to interpret. Based on their review of research in less developed countries, Bell et al. (1984) found little support for the claim that firms entering a new activity can learn costlessly from the experience of others, while Tybout (2000) in a similar but more recent review, notes that the best documented case of spillovers in less-developed countries is the Green Revolution in Indian agriculture.

There is some econometric evidence regarding information spillovers from exporting. Aitken et al. (1997) examine whether locating near other exporters increases the probability of exporting, using data on 2,104 Mexican plants over the period between 1986 and 1990. They find that the probability that a domestic plant exports is positively correlated with the proximity of other exporters, but only if the latter are multinationals. As a consequence, the authors highlight the importance of the presence of multinational enterprises in export processing zones. Clerides et al. (1998) find that the costs of breaking into foreign markets are negatively related to the number of firms that have already done so. However, Bernard and Jensen (2004) do not find any evidence of spillovers from exporting. They also do not find any effect of state export promotion on exporting.

The second matter of controversy relates to the administrative and fiscal feasibility of the policy interventions, their informational requirements, and their political economy consequences. Recent theoretical and empirical research on industrial development policy has focused on a slightly different market failure. It is related to informational externalities in the entrepreneurial process of discovering new profitable investment opportunities.[69] In open economies, new profitable investment opportunities would almost naturally involve export products. Diversification and the discovery of new opportunities for profitable production or export are closely linked to development. Empirical work by Imbs and Wacziarg (2003) shows that the relation between diversification and development has the shape of an inverted U. Diversification first increases with development but there exists a point, relatively late in the development process, where countries start specializing again. It is not clear whether the discovery activity simply occurs with economic growth or if it is a driver of subsequent growth.[70] There is also a considerable body of policy literature that emphasizes the benefits of export diversification.[71]

64 See Panagariya (2000).

65 See Rodriguez-Clare (2004).

66 See Zimmerman (1982), Hansen et al. (2003), Neij et al. (2003), Irwin and Klenow (1994), Gruber (1998) and Lieberman (1984).

67 Ohashi (2004) finds little intra-industry knowledge spillovers in Japanese steel in the 1950s and 1960s while Thornton and Thompson (2001) find strong learning effects but small spillovers across shipbuilding yards in the US.

68 See Jarmin (1994).

69 See Hausmann and Rodrik (2003).

70 On this last point, see Klinger and Lederman (2004).

71 See the introduction by G.K Helleiner in Helleiner (2002).

Box 6: Export assistance in WTO Members

Governments provide assistance to exporters by supporting activities dealing with export facilitation, information, image-building and participation in fairs. Export assistance to the business community has been available in industrialized countries for a long time, but availability of support services markedly increased since the 1970s.[1] Institutions responsible for the development and management of export promotion system vary across countries and involve the government, private sector organizations or a mixture of both. Export assistance activities can be divided into two groups: activities providing information on export opportunities to potential domestic exporters and activities providing information on domestic products and producers to potential foreign importers. The need for governments to intervene in export assistance has been justified on the ground of information spillovers from pioneer exporters on other potential exporters.[2]

The Table below gives an overview of export promotion activities offered by WTO Member governments according to the information provided in the Trade Policy Review reports from January 2004 to October 2005.[3] In the table commercial offices are only those that are explicitly mentioned as being branches of an export promotion agency. Embassies and consulates that fulfil the services of commercial offices abroad are not taken into account.[4]

Export promotion policies in WTO Members

	WTO Members
Information for and assistance to potential exporters	
on-shore activities: information	
information centres	Ecuador, Philippines, Republic of Korea, Switzerland
provision and management of trade data (bank)	Nigeria, Philippines, Suriname, Tunisia
on-shore activities: assistance	
quality control, certification etc.	Brazil, Republic of Guinea, Trinidad and Tobago
on-line business portal	Burkina Faso, Jamaica, Paraguay
training	Brazil, Burkina Faso, Ecuador, Jamaica, Nigeria, Tunisia
assistance in administrative matters	Egypt
assistance in product design and other advisory services	Japan, Nigeria, Sri Lanka, Switzerland
off-shore activities	
market surveys/ identification of market opportunities	Belize, Brazil, Burkina Faso, Egypt, Jamaica, Japan, Mongolia, Nigeria, Paraguay, Singapore, Sri Lanka, Switzerland, Suriname, Trinidad and Tobago, Tunisia
commercial offices	Ecuador, Jamaica, Singapore
Information for potential importers abroad	
on-shore activities	
organize domestic fairs and exhibitions	Belize, Republic of Guinea, Republic of Korea, Suriname, Tunisia
off-shore activities	
support exporters' participation in fairs and exhibitions abroad	Belize, Brazil, Burkina Faso, Japan, Nigeria, Philippines, Republic of Korea, Switzerland, Trinidad and Tobago
represent exporters in fairs and exhibitions abroad	Jamaica, Suriname, Switzerland
participation in trade missions	Burkina Faso, Nigeria, Republic of Korea
advertising abroad/ image building	Belize, Brazil, Egypt, Jamaica, Nigeria, Republic of Korea, Suriname, Switzerland, Trinidad and Tobago, Tunisia

1 Seringhaus and Botschen (1991).
2 See for instance Aitken et al. (1997).
3 See Box 17 for an explanation of the WTO's trade policy review mechanism. Trade Policy Review (TPR) reports use the term export promotion in the context discussed here, rather than export assistance. The term export assistance is chosen in this box in order to differentiate the activities discussed here from the broader term "export promotion strategy" as used in the rest of this Report.
4 See Rosen (2005).

Source: Trade Policy Review reports published between January 2004 and October 2005 and covering the following 29 WTO Members: Belize, Benin, Brazil, Burkina Faso, Ecuador, European Communities, Egypt, The Gambia, Jamaica, Japan, Liechtenstein, Mali, Mongolia, Nigeria, Norway, Qatar, Paraguay, Philippines, Republic of Guinea, Republic of Korea, Rwanda, Sierra Leone, Singapore, Sri Lanka, Suriname, Switzerland, Trinidad and Tobago, Tunisia, United States. No explicit export promotion programs have been reported in: European Communities, The Gambia, Mali, Qatar, Sierra Leone and United States. Rwanda has not set up any arrangements for export promotion.

Diversification of the productive and export structure requires learning what one is good at producing, which itself involves the "discovery" of an economy's cost structure. Producers must experiment with new product lines. They must discover whether it is cut flowers, soccer balls or computer software that can be produced at low cost. The problem is that this activity has a great social value but that the entrepreneur who makes the discovery can only appropriate a small part of its social value. If the entrepreneur fails in his venture, he bears the full cost of his failure. If he succeeds, others will follow and he will have to share the value of his discovery. It is important to distinguish discoveries as defined in this paragraph from innovation and R&D. What is involved here is not inventing new products or new processes but "discovering" that a certain product, already well established in world markets, can be produced at home at low cost.[72] This typically involves technological tinkering to adapt foreign technology to domestic conditions.[73]

In the presence of informational externalities of the type just described, laissez-faire leads to underprovision of "discovery" and governments need to play a dual role. They need to encourage entrepreneurship and investment in new activities *ex-ante*, but impose discipline and stop unproductive activities *ex-post*. A comparison of various types of interventions suggests that trade protection is not an efficient way of promoting self-discovery, while both export subsidies and government loans and guarantees have benefits and costs.[74] Export subsidies increase the returns to success while government loans and guarantees lower the losses in case of failure. Export subsidies do not discriminate between innovators and copycats, while government loans and guarantees do. But loans and guarantees distort risk assessment.

Hausmann and Rodrik (2003) provide indirect empirical evidence in support of the argument that inadequate incentives to invest in learning what one is good at producing hamper the development of non-traditional activities. They provide support from the literature on international trade, technology transfer and economic history for three separate propositions. The first proposition is that there is a large element of uncertainty about what a country will be good at producing, beyond broad aggregates such as "labour-intensive manufactures". Second, there are significant difficulties entailed in importing technology off-the-shelf and successful local adaptation requires considerable domestic tinkering. Third, domestic imitation often proceeds rapidly when the first two difficulties are overcome, bidding away the rents of the early incumbents.

Information problems faced by consumers have also provided arguments for interventions in support of infant industries. If industry pioneers have already developed their reputations among consumers, potential competitors offering similar quality products at similar or even lower costs may not be able to penetrate the market. The argument that information barriers might preclude efficient entry would seem to have relevance for a number of manufacturing and services industries.[75] Depending on their assumptions, different analyses have strikingly different policy implications. Under the assumption that firms do not choose the level of quality of their products, subsidies can be shown to improve domestic welfare.[76] However, under the assumption that firms can choose their products' attributes, output subsidies, which affect only the price that a firm receives for its product, will not solve the market failure. This is because subsidies reward reputable firms and fly-by-nights equally, and do not alter the incentives that firms face in choosing among these strategies. In such a case, policies that provide a differential incentive for firms to produce goods of higher quality such as minimum quality standards would be preferable.

Coordination failures have long been seen as an argument for government intervention.[77] Recent research suggests that coordination failures in taking the necessary actions to increase sector-wide productivity may seriously hamper development as they impede the emergence of activities where industry-specific local externalities are important.[78] Because production and investment decisions in the upstream and downstream parts of industry are often

72 See Hausmann and Rodrik (2003) and Hoff (1997).

73 In their survey of technological transfer, Evenson and Westphal (1995) list adaptations such as "technological efforts related to raw material control, product and process quality control, production scheduling, repair and maintenance, changes in production mix, etc."

74 See Hausmann and Rodrik (2003).

75 See Grossman and Horn (1988).

76 See Bagwell and Staiger (1988) or Mayer (1984).

77 See World Bank (1993) for instance.

78 See Rodriguez-Clare (2005).

interdependent, in the absence of coordination, profitable new industries can fail to develop. Building an airport in a region that has no hotels would not lead to any traffic, but hotels without a regional airport may not be profitable either. Similarly, a large scale irrigation project would not be profitable if there are only few farms using modern technologies, but using such technologies is profitable only if there is adequate irrigation.[79] Two conditions are necessary for coordination failures to arise: new industries must exhibit scale economies and some of the inputs must be non-tradable or require geographic proximity.[80] Under certain circumstances, coordination can be achieved without government intervention but a government role may be required in some cases.

The most efficient intervention in the presence of coordination failures is not a production subsidy. There is no need for production subsidies because all the investments, if they are made, are profitable. The purpose of the government's intervention is to ensure that all interrelated investments are made. This can be achieved through pure coordination or through *ex-ante* subsidy schemes. Examples of such *ex-ante* subsidies include investment guarantees or implicit bail-outs. One problem is that measures like these induce moral hazard and are prone to abuse.[81] Note that because all industries in principle have characteristics that could generate clusters, but at the same time many industries can operate in the absence of clusters, the appropriate policy should not be targeted on particular sectors but rather be targeted at the activity or technology that would contribute to solving the coordination failure.

Capital market imperfections are often seen as an obstacle to industrial development. Capital markets take on a critical role in the process of entry into a new industrial activity. They first intervene in one of the versions of the infant industry argument. In the presence of learning-by-doing, so this argument goes, a producer who could make profits in the long run may not enter the market due to higher costs in the early years than those of incumbent firms. Over time, profits would cover the initial losses but in the absence of well-functioning capital markets, the producer would not have access to the funds he needs. Economic theory tells us that the first best solution in this case is to correct the credit market imperfections directly. For instance, equity injections through venture capital firms would be preferable to protection or production subsidies.[82]

Capital market imperfections have also been used to justify credit subsidies and subsidized credit insurance, in particular for exports. The process of entry into a new industrial activity can only be efficient if producers can borrow funds at rates that reflect social cost plus a reasonable premium related to the risk associated with the new activity. However, capital markets are among those most affected by information problems. Equity markets are often weak or absent in developing countries, while credit is often rationed and seldom allocated to the highest bidder. The reason for this is that bidders are bidding promises while lenders are interested in the actual rather than the promised return. As a result, capital is allocated by a screening and evaluation process which is quite different from the one that would be associated with perfect markets. If for some reason the private cost of capital is higher than its social cost, the argument goes, governments must subsidize credits. If on the other hand, some information failure prevents a correct evaluation of the risk associated with new activities, the government should provide subsidized credit insurance.

In many countries government agencies exist to assist domestic companies in financing the export of domestic goods and services to international markets. These agencies include the Italian SACE, the French COFACE, the US Ex-Im Bank, the Japanese NEXI and the German EULER HERMES. They provide, for instance, working capital guarantees (pre-export financing); export credit insurance; and loan guarantees and direct loans (buyer financing). In many instances these activities result in the provision of subsidized insurance of export credits and/or the provision of credit finance at subsidized interest rates. See Box 7 for a further discussion on export credits.

79 Rodriguez-Clare (2005) provides several other examples of national and sector level coordination failures.

80 See Rodrik (1996). The cluster approach to development is based on a similar idea. See also the discussion of those conditions in Pack and Saggi (2006).

81 Moral hazard is defined as an insurance-induced alteration of behaviour that makes the event insured against more likely to occur.

82 Stiglitz (1993) discusses the role of governments in financial markets.

Box 7: The OECD Export Credit Arrangement

Under the auspices of the OECD, an Export Credit Arrangement came into existence in 1978. The Arrangement places limitations on the terms and conditions of officially supported export credits (e.g. minimum interest rates, risk fees and maximum repayment terms) and the provision of tied aid. It includes procedures for prior notification, consultation, information exchange and review for export credit offers that are exceptions to or derogations from the rules as well as tied aid offers. The participants to the Arrangement are: Australia, Canada, the European Community, Japan, Republic of Korea, New Zealand, Norway, Switzerland and the United States.

The OECD regularly collects data on the export credit activities of the members to the Export Credit Arrangement. The Table below gives information on the value of transactions covered by long-term export credits for the years 1998-2003. It also gives information on the allocation of export credits across sectors in the mentioned period. Around 40 per cent of total transaction value was allocated to transport and storage in most of the years, while around one-third was dedicated to energy-related activities. The bulk of the former transactions went to the air transport sector. A lot of the energy-related transactions were related to coal-fired, gas-fired or nuclear power plants and to "energy manufacturing". Note that separate sector understandings exist on export credits for ships, nuclear power plants, civil aircraft and – during a trial period up to June 2007 – for renewable energies and water projects.

Long-term (over five years) export credits by sector, 1998-2003
(Percentages and billion dollars)

SECTOR	1998	1999	2000	2001	2002	2003
	Percentage					
Agriculture	0.4	0.2	0.1	0.6	0.3	1.4
Communications	4.4	3.1	7.8	9.3	10.9	4.4
Construction	0.1	0.6	0.9	1.2	1.3	0.7
Other services	1.4	1.4	0.9	1.6	2.4	1.5
Energy generation and supply	22.6	19.9	26.5	10.4	10.0	19.0
Industry	24.4	14.4	20.4	25.0	27.9	14.6
of which chemicals	0.7	2.4	2.6	7.5	4.3	3.4
of which energy manufacturing	8.3	3.6	1.8	3.9	4.1	3.1
Fishing	0.0	0.0	0.0	0.0	0.1	0.0
Forestry	..	..	..	0.1	..	..
Mineral resources and mining	6.8	2.3	2.9	6.6	5.2	8.4
Transport and storage	38.1	55.7	39.0	43.2	39.2	47.6
Water supply and sanitation	1.0	1.7	0.8	1.4	2.2	0.6
Others	0.9	0.8	0.7	0.6	0.6	1.8
	Billion dollars					
TOTAL	88.6	113.8	121.7	110.4	96.7	100.0

Source: OECD (2005b).

From a theoretical point of view, this argument is not completely straightforward. Consider first the case for subsidized insurance. The case for intervention would need to rest on potential insurers' irrational aversion to risk or their systematic overestimation of the risk associated with new activities. It would also rest on the assumption that the government is better able than the private sector to assess risk. Economists do not see this case as very compelling.[83] Even the more sophisticated arguments, where the absence of an insurance market is explained by moral hazard or adverse selection, are not regarded as compelling because governments are not deemed to have a particular advantage over the market in dealing with those informational problems.[84]

[83] See Grossman (1990) and Panagariya (2000).

[84] See Panagariya (2000).

Similarly, in the case of credit subsidies, it has been argued that so far no compelling case for such subsidies has been articulated.[85] Grossman (1990) examines the precise market interactions that might give rise to a divergence between private and social discount rates. He shows that it may be difficult if not impossible for the government to know *ex ante* whether to encourage or discourage investments in some new activity to compensate for the biases stemming from imperfections in private capital markets. His conclusion is that a cautious policy response to alleged capital market imperfections seems advisable.

(c) Implementation issues

Much of the discussion regarding the merits of industrial development policies has focused on the administrative and fiscal feasibility of government interventions, their informational requirements, and their political economy consequences. Economists typically agree on the theoretical case for government intervention in the presence of market failures, such as those discussed above, although there is some disagreement regarding the empirical relevance of the cases that have been identified. However, as already mentioned, there is a clear divergence of views on the feasibility issue, which is closely related to the divergence in the interpretation of the East Asian success stories and other experiences. This subsection considers the feasibility issue while the next one summarizes the debate on the lessons to draw from existing experiences.

Lall (2002) proposes a useful typology of export promotion policies that can be applied to industrial policy interventions. He first distinguishes between two groups of policies according to the nature of the market failure they are supposed to address. The first group includes "permissive policies", that is, policies aimed at removing distortions created by policies that deter exporting or more generally the development of new activities. This group includes mainly policy reforms aimed at reducing macro-policy mismanagement and uncertainty, make exporting profitable and minimizing transaction costs to producers. Permissive policies are fairly uncontroversial.

The second group comprises "positive policies" to overcome structural market deficiencies in the creation of new advantages. Positive policies aim mainly at encouraging new activities. They can be subdivided into functional and selective interventions. Functional interventions are market-friendly interventions aimed at addressing market failures without directly modifying resource allocation between specific activities. Examples of functional policies would include improvements in physical infrastructure, human capital or the functioning of capital markets, or the provision of information and technical support to potential exporters. Functional policies are also relatively uncontroversial.[86] Selective interventions are the most controversial. They intend to influence resource allocation, through specific subsidies or protection, credit direction, creation of specific skills or technologies, promoting large firms or attracting specific investors, etc.

The mainstream view of development, often termed the "market friendly" view, would accept the need for permissive and functional interventions but reject the use of selective interventions.[87] In the mainstream view, only the failures that call for functional interventions should be addressed. Failures that require selectivity are either unimportant or cannot be remedied. In other words, either the cost of selective market failures is low enough not to matter, or it is lower than the cost of government failures. This view has been criticized on the one side by those who think that getting the prices right is sufficient for an economy to reach optimality, and that neither functional nor selective measures are justified. On the other side, there are those who think that market failures are important and pervasive, and that effective remedies can be devised.[88] The espousal of this view implies a crucial role for governments, including through selective interventions.

Various arguments against selective interventions have been discussed in the literature. Among the main arguments are that developing countries lack the competent bureaucracies to render such interventions effective, that governments cannot pick the winners and that interventions are prone to political capture and corruption. The following paragraphs discuss these arguments in more detail.

85 See Panagariya (2000) and Grossman (1990).

86 Certain functional policies, such as investment in transport infrastructure, may be relatively uncontroversial from an economic perspective, but controversial from an environmental perspective.

87 See Noland and Pack (2003) for a recent restatement of the mainstream market-friendly position.

88 A "strong" neo-classical position would accept only permissive interventions while a structuralist or revisionist view would support certain selective interventions.

First, the implementation of selective interventions requires a considerable amount of information and skill.[89] As discussed, domestic market failures should be corrected by domestic policies aimed directly at the source of the problem. Governments thus need to have fairly detailed information about the nature and the location of market failures that need to be addressed. For instance, governments would need to identify industries where domestic producers would have a comparative advantage but where learning spillovers prevent the development of a local industry. However, market failures such as learning spillovers or coordination problems are typically hard to identify precisely, so that it tends to be difficult to be sure about the appropriate policy response. There is no reason to assume that the government is well informed or even that it is better informed than the private sector. Moreover, it has been shown that the administration of export subsidies in particular tends to be "organizationally demanding".[90] Technical and administrative skills are needed to understand and design strategies and interventions, to implement and improve them over time, to communicate with the private sector and to ensure that agency problems are overcome.[91] Such skills are often in short supply in developing countries.

Various authors consider that information and skills problems should not be exaggerated. In their view, governments have to decide upon which path they set the economy, but they do not need to assess the costs and benefits of different outcomes. More importantly, they believe that even good decision-making by governments necessarily involves errors.[92] According to Rodrik (2004), the key is to make sure that the State and the firms work together. Public officials need to be able to elicit information from the business sector on an ongoing basis about opportunities, constraints, technological and market parameters and local capabilities. The problem is that, as discussed below, with increased proximity between the government and private interests the risk of capture increases.

Second, industrial policy is open to political capture, corruption and rent-seeking. The neo-classical political-economy literature on trade policy shows how government intervention is likely to produce inefficiencies. Decision-makers in the public sector are modelled as individuals who maximize their welfare and not necessarily the welfare of society. Several conclusions emerge from this type of analysis.[93] Because discretionary behaviour by government officials comes at a cost, a rules-based policy regime which entails high degrees of pre-commitment is advantageous. Moreover, policy stability and predictability help coax the desired response from the private sector. Finally, policies that create rents also create rent seekers. Bureaucrats thus have an incentive to create rents. These conclusions lead to an obvious conclusion: policy interventions should be avoided and the role of the government should be minimized, but in any case, private groups should be kept at arms' length from the government. The risk of political capture is even higher for selective interventions with all the difficulties associated with their implementation. As regards the infant-industry argument, political economy models suggest that while the infant-industry argument is typically an argument for temporary interventions, policies tend to get captured by special interests and become permanent.

While most economists would agree that the results from these "public choice" models are useful to understand the effect of industrial policies, they would not all agree with the broad policy conclusions that have been derived from those models. The latter argue that government capabilities can be improved, that the degree of selectivity can be adapted to the level of capabilities, and that governments can be helped to intervene efficiently.[94] Rodrik (1993) suggests that academic economists' views on state capabilities is superficial and that there is much to be learned by undertaking systematic analytical studies of state capabilities. Rodrik (2004) goes one step further and proposes an institutional framework for "redeploying industrial policy in a more effective manner". The principal-agent model, with the government as the principal and the firms as its agent does not work well, notwithstanding the articulation of an optimal policy that aligns the firms' behaviour with the government's objectives at least cost. Ideally, one would need a more flexible form of strategic collaboration between the public and private sectors, designed to elicit information about objectives, distribute responsibilities for solutions, and evaluate outcomes as they appear.

89 See Pack and Saggi (2006).

90 See Levy (1993).

91 See Lall (2002).

92 See Stiglitz (1996).

93 See Rodrik (1993) and Shapiro and Taylor (1990).

94 See Lall (2002).

There are also reasons to believe that from the point of view of implementation, export promotion has some advantages compared with import substitution. Panagariya (2000), while generally in favour of laissez-faire, points to two reasons to prefer export promotion to import substitution on political economy grounds. The first is that chances to pick an industry where the country has a comparative advantage are better and the second is that the costs of subsidies, which show up in budgets, are more transparent than those of tariffs. Along similar lines, Noland and Pack (2003) come to the conclusion that the use of export performance to measure success rather than the provision of open-ended protection for inefficient sectors explains why Asian industrial policies have a better record than import substitution experiences elsewhere. They note that as a purely practical matter, performance in world markets was probably the criterion least amenable to rigging by the firms or their bureaucratic counterparts.

Two further points have been raised against the use of selective policies. One is that most interventions, and in particular subsidies, use scarce resources.[95] Yet the opportunity cost of industrial policy interventions and the deadweight loss often imposed on other sectors by taxes used to pay for subsidies are typically not taken into account in policy assessments. This is a very general argument but not necessarily one that would condemn all selective interventions. Clearly, resource costs should be taken into account. The other point, which will be discussed in Section F below, is that multilateral disciplines restrict the use of some selective interventions. And more generally, in the case where interventions have a negative impact on third parties, the risk of retaliation should be taken into account.

(d) Export Processing Zones and industrial development

Export processing zones (EPZs) have been established over decades and today significant shares of developing countries' manufactured exports originate in EPZs. This Section defines EPZs as geographic areas that offer firms established within them more liberal trade conditions and a more liberal regulatory environment than common within the relevant country.[96] Note that this definition therefore does not include *maquiladoras* that distinguish themselves from other companies purely through their economic activities and not necessarily through their location. Paraguay, for instance, has different legislations for *maquiladoras* and for EPZs, with *maquiladoras* being defined as companies that perform value-added activities for foreign companies using the goods and services provided by those foreign companies. Those value-added activities include transformation, elaboration, repair, assembly or industrial processing. The final products of the *maquiladoras* are expected to be re-exported, but *maquiladoras* do not need to be located in specific zones. Traditionally, EPZs have been considered to specialize in the export of manufactures, but some of them have increasingly engaged in the exports of services.[97]

The incentives provided differ in nature and can change over time. One might consider the bulk of these measures as indirect subsidies, as direct cash payments are typically avoided. In most cases, a special legal infrastructure is provided at the outset. Most EPZs offer a combination of three types of incentives to companies established in the relevant area. First, many EPZs are characterized by a transport and telecommunication infrastructure that is superior to the one generally found in the country. A number of services may also be provided by the government at below cost to firms established in the zone. Second, import and export duties are typically waived on the trade flows between the EPZ and foreign countries. Third, profits from EPZ activities tend to be exempt from income and/or corporate tax for a number of years.

In many cases, the aim behind the special incentives provided in EPZs seems to have been to attract foreign companies. The idea was that foreign investment would create jobs and lead to positive spillovers on the rest of the economy, thus stimulating overall growth.[98] More recently, the literature has put stronger emphasis on the role EPZs can play as a transition tool from a closed to an open economy.

On the basis of optimal tax theory, it can be argued that taxes should be lower for activities that are more sensitive with respect to the tax rate. To the extent that FDI is more "footloose" than domestic investment, fiscal incentives

95 See Noland and Pack (2003).

96 In the same context a variety of terminologies, such as industrial free zones, free trade zones and special economic zones have been used in the literature and by policy makers. See Madani (1999) for an overview.

97 See, for instance, WTO (2005a) on the importance of IT exports for Jamaica's EPZs.

98 See Pack and Saggi (2006).

for foreign investors in EPZs can therefore be justified. In principal, such incentives could have a permanent character, but the literature has stressed that the benefits from such fiscal incentives are likely to be reduced or eroded in the case of tax competition from other countries.[99] Tax incentives, therefore, do not necessarily trigger more FDI. Even if an EPZ manages to attract FDI, the benefits of such FDI for the economy as a whole will largely depend on the linkages that take place between firms based in the EPZ and other domestic firms.[100]

EPZs have also been regarded in the literature as a useful stepping stone from a closed economy to a fully open and integrated economy.[101] In particular, they may address two types of challenges countries face when liberalizing their trade regime and in this context could be interpreted as an example of the permissive or functional policy interventions discussed previously. The first challenge is the one society faces due to the change in price signals following liberalization. Such changes may trigger significant and sometimes costly transition processes and may have important impacts on income distribution. Depending on the extent of such changes, they may trigger serious economic hardship for some, and lead to opposition against reform and/or other social conflicts.

An attractive feature of EPZs is that they restrict such price changes to certain geographic areas. If companies based in EPZs are exempted from import and export charges, they face "correct" price incentives. New profit opportunities are thus given at the margin, while the disruption of existing economic activities is minor. The gains from such "partial" liberalization are likely to be limited, though, and ultimately the authorities should consider extending trade liberalization to the rest of the economy. It has been argued in the literature that the existence of EPZs may create a protectionist bias in the long-run, as companies based in the EPZ have no incentive to lobby for further liberalization. Overall, political pressure in favour of full liberalization would therefore be lower in countries with established EPZs than in countries without EPZs.[102] If this is the case, the effectiveness of EPZs as an adjustment tool would be significantly hampered.

The second challenge refers to the introduction of complementary policies necessary for successful trade liberalization that have been emphasized in the recent trade literature.[103] In particular, it has been argued that the lack of appropriate infrastructure can seriously impede countries' supply response to trade liberalization. Given limited government resources, especially in developing countries, it would be very difficult to make the necessary investments in infrastructure prior to or in parallel with trade liberalization on an economy-wide basis. EPZs are often provided with better infrastructure than the rest of the country. Upgrading the infrastructure for companies engaged in exporting then levels the playing field with respect to competitors abroad. The provision of infrastructure in EPZs can thus be seen as a stepping stone towards the provision of high quality infrastructure in the entire economy. The use of this policy tool in EPZs does not create the type of protectionist bias that has been discussed in the previous paragraph.

Trade Policy Reviews provide information on the existence and characteristics of export processing zones and other "free zones" in WTO Members. Among the 29 Members reviewed between January 2004 and October 2005, 17 were reported to have adopted some type of free zone. Japan, Liechtenstein, Norway, the Republic of Guinea and Qatar were reported not to have any EPZs. In Rwanda, Suriname and Sierra Leone, relevant legislation concerning the establishment of EPZs was still under consideration at the time of the report, and in Mongolia such a law had existed since 2002 but no EPZ had been created by March 2005.[104]

99 See, for instance Rodríguez-Clare (2004).

100 See the next subsection for evidence of the effect of EPZs on host economies.

101 See Schweinberger (2003) for a general modelling framework for special economic zones. The paper contends that by imposing appropriate employment taxes and/or subsidies in conjunction with the creation of the special economic zone, the special economic zone: (a) results in an increase in government revenue; (b) does not generate conflict among households; and (c) brings about structural change only in the geographic entity declared special economic zone. See also the discussion in Rodrik (2002) on the role of EPZs and special zones in Mauritius and China.

102 Cadot et al. (2003) develop this argument with respect to duty-drawbacks.

103 See for instance WTO (2004).

104 The TPR reports for Burkina Faso and Mali make no reference to Export Processing Zones. The TPR for Switzerland makes reference to the existence of Free Ports that provide warehousing facilities. The trade policies of Liechtenstein and Switzerland are reviewed together in one Trade Policy Review report. See the footnote in Box 6 for the list of Members reviewed in the relevant period.

Table 1 provides an overview of the characteristics of the free zones in the other 17 surveyed Members. The Table shows that in most free zones established companies benefit from tariff reductions or exemptions on imports and from tax reductions or exemptions related to their revenue. Normally companies established in the zones and taking advantage of those benefits are supposed to export most of their production and limits exists on the amount of goods or services that can be supplied to the territory in which the EPZ is located. In other zones, companies can sell their products or services where they want but the tax and duty benefits only apply to the share of their production that is exported. Ecuador is an exception to this rule, as companies in the free zones do also not appear to be required to pay income tax for their sales to the customs territory of Ecuador. This may explain why around 70 per cent of the free zones' exports went to the customs territory of Ecuador between 2000 and 2003.

Through their tax and duty reductions, companies in the free zones face different price signals than other companies. But in some zones companies also have other cost advantages, in particular relating to infrastructure and regulatory costs. Most zones offer simplified import and export procedures to their users. Setting up a business is also frequently easier within the zones than in the national customs territory. In Jamaica, Nigeria and Tunisia, support is also directed to the development of infrastructure within the free zones or to facilitating access to other services that may be relevant for users.

Table 1
Instruments used in export processing zones or other "special zones" according to TPRs, January 2004-October 2005

	Classification of activity	Member
1	**Direct Payments**	
	Investment Support	Tunisia
	Reimbursement of transport costs for exports	Tunisia
2	**Provision of infrastructure and other services below cost**	
	Infrastructure development	Nigeria
	Ware housing facilities	European Union, Nigeria, Singapore, United States
	Preferential land rental	Nigeria, Sri Lanka
	Others	Jamaica, Nigeria
3	**Tax Breaks**	
	Profit/corporate/income/sales tax relief	Belize, Brazil, Ecuador, Egypt, The Gambia, Jamaica, Republic of Korea, Nigeria, Paraguay, Philippines, Singapore, Sri Lanka, Trinidad and Tobago, Tunisia, United States
	Facilitated repatriation of profits	Nigeria
4	**Tariff reductions or exemptions**	
	Duty drawbacks/exemptions for imports/ VAT refunds for imports	Belize, Benin, Brazil, Ecuador, Egypt, European Union, The Gambia, Jamaica, Republic of Korea, Nigeria, Paraguay, Philippines, Sri Lanka, Trinidad and Tobago, Tunisia, United States
	Exemptions from export taxes	Belize
5	**Other**	
	Special regime for labour relations	Egypt, Nigeria
	Simplified commercial procedures related to imports (for instance: no import or export licensing required, no quantitative restrictions)	Belize, Ecuador, Egypt, Jamaica, Republic of Korea, Nigeria, Paraguay, Trinidad and Tobago
	Simplified procedures to set up commercial activity	Ecuador, Nigeria

Source: Trade Policy Review reports published between January 2004 and October 2005.

The relevance of EPZs for a country's trade differs significantly across countries.[105] Exports from EPZs represented only 0.3 per cent of Nigeria's merchandise exports in 2003, 1.6 per cent of Trinidad and Tobago's exports in 2004 and 2.1 per cent of US exports in 2001.[106] In Sri Lanka, by contrast, exports from EPZs represented 25.1 per cent of total merchandise exports in 2002, while in Jamaica the relevant percentage went down from 21.8 per cent in 1996 to 8.8 per cent in 2000.[107] EPZs also play an important role in Bangladesh, the Dominican Republic, El Salvador,

105 Employment in EPZs is estimated to be around 13 million at the global level (ILO, 2003).

106 Figures based on information provided in relevant Trade Policy Reviews and own calculations.

107 Figures based on information provided in relevant Trade Policy Reviews and own calculations.

Morocco and Tunisia. Information from national statistics reveals that EPZ exports represented 19 per cent of total merchandise exports in Bangladesh in 2002/03, 76.8 per cent in the Dominican Republic in 2004, 55.3 per cent in El Salvador in 2004, 37 per cent in Morocco in 2003 and 69.3 per cent in Tunisia in 2002.

(e) Empirical evidence regarding the effects of industrial development subsidies

As already mentioned, the experiences of East Asian economies with industrial policy and the issue whether they might teach any lesson to other developing countries figure prominently in the debate about the role of government intervention in development policies. Given the prominent role played by subsidies in East Asian export promotion strategies, these experiences are particularly relevant. This subsection does not survey the wealth of literature on this topic – others have done it – but rather presents the main arguments in the debate.[108] Some of the principal results in the literature concerning other more recent experiences are also presented.

Early explanations of the growth performance of the Republic of Korea and Chinese Taipei emphasized the importance of getting the fundamentals right and outward orientation with few price distortions. In the 1980s, however, several scholars pointed out that these two economies had also used selective interventions, such as incentives to individual sectors, restrictions on trade and inward FDI and tight control of the financial sector. In 1993, in a Report entitled "The East Asian Miracle", the World Bank proposed a compromise interpretation. It acknowledged the important role of both getting the fundamentals right and export-push strategies. The Report suggested that in Japan, the Republic of Korea and Chinese Taipei, incentives were neutral on average, with export incentives offsetting substantial remaining protection. Firm-specific export targets were also part of the Republic of Korea's export promotion strategy, but actual exports often exceeded the targets. Governments made efforts to promote specific export industries. They also gradually reduced protection, and provided institutional support to exporters and a duty-free regime for inputs used in exports. The World Bank found that "... in some instances, government interventions resulted in higher and more equal growth than otherwise would have occurred. However, the prerequisites for success were so rigorous that policymakers seeking to follow similar paths in other developing economies have often met with failure." The Report mentions two prerequisites: institutional mechanisms which allowed the setting of clear performance criteria for selective interventions and to monitor performance, and mechanisms that prevented the costs of interventions becoming excessive. The benefits from using exports as a performance yardstick are strongly emphasized in the Report.

Partly catalyzed by the publication of "The East Asian Miracle", an enormous amount of empirical research on the effect of selective industrial policy has since been conducted. Noland and Pack (2003) survey this research and conclude that, on balance, the weight of the evidence derived from both econometric and input-output studies indicates that industrial policy made a minor contribution to growth in Asia. Empirical work on Japan, the Republic of Korea and Chinese Taipei fails to find links between interventions and sectoral productivity growth or trade performance. Available evidence also fails to prove that the rate of productivity growth in "neglected" sectors was increased indirectly by the growth of the favoured sectors. Evidence suggests, however, that in both Japan and Chinese Taipei the pattern of interventions was driven more by political economy considerations, such as sectoral employment, the presence of large firms, or the degree of sectoral concentration, than by dynamic comparative advantage.

The main factors that contributed to the "Asian Miracle" were good macroeconomic policy, including limited government deficits, low rates of inflation, and very stable real exchange rates.[109] These factors were conducive to high rates of saving and investment, which played a critical role in the growth story. Another critical component was the bias towards exporting. Noland and Pack mention four other reasons why the East Asian experience should not be seen as a justification for selective interventions. First, the policies deployed were exceptionally complex and were implemented under conditions of political stability by highly competent bureaucracies. Second, the financial crisis in the late 1990s should be factored into the assessment of the policies. Third, the tightened rules of the multilateral system would make it more difficult to use some of the instruments that were used by Japan, the Republic of Korea and Chinese Taipei. Fourth, the experiences of Hong-Kong, China and Singapore show that there are alternatives to selective interventions.

[108] See Hernandez (2004), Noland and Pack (2003) and Lall (2002).

[109] See Noland and Pack (2003).

Rodrik (2004) has a different interpretation of the East Asian experience. He argues that industrial policies have played a role in most non-traditional export success stories around the world, notably in East Asia. The fact that the literature provides numerous examples of success and failure stories of individual projects fits very well with his argument that even under optimal incentive programmes, some of the investments that are promoted will turn out to be failures. Optimal cost discovery requires equating the social marginal cost of investment funds to the expected returns of projects in new areas. The realized return on some of the projects will necessarily be low or negative, to be compensated by the high return on the successes. Lall (2002) discusses various indicators of the performance of East Asian Tigers and loosely relates them to the policies they pursued. He argues that the export success of the Tigers suggests that they "did something right" in mounting their selective interventions. However, he also discusses extensively the conditions that made this success possible and notes that selective interventions could work so well only because the institutional setting was appropriate. His conclusion is that "when all is said and done, there does remain some scope for the use of selective policies to promote exports, but its exact scope still has to be delineated."

Chang (2002) also supports the use of activist industrial policies. He examines the experiences of a range of now developed countries including the United Kingdom, the United States, Germany, France, Sweden, Belgium, the Netherlands, Switzerland and Japan and considers what kinds of industrial, trade and technology policies they used in the early stages of their development. He shows that almost every one of those countries used infant-industry protection and other activist industrial policies when they were catching-up economies. There was a considerable degree of diversity among those countries in terms of their policy mix. Other tools that were used include export subsidies, tariff rebates on inputs used for exports, conferring of monopoly rights, cartel arrangements, directed credits, and support for R&D. Chang, however, does not provide evidence regarding the effect of activist policies on economic performance.

Evidence concerning the effects of export subsidies and other export promotion measures is also mixed. There is evidence that selective governmental intervention in support of particular forms of non-traditional exporting activity – both through special incentives and through other types of encouragement and support, including specific training and research, credit, and marketing assistance – were important to the development of non-traditional exports in Chile and Costa Rica.[110] In Costa Rica and to a lesser extent in Chile, active policies to encourage FDI into "priority" sectors played a role.

In other regions, export promotion policies were less successful. Ndulu et al. (2002) describes export promotion programmes in Tanzania and assesses their impact. In the post-1984 period, a combination of macro-policy incentives and specific policies led to an initial swift response and general upswing in non-traditional exports. For various reasons related to difficulties with the implementation of the measures and more general supply-side constraints, however, the momentum was not sustained. Implementation problems were also identified in other African countries. Reviewing the system of export incentives in 13 African countries, Hinkle et al. (2003) conclude that no sample country came anywhere close to international best practice for export incentives.

Panagariya (2000) reviewed cases of export subsidies in Asia and Latin America where scanty results did not seem to warrant the costs incurred during decades of export subsidization. Conversely, he found that as soon as trade liberalization and sound macroeconomic policies were pursued, good progress on exports was made despite a simultaneous and sharp reduction of export subsidies. Nogues (1989) reviewed a large number of country experiences and concluded that the diversification of exports towards manufactures occurred when policies of more open import regimes and relative stability in real exchange rates were pursued. In contrast, the provision of export subsidies was not a common element among successful countries. He found that subsidizing countries faced large opportunity costs and an additional waste of resources through rent-seeking activities induced in the private sector.

While EPZs have triggered a rise in exports, job creation and income generation in some cases, the literature suggests that they have frequently not fulfilled the expected role of "engines of industrialization and growth" as some proponents had anticipated.[111] Helleiner (2002) notes that in Kenya, South Africa, Tanzania and Zimbabwe EPZs were not important contributors to non-traditional export success. But EPZs played a critical role in the case of Mauritius. The five studies

[110] See the essay by Agosin (2002) on Chile and the essay by Rodriguez (2002) on Costa Rica in Helleiner (2002).

[111] See the references in World Bank (2004).

of African countries in Helleiner's work also show that FDI has not as yet made a particularly important contribution to African non-traditional export expansion. Even in the Mauritius EPZ experience, domestic investment was dominant. Subramanian and Roy (2001) compare the Mauritian success with the failures of EPZs in other countries and link the difference in impact with differences in implementation. Madani (1999) concludes that EPZs can only play a dynamic role in a country's development under certain conditions – including an appropriate setup and good management – and this only as a transitional step in an integrated movement toward general liberalization of the economy.

2. INNOVATION AND SUPPORT FOR NATIONAL CHAMPIONS

Innovations are an important driver of economic growth. They spur growth in the country where innovations take place, at least if the country manages to make use of these innovations in economic terms. They also spur growth in countries that manage to understand, use, produce and commercialize the innovations made elsewhere. In other words, it is not only the "creation" of innovations that matters for growth but also the absorption of innovations made by others. This subsection will only deal with the first aspect of innovation, i.e. with innovations at the global knowledge frontier, and not with the absorption of innovations that has to some extent been dealt with in the previous subsection.

Innovations may be radical, consisting in the invention of completely new processes or products, or incremental, improving upon existing products or processes. Both types of innovations tend to be the outcome of previous efforts and investments in research and development and the required investments are frequently significant. Given the often lucrative returns to the successful introduction of innovation, private entities can be expected to be interested in conducting research and in paying for it. Yet governments around the world have traditionally intervened in R&D activities. They have done so by supporting education and thus human capital formation necessary for R&D activities. But they also sponsor R&D activities directly, both in public establishments, like universities, or in private entities. Economists justify such government intervention on the grounds of two characteristics of research and development that trigger market failures. The first justification is linked to the fact that innovations have public-good characteristics and the second to the size of R&D costs and ensuing economies of scale in R&D intensive industries. The discussion in Section C indicated that both characteristics would lead economists to conclude that the private sector is likely to invest less in R&D activities than would be desirable from the country's point of view.

R&D efforts aim at creating knowledge and knowledge has public-good characteristics, making it likely that the benefits of the created knowledge for society exceed those that the creator of the knowledge is able to appropriate. This is so because knowledge generated through an R&D effort may spread and once others have acquired the knowledge they may use it to their own benefit. R&D activities thus give rise to positive externalities – that is, benefits for actors that are not involved in the original R&D activities. The fact that private companies do not take those positive spillovers into account when making their investment decision with respect to R&D is likely to result in under-investment in R&D from society's point of view. Governments may therefore want to intervene in order to increase investment in R&D.[112] The relevance of knowledge spillovers was already raised by Marshall in the 1920s and has been discussed in the 1960s by economists like Arrow. While the existence of such spillovers has never really been questioned, economists still only have a partial understanding of their precise nature. Yet it would be necessary to understand how spillovers take place to determine the best type of policy intervention to stimulate R&D.

It is generally accepted that intellectual property rights, like patent protection, can help to correct the market failure caused by positive knowledge spillovers to a significant extent. A patent guarantees to its owner the sole use of a patented invention during a specified period of time. During that period the patent owner will be able to reap monopoly benefits from the new product or process and will thus be able to recover the initial investments made in R&D, at least to some extent. Once the patent expires others will be able to use the knowledge contained in the patent and potentially compete with the original inventor in the relevant market. The length of the patent protection will to a large extent determine whether the appropriate balance is struck between encouraging R&D investments on the one hand and allowing society to benefit from knowledge spillovers generated through these investments on the other. In a global set-up, intellectual property right protection needs to be international in order to maintain the incentives for R&D investments.

[112] See, for instance, the discussion in Grossman (1990).

Although appropriate intellectual property right protection helps to encourage R&D, it may not be possible to design it in such a way that spillovers are completely internalized. Private investment in R&D would thus continue to be suboptimal. Besides, intellectual property right protection does not help to overcome the other market failure that may be relevant for R&D activities – the one arising due to the high levels of investment needed for R&D. High fixed costs, in terms of high initial R&D investments, give raise to increasing economies of scale. This may lead to situations where a private company would never be able to recover the initial R&D costs (even in the absence of spillovers) and would as a consequence never make the initial investment. From the point of view of the economy, however, the investment may be desirable because it leads to significant consumer gains.[113] Empirical research confirms the relevance of this argument. It has been shown that consumer benefits from major new innovations have been quite large compared with the research costs borne by the innovators.[114] Government support for major new innovations may thus be justified, although it may be difficult for the government to identify the most promising R&D efforts.

The weight of R&D in economic activities appears to have increased over time and around the world. At the global level R&D expenditure represented 0.85 per cent of GDP in the 1990s compared with 0.42 per cent in the 1960s.[115] High-income countries invest significantly more in R&D than developing countries. The median level of R&D expenditure in high-income countries reached 1.19 per cent of GDP in the 1960s and 1.73 per cent in the 1990s.[116] The corresponding figures for developing countries are 0.21 per cent in the 1960s and 0.59 per cent in the 1990s. There seems to be some agreement in the economic literature that industrialized countries have a comparative advantage in R&D-intensive activities and that they should therefore allocate more resources to such activities. Developing countries, instead, should put more weight on enhancing their capacity to absorb new innovations than on participating in cutting-edge research. Rodríguez-Clare (2004), for instance, argues that only the more advanced countries should focus on research and development and relates his argument to the recent finding by Imbs and Wacziarg (2003) that growth is associated with increased diversification in production during earlier stages of development and only later on with increasing concentration, i.e. increasing productivity in existing activities.

Other authors are more nuanced and acknowledge that distinctions need to be made among different groups of developing countries. Watson et al. (2003) distinguish three types of developing countries: scientifically-proficient countries (e.g. Brazil, China, India and South Africa), scientifically-developing countries (e.g. Colombia, Indonesia and Pakistan) and scientifically-lagging countries (e.g. Nepal, Mali, Ecuador, Libya). The first group contains countries that define their relationships with the scientifically-advanced countries on the basis of equality or near equality, the second group contains countries that have pockets of adequate scientific and technological capacity amidst general scarcity, while such capacity is almost entirely lacking in the third group. For the third group it would be unwise to focus on knowledge advancement or cutting-edge research, in particular when taking into account their resource constraints.

A cursory look at expenditure on research and development in a number of developing and developed countries in recent years confirms the idea that more advanced economies invest more in R&D. Table 2 shows that economies like Japan, the United States and, to a lesser extent, the European Union spend a significantly higher share of their GDP for research and development than countries like Brazil, India and China. The Table reflects R&D expenditure from private and public domestic sources and from foreign sources. The role of the business sector and the government in R&D funding differ significantly across countries. The business sector accounted for almost 62 per cent of funding in OECD countries in 2003. This value reflects more or less the share of business funding in the United States, whereas Japanese companies participate more in national

113 See, for instance, the example of a monopolist facing high fixed costs as discussed in Grossman (1990). In a case of large fixed costs, it is possible that the price consumers are willing to pay remains below average costs, but that consumer surplus and the firm's revenue together exceed the total cost of production for certain levels of output. In such cases production is not profitable for the company, but may be desirable from a welfare point of view. For more detail, see the discussion of the market failure occurring as a result of so-called economies of scale in Section C of this Report.

114 See for instance Bresnahan (1986) and Trajtenberg (1989).

115 These values refer to median levels and are based on information provided in Lederman and Saenz (2005). The values refer to R&D expenditure financed by the productive sector, the public sector and foreign sources. Separate values for R&D financed by the public sectors are not provided in the article.

116 Country groupings as defined in Lederman and Saenz (2005).

R&D efforts (74 per cent of total R&D expenditure) and European companies less (55 per cent of total R&D expenditure). In developing countries the role of the private sector in R&D spending tends to be lower. It was, for instance, 40 per cent in Brazil in 2003 and 23 per cent in India in 2000.

Table 2
R&D expenditure as percentage of GDP, 2000-03

	2000	2001	2002	2003
Argentina	0.4	0.4	0.4	0.4
Brazil	1.0	1.0	1.0	1.0
China	1.0	1.1	1.2	...
EU (15)	1.9	1.9	2.0	2.0
EU (25)	1.8	1.8	1.9	1.9
India	0.9	...	...	...
Japan	3.0	3.1	3.1	3.2
Mexico	0.4	0.4	0.4	...
South Africa	0.6	...	0.7	...
Tunisia	0.5	0.5	0.6	...
United States	2.7	2.7	2.7	2.6

Source: RICYT (Argentina, Brazil and Mexico), OECD MSTI Database May 2005 (EU(15), Japan, United States). UNESCO, Science and Technology Indicators March 2005 (China, India, Tunisia and South Africa). The values for South Africa represent values for the years 1998 and 2002.

When concentrating on government expenditure on research and development,[117] the difference between developing and developed countries in our sample is less clear-cut, as illustrated in Table 3. Brazil, the European Union, India and Japan all allocate around 0.6 per cent of their GDP to research and development. Government expenditure on R&D is highest in the United States, and reached 0.81 per cent in 2003. In 2005 nearly two-thirds of the US government's R&D budged was devoted to defence.[118] For most countries in Table 3 where data are available, government expenditure on R&D represented a relatively stable share of GDP between 1999 and 2003.

Table 3
Government financed R&D expenditure as percentage of GDP, 1999-2003

	1999	2000	2001	2002	2003
Argentina	...	...	...	0.29	0.29
Brazil	...	0.61	0.64	0.59	0.56
China	...	0.33	...	...	...
EU (25)	0.63	...	0.64	0.64	...
India	...	0.65	...	...	...
Japan	0.58	...	0.57	...	0.56
Mexico	...	0.26	0.27	0.27	...
South Africa[a]	0.24	...	...	...	...
Tunisia	...	0.42	0.47	0.54	...
United States	0.76	...	0.76	...	0.81

[a] Data refer to 1998.
Note: Governmental expenditure represents the sum of direct expenditure by government and expenditure by higher education for the data coming from RICYT and UNESCO. For the relevant countries the values in this table may be overestimated to the extent that higher education R&D is actually financed by the private sector.
Source: RICYT (Argentina, Brazil and Mexico), OECD MSTI Database May 2005 (EU(15), Japan, United States), UNESCO Science and Technology Indicators March 2005 (China, India, Tunisia and South Africa).

117 Governments use a variety of tools to support R&D other than outright R&D expenditure. R&D tax concessions are, for instance, extensively used by OECD countries as an indirect way of encouraging business R&D expenditure. Special tax treatment for R&D expenditure can take various forms, including immediate write-offs of current R&D expenditures and various types of tax relief such as tax credits or allowances against taxable incomes. Tax subsidies for R&D have increased in 16 out of 24 OECD countries between 1995 and 2004 (OECD, 2005c). In 2004 the rate of tax subsidies was highest in Spain, followed by Mexico and Portugal. Japan ranked nine out of 24 with respect to the use of tax subsidies and the United States ranked 14. Unfortunately, the information available in the OECD database on R&D and innovation does not make it possible to compare the size of such budgetary losses through tax concessions with the size of direct government expenditure on R&D.

118 OECD (2005c).

Once governments have decided to support R&D, they face the difficult question of how to do so. In particular, they need to decide whether R&D support should have a rather general character or be focused instead. Should R&D be stimulated across the country or should it target regional clusters? Should R&D support be available for all economic activities or should certain sectors be privileged? Should support be directed towards private initiatives or public ones and should it rather target applied or fundamental research? All these questions have been discussed in the economic literature and for most of them there does not appear to be unanimity as to the appropriate answers. This lack of unanimity is to a large extent due to the lack of understanding of the mechanisms involved in knowledge spillovers.

There appears to be some agreement that location and proximity matter in exploiting knowledge spillovers. Jaffe (1989), for instance, found that knowledge spills over for third-party use from university research laboratories as well as industry R&D laboratories, and that the geographical distance between university and corporate research activities matters for the size of these spillovers. Other studies concur that knowledge spillovers tend to be geographically bounded within the region where new economic knowledge was created[119], although the precise relationship between distance and knowledge will only be known when it is fully understood how knowledge is passed. There are reasons to believe that knowledge spillovers are not homogenous across firms and that large firms are more adept at exploiting knowledge created in their own laboratories, while smaller counterparts have a comparative advantage at exploiting spillovers from university laboratories.[120]

The relevance of geographical distance for R&D spillovers has led to the use of the term "innovation clusters", the most famous example of such a cluster probably being the micro-electronics cluster in Silicon Valley. Other well-known clusters are the Emilia-Romagna region, where machine tools, ceramic tiles, knitting and footwear are dominant activities, and the German region of Baden-Württemberg that contains an important engineering cluster. In recent years, many governments have made a conscious effort to replicate such regional success stories.[121] So-called cluster policies have, for instance, been pursued in Wales (Technology Clubs), Spain (Basque country), Flanders (Flanders Language Valley), the Republic of Korea (Daegu), Brazil (Sinos Valley) and Malaysia (Multimedia Super Corridor – see Box 8).[122] Yet the advice with respect to cluster policy varies, with some arguing that governments should merely create an environment that facilitates the creation of clusters, whereas others suggest that governments should try to identify potential clusters and support their growth.[123] There seems to be some agreement, though, that clusters cannot be designed from scratch, but should be built instead on the basis of existing activities.[124]

A related question that is important for policy-makers is whether spillovers occur solely within an industry or not. There is no agreement in the literature about the need for both geographical and "economic" closeness between entities carrying out R&D in order for spillovers to take place. While certain contributions emphasise that clusters tend to specialize in relatively few products or technologies[125], others argue that diversity across complementary economic activities sharing a common science base is more conducive to innovation than is specialization.[126] The first scenario would represent an argument in favour of supporting the creation of industrial clusters and to target R&D support in both geographical and sectoral terms, as suggested in Rodríguez-Clare (2004). Proponents of such a strategy would thus argue in favour of R&D support for a rather narrowly defined group of recipients.

119 See Audretsch and Feldman (2004) for an overview of the relevant literature.

120 Acs et al. (1994).

121 See, for instance, OECD (2001a) for a discussion of the role of cluster policies for the nurturing of regional clusters.

122 Hospers and Beugelsdijk (2002).

123 See OECD (2001a), Rodríguez-Clare (2004).

124 Cortright and Mayer (2001), OECD (2001a), Rodríguez-Clare (2004).

125 Cortright and Mayer (2001).

126 See Audretsch and Feldman (2004) for a discussion of the relevant literature.

Box 8: Multimedia super corridor in Malaysia[1]

The Malaysian Government's Multimedia Super Corridor (MSC) was launched in 1996 as an initiative to support the development of the information and communication technology industry. Ten years later, the MSC hosts around 900 multinationals, foreign-owned and home-grown Malaysian companies focusing on multimedia communication products, solutions, services and research and development.

Companies settling in the MSC can take advantage of a broad range of facilities and financial and administrative incentives. These include:

- high quality infrastructure and infostructure supported by secure cyberlaws;
- unfettered employment of local and foreign knowledge workers;
- exemption from local ownership requirements;
- exemption from corporate income tax for five years (or an investment tax allowance);
- qualification for R&D grants;
- duty exemption on multimedia equipment imports.

Companies settling in the MSC are also assisted by the government-funded Multimedia Development Corporation (MDC) in a number of ways.

The MDC:

- ensures a rapid turnaround for applications for entering the MSC;
- assists companies in permit and licence approvals; and
- introduces companies to potential local partners and financiers.

[1] Information based on http://www.mdc.com.my accessed in January 2006.

Rodríguez-Clare (2004) proposes ways of identifying good candidates for such targeted R&D support, for instance on the basis of a sector's export performance. He therefore argues that governments do not need to "pick winners" but only need to recognize "revealed winners". Notwithstanding this difference, such focused policies carry the risk of targeting the wrong regions and sectors, which may result in very costly policy mistakes. Numerous economists therefore continue to have a preference for more general R&D policies that aim at raising the economy-wide level of research expertise.[127] Such policies avoid the need for governments to "pick" or "recognize" winners, are less prone to capture and dilute the strategic disincentive to undertake R&D with unappropriable spillovers.

Industries characterized by high fixed costs, due to necessary initial R&D investments or other investments, tend to be industries in which only a small number of producers are active. This is due to the fact that each producer needs to be able to produce at a rather large scale in order to recover the initial investment. In markets with few players, however, competitive pressure is relatively low and individual players are able to exert market power and shift rents from consumers into their own pockets. In such markets, therefore, governments may have an incentive to support national producers if this implies that rents will be shifted from foreign consumers to national producers and/or that less rents will be shifted from domestic consumers to foreign producers. Government intervention in such a context is often called "strategic trade policy" (see discussion in Section C). It often takes place in R&D-intensive industries under the pretext that "national champions" in certain industries need to be preserved. The semiconductor rivalry between the United States and Japan and the civil aircraft rivalry between Europe and the United States have often been cited as examples involving strategic trade policies (see Box 9).

127 See for instance Neary (2000), Pack and Saggi (2006) and Watson et al. (2003).

Box 9: Strategic trade policy : the semiconductor and the civil aircraft rivalries[1]

The semiconductor rivalry

Since the debut of the transistor in 1947, semiconductors have been at the heart of the electronics revolution. The many products and processes that have evolved alongside this industry span the high-technology "food chain", from equipment and materials upstream to computers downstream. Not surprisingly, policymakers have long identified success in the semiconductor industry as a necessary prerequisite for competing in high technology more generally, resulting in US-Japan "chip rivalry". In the context of this rivalry, the President of the US Semiconductor Industry Association urged Congress in 1990 not to abandon the industry in its trade dispute with Japan as "there was a difference between semiconductor chips and potato chips that mattered for the nation as a whole".

US Government spending on R&D has contributed to most developments in semiconductor technology. Through the 1960s, procurement by the National Aeronautics and Space Administration (NASA) and the Department of Defense accounted for most of the nation's semiconductor output (100 per cent until 1962). In more recent years, federally funded R&D has helped realize gains in the design and fabrication of successive generations of chips, for instance through its support of the Semiconductor Manufacturing Technology consortium.

The Japanese government, too, intervened significantly in the semiconductor market. Through the mid-1980s, tariffs and non-tariff barriers protected the Japanese market from imports of chips. This protection helped the domestic semiconductor industry to achieve the necessary production efficiencies to compete in export markets. Once trade was liberalized, state-funded R&D programs continued to assist the industry. For example, the Very Large Scale Integration (VLSI) projects underwritten by Nippon Telephone and Telegraph (NTT) and the Ministry of International Trade and Industry (MITI) sought to help Japan's consumer electronics giants cope with imports.

The Civil Aircraft Rivalry: some anecdotes

The civil aircraft rivalry between Boeing based in the United States and Airbus based in Europe has long been presented as the textbook case of strategic trade policy. The story is that in their search for rents in this imperfectly competitive industry, firms demand and governments supply export and R&D subsidies, hoping to win market share at the expense of foreign competitors. Indeed, it has been argued that governments on both sides of the Atlantic have invested greater resources fighting for civil aircraft than for most other high-technology industries.

On the United States side, the Export-Import Bank of the United States (EXIM) earned the nickname "Boeing's Bank", because 40 per cent of its portfolio was at one stage invested in the aerospace industry. Between 1967 and 1977, for example, EXIM loaned US$5.77 billion on sales of US$12.8 billion of US aircraft, and much of this in support of Boeing's exports.

In Europe it was allegedly Margaret Thatcher who pushed support for the launch of the A320 to the top of her agenda in talks with François Mitterand and Helmut Kohl in 1984. Mitterand's unwavering commitment to Airbus was representative of the three leaders, stating that "the A320 will be built, and I am its number one salesman".

The precise nature of support granted to Boeing and Airbus by the governments concerned, and the WTO legality of such support, are the subject of ongoing dispute settlement procedures in the WTO.

[1] Box based on chapters 3 and 4 in Busch (1999).

The argument in favour of strategic trade policy is more complex than may appear at first glance. Suppose the world market is large enough to support only one firm in an activity – a firm that would be making monopoly profits.[128] Each country's welfare with respect to this activity then consists in consumer benefits (technically, consumer surplus) with respect to the consumption of the relevant goods or services and the profits made by the firm if it is a national firm that serves the relevant market. Consumer surplus is maximized if production takes place where it is most efficient. But given that the relevant firm makes profits it may be interesting for each country to have a national producer serving the market. If the cost disadvantage of national producers is not too significant, it may be beneficial in terms of total welfare to accept a reduction in consumer surplus in order to secure the profits obtained in the relevant market. Consider now an early commitment by a domestic government to support the entry of a domestic firm into the industry by whatever subsidy is necessary. Models have shown that if the foreign firm finds this policy announcement to be credible, it may refrain from bearing the costs of entry, recognising that the market is not large enough to support both firms at a profitable scale.

The above story is a story of strategic entry promotion for a monopolist. It is possible to make arguments along similar lines in favour of strategic promotion in oligopolistic industries.[129] Whether such a policy is beneficial, and to whom, is difficult to determine a priori. Increased entry in oligopolistic industries may lead to increased competition and a reduction in prices, thus being beneficial for consumers. Third countries – that is, countries not producing and not subsidizing the relevant product – gain from strategic trade policies in such a case. It has, for instance, been estimated that the entry of Airbus in the market for commercial airliners on average reduced prices by 3.5 per cent.[130] Increased competition may, however, reduce the incentives to invest in further innovations in the relevant industries, which has a negative impact on consumers in both importing and exporting countries in the long-run. Government support for strategic reasons may also lead to excessive entry, resulting in increased consumer prices because producers cannot produce at a sufficiently large scale. Existing empirical evidence indicates that this may have occurred in the market for medium-range wide-bodied aircraft and the market for 30-40 seat commuter aircraft, where subsidies resulted in average costs of production that are higher than need be.[131]

Whether and to which extent producing countries gain from government intervention depends on the effect of the policy on domestic consumers, domestic producers and on the cost of the policy intervention. Economists tend to urge caution in the use of aggressive output, export or R&D subsidies for shifting profits to monopolistic or oligopolistic firms. If governments in two or more countries apply the same policy, profits are likely to be dissipated in excessive entry and the subsidizing countries will suffer in the end.

3. REDISTRIBUTION

This subsection begins with a discussion of why many societies place such importance on the distribution of income. A description then follows of the possible costs involved in transferring income from the rich to the poor and how different forms of subsidies compare in terms of effectiveness and costs in achieving a given level of redistribution. The subsection then goes on to consider specific examples of how governments use subsidies to achieve equity goals. Subsidies provided to water and telephony services have been chosen for this purpose. While it is typically low-income groups who are the targets of redistribution programmes, subsidies to achieve more balance in regional development will also be discussed. Finally, the use of subsidies to assist declining industries to adjust to economic difficulties will also be considered, although such interventions may also be justified on efficiency grounds. There will be some discussion of the trade impact of subsidies. An underlying theme in the discussion is the trade-off that must generally be made between equity and efficiency when redistribution polices are pursued. We shall also consider how it may be possible to reduce the associated costs of subsidies through better targeting or the incorporation of market discipline in their use.

128 See Ethier (1982) and Dixit and Kyle (1985) on strategic-entry promotion.

129 See for instance Brander and Spencer (1985).

130 Neven and Seabright (1995). The 1992 US-EU agreement on trade in civil aircraft which limits subsidies, instead, led to a price increase of about 3 per cent according to estimates by Irwin and Pavcnik (2001).

131 See the discussion in Grossman (1990).

(a) Why do societies redistribute income?

Why do societies find it necessary to redistribute income from the rich to the poor? In mainstream economic analysis based on the quest for efficiency, an inequitable distribution of income does not by itself represent a market failure. So long as the market ensures that goods are priced at marginal cost and factors of production are paid their marginal products, then the ensuing outcome is considered Pareto-efficient. One distribution of income is as good as another under a Pareto-efficient outcome. Hence, one needs to look beyond economic efficiency to understand why governments go to such lengths to achieve some balance in distribution. One finds a range of possible answers to the question, some of which rely on philosophical or moral explanations, others on political economy explanations, and still others on a mix of history, psychology and sociology.

It is possible to justify redistribution of income based on utilitarian theory.[132] A central principle of utilitarian theory is that an action conforms to the principle of utility "when the tendency it has to augment the happiness of the community is greater than any it has to diminish it".[133] Thus, if individuals experience declining marginal utility of income, then society's "happiness" can be increased by redistributing income from the rich to the poor, since on average the reduction in utility experienced by the rich is more than offset by the increase in the utility of the poor.

But even philosophers coming from a non-utilitarian tradition have provided reasons why societies need to be concerned with fairness in income distribution. In the *Theory of Justice*, Rawls (1971) argued that rational human beings, acting from an initial situation of ignorance about what their actual social station in life might be, would eventually arrive at a social contract that embodies two basic principles. One of those principles, the difference principle, would only allow social and economic inequalities if they lead to the betterment of the worst-off individuals in society.[134] Rawls allows for the possibility that some forms of income inequality can make the worst-off citizens better off if, for example, it acts as an incentive for the rich to innovate, the benefits of which would also flow to the poor. But except for these cases, the difference principle would strongly favour an equitable distribution of income and wealth, with a particularly high weight placed on the state of the economically worst-off. A just society will guarantee a social minimum (income) from which no citizen will fall below. This is to be guaranteed by "family allowances and special payments for sickness and employment, or more systematically by such devices as a graded income supplement (a so-called negative income tax)."[135]

Alternative explanations from public choice theory rely on the median voter (Meltzer and Richard, 1981).[136] In democracies, voters' approval determines the kinds of policies adopted by governments. According to the theory, policies which appeal the most to the median voter will be adopted since at least half of the voting populace will vote the same way he does. Consider a situation where voters decide on policies based on their income levels and where the issue at hand is income redistribution, let us say through transfers from those individuals whose incomes are above a certain threshold to those whose incomes fall below this threshold. The median voter would support redistribution policies if the threshold income is higher than the median income. Thus, redistribution would be adopted because it is in the economic interest of the majority of the voting population.

More complex explanations of the motives for redistribution rely on differences in *weltanschauung* among societies. Alesina and Angeletos (2005) construct a model where the interaction between social beliefs and welfare policy creates multiple equilibria. A society which believes that individual effort determines income will choose low taxes and have very little redistribution. In equilibrium, effort will be high and the role of luck will be limited, in which case market outcomes will be relatively fair and social beliefs will be self-fulfilled. A society which believes that luck, birth, connections, and corruption determine wealth will levy high taxes, thus distorting allocations and making these beliefs self-sustained as well.

132 In this tradition would fall Jeremy Bentham and John Stuart Mill.

133 Bentham (1789).

134 The first principle requires that rules defining basic liberties apply to everyone equally and that they allow the most extensive liberty compatible with a like liberty for all.

135 Rawls (1971), p. 243.

136 We also discuss public choice theory briefly in Section C when considering theoretical propositions underlying the use of subsidies and other policy interventions.

Bénabou and Tirole (2005) note how international surveys reveal wide differences in the views held in different countries concerning the causes of wealth or poverty and the extent to which people are responsible for their own fate. They then develop a theory of collective beliefs and motivated cognitions, including those concerning consumption, happiness and religion. Their model produces two equilibria. The "American" equilibrium is characterized by a high prevalence of just-world beliefs among the population and relatively laissez-faire policies. The "European" equilibrium is characterized by more pessimism about the role of effort in economic outcomes and a more extensive welfare state. Glaeser (2005) has reviewed the extensive literature on American "exceptionalism" – the fact that there is less redistribution in American society than in European society. He cites evidence that there is little difference in income or intergenerational mobility between the United States and Europe[137] and concludes that different beliefs about income mobility in the United States and the EU have little to do with reality.

But income redistribution is not costless to society. These costs arise because of adverse effects on incentives and the administrative costs of the transfer programmes. Perhaps one of the clearest articulations of the idea that there is some fundamental trade-off involved between equity and efficiency comes from Okun (1975). High marginal tax rates can reduce the incentive for saving, risk-taking and entrepreneurship. This is the excess burden associated with raising the taxes needed to finance the transfer. On the other hand, generous social programs can dull incentives to participate in the labour market and to work among recipients of the transfer. In addition, the rich may also be tempted to engage in socially wasteful activities to avoid taxes. Consequently, economic output and growth can suffer from too aggressive an effort to redistribute income. The process of redistribution can be described as a little like carrying money from the rich to the poor in a "leaky bucket". Although the bucket may be filled to the brim at the start, it will arrive to the recipient with less money than when it started out because of all the inefficiencies created by redistribution.

Another cost posed by redistribution programmes is that they can give rise to highly organized special interest groups who can turn redistribution policies in their favour because of their political influence. For example, Mulligan and Sala-i-Martin (2003) have noted how large social security programmes have become and how their growth rates cannot be accounted for by demographics. Given that the share of elderly benefits in GDP has grown more than the share of the elderly in total population, they argue that this is because the political power of the elderly has been growing over time. An additional cost that may arise from special interest groups is that governments may consciously choose inefficient forms of redistribution programmes so as to disguise transfers to these groups (Coate and Morris, 1995).

(b) Subsidies as an instrument of income redistribution

Whatever the underlying motives for redistribution, governments can achieve their redistributional goals through a host of instruments. The traditional instruments include a progressive income taxation system, social security and public health programmes. Although these may be the main instruments for redistribution, they are not the only ones used for such purposes. For surely part of the spending on public education, public housing, etc., could also be classified as social expenditures, i.e., they have the objective of improving economic opportunities or conditions for parts of the population. And outside these traditional areas of social expenditures, governments often justify subsidies to agriculture as necessary to support farm income.

While the focus of this subsection will be on the use of subsidies to achieve redistributional goals, it does not mean that they are superior to alternative policy instruments in being able to achieve a given transfer of resources to the poor at the least cost to taxpayers. Redistribution programmes that transfer purchasing power directly from the rich to those in need are the least inefficient. They increase the well-being of the poor more than an alternative scheme costing the same amount of money. Spending "x" euros on food subsidies for low-income households increases the welfare of recipients less than a cash gift of the same amount. This is because there may be other needs that the household perceives as equally or more important than food. With an income transfer, the household will have the flexibility of deciding how much of the additional "x" euros received should be spent on food and how much

[137] He cites papers by Gottschalk and Spolaore (2002) and Checchi et al. (1999) showing no major difference in income or intergenerational mobility between the US and Europe.

to be spent on other needs.[138] If redistribution in general is like using a "leaky bucket" to transfer money from the rich to the poor, subsidies involve the use of a bucket with a bigger hole at the bottom.

It is sometimes not easy to distinguish between income transfers and subsidies. In this part of the Report, income transfers will include anything which provides public funds directly to a beneficiary but leaves him free to decide how best to spend the largesse. Social security payments in the United States have this characteristic. Subsidy programmes, on the other hand, provide public funds to a beneficiary but in a form that can be spent only on certain types of goods or services. Public health programmes in many countries have this characteristic.

(c) Subsidies to utilities in developing countries

The demands for water, power and telecommunication services are some of the most basic needs. Consumption of these goods and services usually represent a sizeable chunk of poor households' budgets. Because many countries consider access to these services as a right, governments often adopt policies that severely under-price these basic goods and services. Two examples of subsidization to basic services are considered here – water supply and telecommunications.

(i) Water supply

In the case of water supply, assistance to the poor is often achieved through the water tariff structure. This takes the form of increasing block tariffs, which starts with a very low tariff for water consumption below a threshold level but then rises with higher consumption levels (Box 10). The lowest tier of the tariff structure is the price which is charged the poorest consumers. The higher tiers in the tariff structure reflect the charges paid by the large household consumers and the industrial users, who effectively (cross) subsidize poor households consumers.

But the water tariff structure is often set too low so that water utilities are not able to recover costs. A survey undertaken by McIntosh and Yniguez (1997) for the Asian Development Bank of 50 water utilities in the region showed that the average domestic tariff in Asian water utilities was about US$0.36 per cubic meter of water.[139] Fifteen of the 50 surveyed water utilities had average tariffs that did not generate sufficient revenues to cover their operating and maintenance costs. An even larger number of the utilities (29) did not generate sufficient revenues to be able to finance their capital costs. As a result, subsidies to water utilities in the Asian region takes the form of a contribution by central governments to capital investments that are either in the form of grants or soft loans (McIntosh, 2003).

But low tariffs lead to fundamental problems in providing water. If water is not correctly priced, it may be wasted. Low revenues make it difficult for the utility to maintain let alone upgrade facilities and to expand capacity, resulting in inadequate water supply. Water is only intermittently available to the poor and they may need to spend more to purchase water from informal providers. For example, only slightly more than half of the 50 water utilities included in the ADB survey provided 24 hour water service. Twenty-four hour water service ends up being a luxury rather than something that can be taken for granted.

In addition, the water subsidy may not even reach the poor and may be captured by richer households. In sub-Saharan Africa, many of the poorest households are not connected to the water network (WUP, 2003).[140] Rapid urbanization in the region has led to the mushrooming of informal settlements, which have no access to many forms of public infrastructure, including water. Thus low-income households may have to access water supply and sanitation services through a broad range of service delivery arrangements, intermediaries including

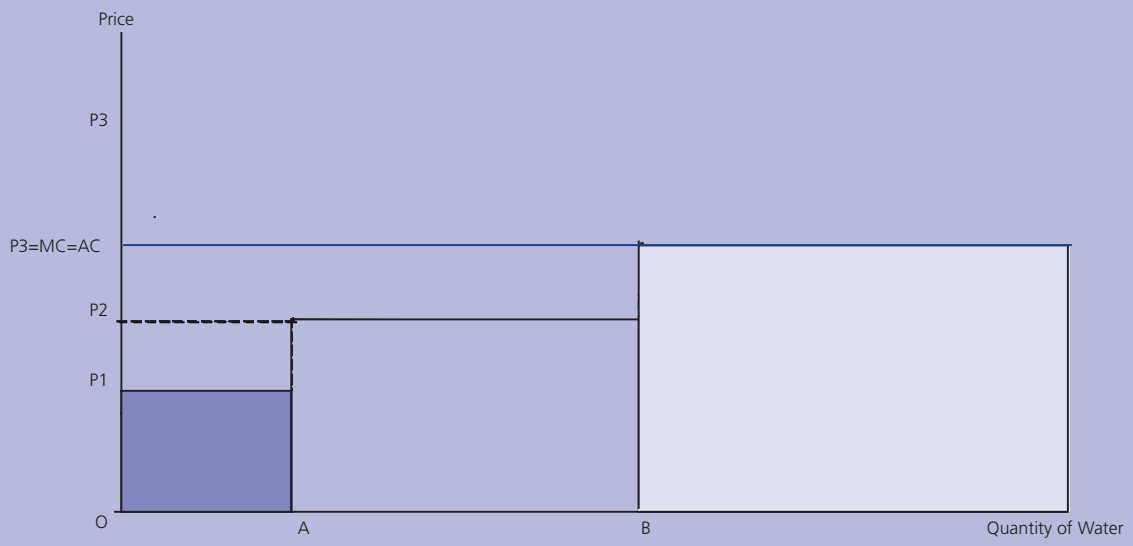
[138] Even in a second-best world where revenues need to be raised through distortionary taxes on goods, redistribution through subsidies is inferior to simple transfers. This follows from the need to preserve the usual first-order conditions of production efficiency even in this second-best setting, i.e. society must still be on the production possibility frontier (Diamond and Mirrlees, 1971).

[139] McIntosh and Yniguez (1997). But this average hides some significant intra-regional differences. For example, domestic tariff levels in a number of South Asian cities were as low as US$0.01 to US$0.03 per cubic meter. In contrast, tariffs in Hong Kong, China and Singapore were about US$0.55 per cubic meter.

[140] The Report is a comparative study of water and sanitation services in nine African countries.

community or private outlets, vendors who deliver door-to-door on a daily basis, wells and boreholes, apart from taps connected to the public water delivery system.

Box 10: Block water tariffs



Water tariffs are often multi-tiered. In this example, the lowest tier of the price structure (P1) is targeted at the poorest households, who are assumed to be low-volume consumers of water (average consumption of OA). The upper tiers of the structure are the prices charged to heavier users, who will normally be richer households (price of P2) or industrial users (price of P3).

In this example, the price charged to industrial users, and the marginal cost and average cost of water consumption are all identical and depicted by the horizontal line from the vertical axis. Rich and poor households pay prices that are less than marginal cost while industrial users provide «cross-subsidies» in the sense that they pay a higher price. The shortfall between total revenues and total costs is covered by the government with subsidies taken from the budget.

In this case, better targeting of the poor and economic efficiency would call for increasing the water tariffs charged to richer households, to the level of marginal cost. This would reduce the drain on the treasury and ensure that rich households make decisions on water consumption facing the true cost of the resource.

The irony of this situation is that because connection is costly for the poor urban household and because the quality of water service is often bad, they may end up paying a lot more for their water from private sources. Thus, the evidence suggests that the poor are often willing to pay a lot more just to ensure access to clean, safe and regular water. Thus proposals for reforming water utilities often begin with rationalizing the water tariff structure to more precisely target the poor and to correctly reflect the cost of water (see Box 10).

There is one other aspect relating to the subsidization of existing water utilities that needs to be mentioned. Subsidies are often part of a policy regime that puts water supply and sanitation firmly in the hands of the public sector, despite the financial burden on the treasury. In this sense, subsidization in the water sector and hostility to domestic and foreign private sector participation goes hand-in-hand. To that extent then, subsidies limit opportunities to trade, which would occur if foreign private water suppliers were allowed to provide their services.

There is evidence that private sector participation, whether domestic or foreign, can improve economic efficiency in the water sector. It should be noted, however, that not all experiences involving the supply of

water by the private sector have been successful, and this has fuelled public reservations about the desirability of leaving the supply of this essential service in the hands of private enterprises. A key question is whether efficient supply of water necessarily involves a sacrifice in equity. The evidence seems to be mixed. Private sector participation in water supply and sanitation in developing countries and transition economies is increasingly becoming more common. Clark et al. (2004) listed at least 27 such examples which have been the subject of careful case studies. Their paper analysed evidence bearing on the performance of private and public water utilities. It focused on the impact of private sector participation in three Latin American countries and concluded that access to water from public and private utilities has improved and that private participation has not negatively affected the poor. Other recent studies paint a more nuanced picture. Simpson (2006) concludes that liberalization of water services has produced a mixed record, with coverage rising at the same time as prices. Solanes (2006) analyses the effect of the liberalization of the Buenos Aires water system on access by the poor. His study suggests that while tariffs went up, there was no accompanying expansion in coverage so that a large part of the urban poor population continued not to have access to water supply.

(ii) Universal access in telecommunications

Most countries adopt universal access to telecommunications as a public policy goal. A major focus of universal access policy is low-income households and rural areas, which may not be adequately covered by private service providers. The demand for telecommunication services in these areas might be too low to support the cost of establishing the infrastructure to connect the population to the telecommunication network. If low-income households are unwilling or unable to pay the full cost of these services, subsidies might be used to defray part of the cost that will be incurred by service providers.[141]

Because of the high fixed costs and their network nature, telecommunication services have been traditionally considered natural monopolies. Whether these services are provided by a state or private monopoly, universal services obligations were primary financed through cross-subsidization. This implied that some users (high-income consumers in urban areas) paid prices above cost, while others (poor individuals in rural areas) paid prices below costs.

More recently, however, technological developments the telecommunications sector have led to increased privatization of state monopolies and the introduction of competition. In a competitive environment, firm level cross-subsidies are difficult to maintain, because whenever a class of users is charged below cost suppliers will have little incentive to serve these consumers. Many governments therefore have to rethink how to guarantee universal access. The challenge of universal access policy is to expand access to infrastructural utilities services in under-served areas, minimize the subsidy to be paid and yet ensure service operators' profitability and long-run sustainability.

Among the most common measures used to finance universal access in a competitive environment are direct transfers to users that the government wishes to help, regulatory measures whereby universal service obligations are included in the concessions and licences granted to operators, taxes on asymmetric interconnections favouring rural operators and universal access funds (see Table 4). As has been emphasized in this report, lump-sum transfers are the best instrument for assisting the poor from an efficiency perspective. However, in practice, especially in the case of developing countries, a tax and transfer system might not be efficient, because of tax evasion and inefficiency in tax collection.

141 See Section E for a discussion of the incidence of subsidies in the telecommunications sector.

Table 4
Main mechanisms to provide universal access

Measure	Selected Countries
Universal access obligation on incumbent	Mexico, South Africa, France, Japan, United Kingdom
Universal access obligation on new entrant	Uganda, India, Ghana, Philippines
Universal access fund A fund is established and used to finance the extension of telecommunication services to targeted regions or population. The fund is financed by a tax on the operators, general tax funds, privatization, or the sale of licenses.	1. Uganda, Peru, Ghana, United States 2. Nepal, Brazil (1-3 per cent of sector revenue) 3. El Salvador, Chile (general tax funds) 4. Guatemala (sale of resources: privatization, sale of licenses)
Public-private partnership (Build-Operate-Transfer) Private investors build the telecommunications network, operate it and receive a share of the revenues. After a specified period of time, the network is turned over to the government.	Indonesia, Thailand, Bolivarian Rep. of Venezuela, Kenya
Private-Civil Society Partnership Civil society groups, NGOs or cooperatives can take the lead in introducing telephone connectivity in rural areas. Financing can be raised from both private and the public sources.	Bangladesh, Uganda

Source: OECD (2004a) DCD/DAC/POVNET(2004)13 Annex 1.

Increasingly, some developing countries are resorting to universal service funds (USFs). All firms would be required to contribute to a universal service fund and they can all draw resources from it when they provide a service to the targeted population (poor) or area (rural sector). In this way, the mechanism can be devised in a neutral manner that does not advantage one firm relative to another. One interesting way to determine the size of the subsidies is through auctions, i.e. firms can competitively bid for subsidies. Chile and Peru were among the first to implement this mechanism to provide subsidies (see Box 11 for a discussion of the Chilean case). A licence would be given to the firm that agreed to serve a certain area for the smallest subsidy. It is often the case that the regulator is not as informed as operators about the cost of providing a service to remote areas. Then, competitive auctions can be an effective way to determine the true cost of providing the service. Interestingly, in many cases the winning bid is for a subsidy that is below the maximum subsidy offered by government in exchange for the license. This might suggest that the subsidy previously granted to the monopoly to comply with the universal service obligations were above the real cost of service provision (Cannock, 2001). These models show how governments can harness the forces of competition, through the auction, in order to achieve their equity objective at a lower cost.

In most circumstances, the use of subsidies to assist domestic telecommunications firms is likely to impede access by foreign providers. But the effect may be mitigated if the subsidy is to be auctioned off competitively and foreign service providers are not ruled out from the auction. All providers, whether domestic or foreign, would be eligible for the subsidy *ex-ante* although *ex-post* there would only be one winner.

Box 11: Universal Services Funds in telecommunication services: the case of Chile

Chile is often seen as a successful model of how to combine the use of public money (subsidies) with the discipline of the market place to achieve universal access in telecommunication services.

In Chile, the move toward privatizing the telecommunications industry began in the late 1980s. This led to a more than doubling in the telephone penetration rate, from about 49 per 1,000 population in 1988 to 113 per 1,000 population in 1994. But the explosive growth still left out significant pockets of the population, mainly those in the rural areas which represented about 15 per cent of the population and pockets of the urban poor. To address this equity concern, the government established a Telecommunications Development Fund (*Fondo de Desarrollo de las Telecomunicaciones*) in 1994 to encourage additional private investment in payphone service in rural areas and urban areas with low telephone density.

The project cycle begins with the receipt of requests for payphones from regional and local authorities, neighbourhood associations, telecommunications companies, and the general public. The telecommunications regulator then groups these requests into projects, according to geographical proximity and technical characteristics. Cost-benefit analyses are then carried out on these projects to determine which could be eligible for subsidies under the fund. The maximum subsidy to be offered for a project is the amount estimated to make it commercially viable.

Potential telephone operators are then asked to bid for the projects and the subsidies that go along with them. The winning firm is whoever submits the lowest estimate of the subsidies that would be required to make the project financially viable. Bidding companies must be willing to provide payphones to the public 24 hours a day for at least 10 years. They are free to provide any other services and to determine the prices of those services. However, regulators establish a maximum fee for regional payphone charges.

Between 1995 and 2000 the fund was able to support the provision of payphone services to more than 6,000 rural localities with about 2.2 million inhabitants. During this period, about US$52 million was spent to install payphones, for which the fund provided subsidies of US$22 million. However, the companies also invested another US$109 million for additional services, so every dollar of public money was able to mobilize an addition six dollars of private investment.

However, some questions remain about whether the services can be sustained in the long term. The financial performance of the operating companies has been mixed, with some making small operating profits while others are not expected to break even. So there is real concern that at the end of the 10 year obligatory service, some of the companies might not continue operations.

Source: Wellenius, B. (2002) 'Closing the Gap in Access to Rural Communications: Chile 1995-2002' *World Bank Discussion Paper* No. 430.

(d) Regional development

Many governments are often concerned not only with the distribution of personal or household income, but also with regional disparities in income and employment. The "new economics of geography" (Fujita et al., 2001) suggests that regional differences in industrial structure and in income arise naturally from the interplay of certain economic forces, notably increasing returns to scale internal to the firm and transport costs. It is the tension between these two forces which leads to the simultaneous existence of geographic concentration of industry with dispersion. A key feature of agglomeration is that it is a process which feeds on itself, so that once started, it tends to reinforce the initial clustering effect.

It is easy to see how differences in the geographic concentration of economic activities can then lead to regional differences in income or development. Manufacturing and high technology industries, which tend to be associated with higher average wages and incomes, may become concentrated in certain (urban) regions of a country while agriculture remains in the periphery. Industries may also go through their own life cycles, with periods of strength and decline. Thus, regions that house sunset industries may suffer a process of economic decline and a loss of population.

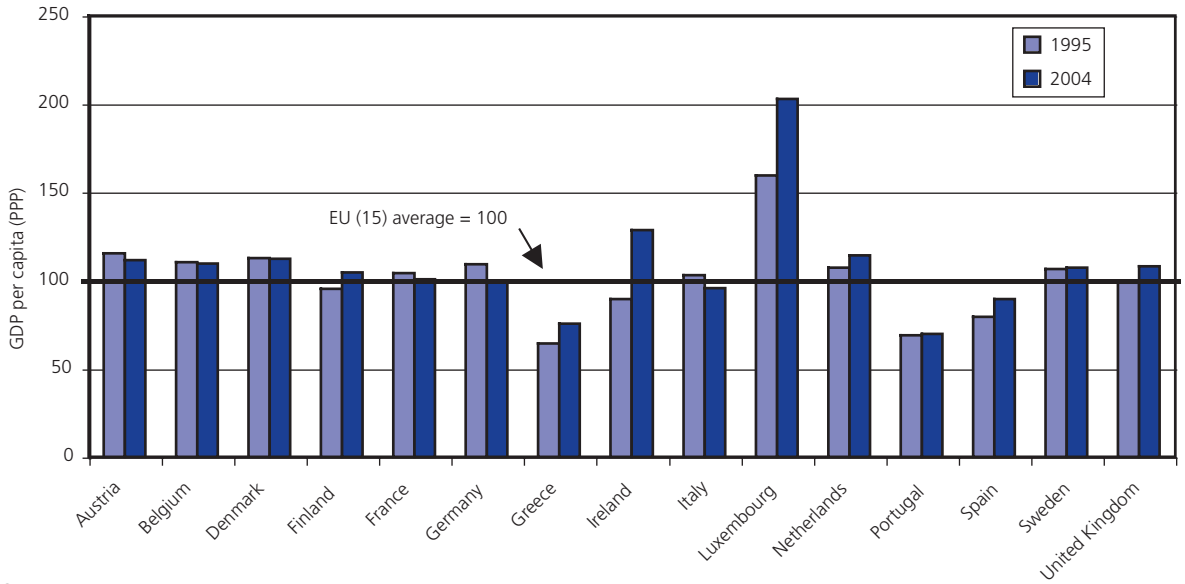
These differences in levels of development and economic activity across regions do not necessarily suggest that there is a failure of the market system. But political and social frictions are likely to arise if there is too big a gap in income or economic opportunities between regions of a country – between rural and urban areas, between the hinterland and coastal regions, etc. The costs of regional disparities could be more pronounced if these regions also differed in some other important ways, such as in religion, ethnicity or political allegiance.

Even in its beginnings, the European Steel and Coal Community placed a large emphasis on equitable regional development. This may have reflected the belief that the level of cohesion of the organization, and the degree of integration that could be achieved, would be markedly lower if the benefits from the establishment of the Community did not flow more equitably to the Members and to economically-lagging regions. In the Preamble to the Treaty of Rome, the founders of the European Community referred to the need "to ensure their harmonious development by reducing the differences existing between the various regions and the backwardness of the less favoured regions". The objective of current EU regional development policy is "to help lagging regions to catch up, restructure declining industrial regions, diversify the economies of rural areas with declining agriculture and revitalise declining neighbourhoods in the cities."[142]

But the pursuit of regional development is not cheap. The EU allocates more than a third of its budget for the purpose of regional development. The main financing facilities for regional development are the structural funds. For the funding cycle 2000-06, a total of US$235.1 billion (in 1999 prices) have been made available. Ninety-four percent of the structural funds are to be used to achieve three objectives. The first objective (Objective 1) is to assist regions whose development is lagging behind to catch up. The Objective 1 regions are those geographical areas with a per capita gross domestic product lower than 75 per cent of the European Community average. The second objective (Objective 2) is to support economic and social conversion in industrial, rural, urban or fisheries dependent areas facing structural difficulties. Finally, the third objective (Objective 3) is to modernise systems of training and to promote employment. There was also an additional €22 billion in pre-accession aid; and another €22 billion in structural interventions for the new Member States will be spent in the period 2004–06.[143]

Some idea of the economic diversity of the 15 members of the EU and of whether some convergence has taken place can be seen in Chart 1 below. Chart 1 shows GDP per capita on a purchasing power parity basis (indexed at 100 for the EU 15 average) for the members first in 1995 and then in 2004. In 1995, six of the members had GDP per capita in PPP terms that were below the EU 15 average. These were Finland, Greece, Ireland, Portugal, Spain and the United Kingdom. Between 1995 and 2004, five of the six increased their GDP per capita, some quite dramatically. The GDP per capita of Ireland, Greece and Spain grew by 43.5 per cent, 17.5 per cent and 12.8 per cent respectively. By 2004, the GDP per capita of Finland, Ireland and the United Kingdom were above the EU 15 average. Only Portugal showed no major improvement.

Chart 1
GDP per capita (PPP) of European Union (15) Members, 1995 and 2004



Source: Eurostat.

142 http://europa.eu.int/comm/regional_policy/intro/working1_en.htm.

143 http://europa.eu.int/comm/regional_policy/intro/working4_en.htm.

If one takes the broadest possible view of economic convergence, that is movement of GDP per capita on a PPP basis towards the EU average, there has certainly been movement towards that direction over the past ten years. Catching up has been particularly dramatic for a number of the poorer EU Member States. But it is not clear to what extent these improvements represent the working of the EU's regional policy, what can be attributed to the single market and to monetary union, and what can be explained by national economic policies.

Outside contractors who have evaluated the EU's regional programme during the previous funding cycle (1994-2000) in attaining Objective 1, reach broadly similar conclusions (ECOTEC, 2003) – namely that the structural funds have had a positive impact on the GDP of the Objective 1 regions and their overall performance relative to the EU as a whole has improved. But the report also stated that while Objective 1 is a significant contributor to the improved performance of those regions, it has probably been secondary to other factors in many cases. The extent of the beneficial impact is heavily dependent on both institutional capacities and factors such as the structure and openness of the economy.

(e) Adjustment

Governments sometimes justify subsidies to declining industries with income distribution arguments. For instance, as discussed in Section E below, financial aid granted by Members of the EU to their coal industries is considered compatible with the proper functioning of the common market if it helps in solving the social and regional problems created by total or partial reductions in the activity of production units. Note that this is not the only objective that would make coal subsidies acceptable to the EU. They would also be acceptable if they help achieve further progress towards economic viability with the aim of achieving a reduction of aid, if they help the coal industry adjust to environmental protection standards, or if they are part of an effort to strengthen the EU's energy security. While these other objectives are discussed in other parts of this Section, this subsection focuses on the income distribution argument.[144]

The productive structure of countries, that is the relative size of various sectors and industries in total production, evolves with changes in countries' relative competitiveness and the capacity for product and technology innovation. While new industries are created and expand, others decline and eventually disappear. As part of this process of industrial transformation, resources are reallocated from declining to expanding industries. Workers leaving a shrinking industry to find a new job in a growing industry may face two types of costs: a short-term adjustment cost and possibly a longer-term reduction in wage, if the new job pays less than the old one.

The short-term and long-term effects of industrial transformation raise different issues for policymakers. The size of the transitional adjustment costs is related to the speed and efficiency of the adjustment process. Government intervention designed to reduce adjustment costs would thus take place primarily for efficiency reasons. In contrast, the longer-term changes in wages reflect changes in the distribution of income among different groups of workers. If there is a risk of a permanent increase in inequality within the country, policy makers may consider intervening for equity reasons. As discussed in Bacchetta and Jansen (2003), the nature of the required government intervention is very different in these two cases.

There are two main cases where governments may subsidize firms with the objective of facilitating adjustment for workers. First, governments may provide credit assistance to ailing firms with the idea that if they manage to improve their competitiveness, adjustment by workers could be avoided. Because credit markets do not always function efficiently, firms may face credit constraints and not be able to obtain the funding necessary for adjustment-related investments, even though they would be able to pay back the loans. This argument, however, raises issues similar to those discussed in relation to selective industrial development policies.

Second, in cases of severe and unexpected shocks affecting the competitiveness of an industry, the question arises whether governments should intervene to slow down the adjustment process. In general, workers will choose the

[144] As far as the industrial restructuring aspect is concerned, a government intervention would be justified in the presence of some market failure. A subsidy, in turn, would be justified only if it is the instrument that addresses the market failure most directly. Note, however, that the market failures examined in relation to infant-industry promotion are unlikely to be present in the case of declining industries.

optimal rate at which to adjust.[145] However, government intervention may be warranted for political reasons or in the presence of certain market distortions. Governments may choose to temporarily subsidize an industry if they expect individuals to underestimate adjustment costs. This may be the case if the shrinking industry is a major regional or national employer. Shrinkage of the industry would imply a large number of workers being released from their current job, which may have serious negative repercussions on regional or national private sector activity in general. Those repercussions represent externalities which, if not taken into account, may result in excessive layoffs.

Governments may also subsidize workers more directly. Credit constraints, for instance, affect both firms and individuals. An unemployed person who cannot rely on his or her own savings may have to borrow money in order to cover current expenses or to invest in training. Because such loans are notoriously difficult to obtain, many industrialized countries have set up social safety nets. Governments may also subsidize training directly. In some industrialized countries, it is compulsory to participate in certain training courses in order to receive unemployment benefits. Such courses often aim at assisting workers in the search process directly, for instance by teaching them how to apply for a vacancy and how to conduct a job interview. Training may also aim at providing unemployed workers with skills that are in high demand. Note, however, that available evidence on the effects of retraining programs on unemployment duration and wage levels is mixed.

4. ENVIRONMENTAL PROTECTION

Environmentalists have long been concerned with the environmental consequences of growth on the environment. However, it is only since the end of the 1960s that the issue of sustainability of economic growth has received attention in the political debate and sensitivity to environmental quality has been deemed necessary for sustainable economic growth in the long run.

The increased attention of government policies toward environmental problems over the last 40 years has been triggered by the evidence of significant environmental degradation (including deforestation, global warming, reduced bio-diversity, air pollution, depletion of the ozone layer, over-fishing, energy resource scarcity) accompanying the exceptional economic growth over the same period. For example, pushed by development needs, global energy consumption has increased by about 70 per cent since 1970. As a consequence, greenhouse gas emissions have increased, leading to an increased risk of climate change and global warming. Industrialized countries are responsible for the majority of historical and current emissions, although OECD countries' share of CO_2 emissions has decreased by around 11 per cent since 1973. This does not remove the risks, as it has been estimated that developing countries may contribute up to 50 per cent of emissions by 2035. As an additional example, between 1960 and 1990, some 20 per cent of all tropical forests in the world were lost. Since 1990, tropical forests continue to recede by an average rate of close to 1 per cent a year. Globally, 94 million hectares of forest area were lost between 1990 and 2000. A leading cause of deforestation is land conversion to agricultural uses. Other reasons include overgrazing, logging, fuel wood gathering, urban growth and road construction.[146]

Widespread agreement exists in the international community that economic incentives which influence the behaviour of producers and consumers must meet sustainable development objectives, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their needs". However, there is still divergence among governments and commentators as to what are the best policy practices to achieve sustainable development.

Parallel to the increased attention to environmental issues, there appears to have been an increase in the use of subsidies for environmental protection. Environment–related subsidy notifications under the Agreement on Agriculture have increased from an average of 23 notifications annually in the period 1997-1999 to a yearly average of 37 in the period 2000-2002 (WTO, 2005b). Similarly, EU state aid for environmental and energy-saving objectives have been increasing over time. They amounted to €8.5 billion in 2003, more than a doubling relative to the 1999 level. The share of environmental subsidies in the EU rose from 13 per cent (average 1999-2001) to 23 per

145 See Mussa (1986).

146 See UNEP, Global Environmental Output at http://www.unep.org/geo/yearbook/yb2004/

cent of total state aid in 2003. However, the incidence of environmental subsidies varies greatly across countries. Within the EU, Denmark, Finland and Sweden devote the largest share of their state aid to the environment and energy saving. In 2003, the figure for Sweden was 75 per cent (European Commission, 2005a).[147]

In order to understand the debate around sustainable development and optimal government intervention, it is important to understand the causes of environmental degradation. These can be pinned down to various causes of market failures and government policy failures. Market failure comes about when property rights are not well defined. There are different sources of market failures for environmental and natural resources.

One source of market failure is negative environmental externalities.[148] These can be consumption or production externalities. There is a negative externality any time a producer or a consumer does not have to bear the full cost of his actions, so that he over-invests in the polluting activity or over-consumes relative to the socially optimal level. For example, a company whose production causes air pollution through gas emissions, but is not made to pay for this, will continue to produce as long as the incremental revenue the firm will earn from selling its product exceeds its incremental cost of production. The firm's decision to produce will not take into account the cost caused to society by the pollution. As a consequence, the firm will produce more than is socially optimal and will over-damage the quality of air. An example of a negative consumption externality is the noise pollution of people playing loud music in a park.

There are other circumstances when the activity of a firm or a consumer may have positive environmental externality effects. The cause of a positive externality is the impossibility of fully appropriating the social benefits deriving from certain actions that are not taken into account by the individual agent, thus leading to under-investment or under-consumption. An example is a firm's research activity directed toward the development of solar energy technologies. When deciding how much to invest in research and development, a firm will compare the private benefits of producing solar energy with the cost of research. Since the firm cannot appropriate the social benefits, it will not take into account the environmental benefit to society of developing a new technology. As a result, the firm will under-invest in this type of research.

Another source of market failure relates to the public-good nature of environmental resources. A public good is pure when it satisfies two conditions – non-excludability (nobody can be excluded from its provision) and non-rivalry in consumption (one person's consumption does not reduce its availability to anyone else). A public good is impure when it is either non-excludable or non-rival in consumption. In environmental economics examples of public goods are the ozone layer, climate change, and biodiversity. Common property goods (like rivers, lakes, some parks) are impure public goods because people can be excluded from benefiting from them. Other natural resources are impure public goods because they do not satisfy the non-rivalry condition. An example is the fish stock, as each unit of fish caught diminishes the amount available to others.

The potential problem with using the market to provide public goods is free riding. That is, since nobody can be excluded, everyone has the incentive to let someone else provide the good. As a result, the public good will be under-provided. In the case of the commons (impure public goods), since one person's use of a good reduces the total available to all, everyone has the incentive to capture the benefits as quickly as possible before someone else gets them. If anyone, without restrictions, can fish from the sea, collect wood from the forests or chase wild animals, the likely result is the over-exploitation of these resources. This phenomenon is known as the "tragedy of the commons".[149]

147 See Section B for the definition of "state aid".

148 See Section C.

149 The tragedy of the commons can be seen as a collective prisoner's dilemma (Hardin, 1968). Individuals within a group have two options: cooperate with the group or defect from the group. Cooperation happens when individuals agree to protect a common resource to avoid the tragedy. By cooperating, every individual agrees not to seek more than his share. Defection happens when an individual decides to use more than his share of a public resource. Game theory shows that individuals benefit from defecting in the prisoner's dilemma (even though both would be better off if both cooperated than if both defected), unless there is some individual cost to defecting. In the iterated prisoner's dilemma, retaliation for past defection can make cooperation the best choice even for a selfish individual. Similarly, far-sighted groups that impose some sort of sanction on members that over-exploit a resource can make over-exploitation unprofitable. This is trickier for larger groups.

Finally, a market failure can occur because of the asymmetry in information available to the consumer and the producer about the quality of a good or of the environmental standards adopted in its production process. The problem is that of adverse selection against the provision of goods of better environmental quality. Products of higher environmental quality are more costly to produce and so must be sold at a higher market price. If producers cannot signal this to consumers, the latter will have an incentive to buy the cheaper good of poorer environmental quality.

A government has available a range of policy instruments to address these market failures. These are command-and-control instruments that take the form of rules and regulations prohibiting, limiting or requiring certain types of actions; economic incentives, including tradable permits, tariffs, taxes, and subsidies designed to create appropriate patterns of incentives for private behaviour; and informative instruments, such as campaigns and education policies. The effectiveness and the desirability of these different policies will depend on the source of market failure and specific circumstances.

Let us consider, for explanatory purposes, the case when a country wants to reduce air pollution by reducing the CO_2 emissions of domestic firms. The country may reduce CO_2 emissions via a range of policies, including by imposing a regulation that obliges firms to reduce emissions to the desired level, by introducing tradable permit schemes, taxing emissions directly, taxing production, providing a subsidy for each unit of emission reduction or for reducing capacity, and by conducting an information campaign targeted to increase environmental consciousness in the markets. What elements determine the best policy?

Economic theory suggests that the first-best policy is always to address directly the source of the problem, otherwise we impose unnecessary costs on society. A first-best policy in this case would be to introduce a tradable permit scheme. Under this approach, the government sets the limits of the maximum allowable amount of emissions. It then allocates this maximum amount among the sources of pollution by issuing permits that authorize industrial plants, say, to emit a stipulated amount of pollutant over a specified period of time. After their initial distribution, permits can be exchanged in the market and other polluters or victims of the pollution can buy them. Producers with a deficit of permits or with plans to expand their activity must reduce emissions from existing plants. Alternatively, they may purchase permits from other producers who are either able to reduce emissions at a lower cost or that find it more profitable to sell their permits rather than using them. Thus, the desired reduction of emissions is attained at the minimum possible cost to the society and a strong incentive is provided to improve efficiency and develop cleaner technologies. This system introduces something similar to a property-right regime, thus addressing directly the market failure. If the market is perfectly competitive and there are no transaction costs, then the system leads to a first-best outcome independently of who gets the permits initially (Coase, 1960). In practice, the problem with this policy instrument is that markets are not perfect, and tradable permits can also be used for strategic competition purposes.

Theory also suggests that emission standards are less efficient than emission charges. Emission taxes are an optimal instrument for environmental protection because the government can set the charge at the marginal environmental damage corresponding to the socially optimal level of pollution (this tax is known as the Pigouvian tax) and then firms will abate at the point where their marginal abatement cost equals the charge. In contrast, emission standards can be economically inefficient and excessively costly to implement. For example, under the regulatory approach, all producers would be subject to the same emission standards regardless of their pollution abatement costs. Ideally, only large scale producers would need to adopt pollution control technologies, as their cost per unit of output is lower than that of small-scale production firms. Although, theoretically, the Pigouvian tax represents an optimal policy instrument, in practice its implementation raises a number of concerns. These include distributional issues, uncertainty about the cost and the benefits of abatement and the cost of monitoring and enforcement. For these and other reasons, policy makers may prefer the use of environmental standards.

In addition, while emission taxes are an optimal policy, taxing production (rather than emissions) would be a second-best policy since production is not a problem per se. The problem is the emissions generated by the production process through, for example, the use of polluting inputs.

Economists tend to consider, from a theoretical point of view, taxes and subsidies[150] as similar instruments, for a subsidy can be thought of as a negative tax. For example, a tax on gas emissions or a subsidy for each unit of emission reduction can be designed in a way to have equivalent effects on one firm's emissions. To the extent that they are both targeted to the emissions, they are a first-best policy.

In general, it may be argued that a tax may be superior over time. This is because a tax deters entry and the expansion of the environmentally damaging activity, while a subsidy per unit of emission reduction may provide the incentive for firms to enter the market. If marginal abatement costs differ, some firms will be compensated for their actual abatement cost, but others will make a profit from the subsidy and this will encourage entry. In this case, even if each firm pollutes less, total pollution may not decrease as there will be more firms that pollute. Another advantage of an environmental tax policy is that it is consistent with the "polluter pays" principle, which argues that the public owns environmental resources and those who damage these resources should pay the public.

As far as information campaigns are concerned, they are an optimal intervention policy to the extent that the source of the problem of excessive emission levels is the asymmetry of information between consumers and producers on one side and the government on the other about the risks of environmental degradation, or the asymmetry of information between producers and consumers about the environmental characteristics of a product or its production process. An information campaign may serve the purpose of increasing the number of environmentally-conscious consumers and producers, which may act as a deterrent for firms against environmentally-damaging behaviour even in the absence of regulations. This may occur in two ways. First, additional information may provide firms with the incentive voluntarily to adopt more environmentally-friendly standards to be able to capture the higher demand for environmentally preferable products (which may be made distinguishable to consumers through eco-labels). Second, firms may find it convenient to adopt environmentally less-damaging processes or produce goods more compatible with environment conservation objectives in order to safeguard their reputation and avoid consumer boycotts. However, the effectiveness of this policy is likely to depend on the socio-economic structure of the country where it is implemented. Empirical evidence suggests that the level of education of the population is a crucial factor in determining pressure on industries to behave in an environmentally-responsible way (Hartman et al., 1997).

A complementary policy in this context can be represented by subsidies provided to the distribution sector to foster the use of eco-labels.[151] The economic justification for this subsidy is the market failure produced by the asymmetry of information between producers and consumers about the environmental damage of the various production processes adopted by different industries. Without an eco-label, consumers will not be able to distinguish between the good that is produced merely in conformity with the prevailing environment standard and the firm that adopts a better (but more costly) environment standard. Without the label the latter producer might not be able to compete in the market, as it will need to charge a higher price.[152]

So far, the analysis has focused on *ex ante* policy instruments available to a government to protect the environment. There are, however, also *ex post* policies or enforcement incentives. These policies, although implemented after the environmental damage has occurred, may work as a pollution deterrent. Indeed, if firms are made liable to repay the environmental damage once it has occurred, they will take every action to reduce the probability of the damage occurring and will abate at the efficient point. But environmental liability may not work, for example, if firms have limited financial liability.

Government intervention to protect the environment may not always lead to efficiency. Firstly, the removal of the cause of market failure in one sector does not necessarily result in more efficient allocation if other sectors of the economy are characterised by market failures. A second consideration is that government intervention may itself induce economic inefficiency. For example, poorly designed tax and subsidy schemes may distort the allocation of resources in an undesirable way.

150 We restrict the analysis to environmentally-motivated subsidies that are intended to improve the environment. Subsidies may also be environmentally harmful. A number of recent studies have focused on environmentally harmful subsidies. See, for example OECD (2005d and 2002).

151 For the use of regulations to solve problems of asymmetry of information, see WTO (2005c).

152 See Valentini (2005).

A general issue relating to the desirability of different policies to achieve environmental objectives is linked to the issue of a possible government failure. In practice, it is very difficult to define the exact amount of an emission tax or a subsidy per unit of emission reduction to achieve a certain environmental objective.[153] In order to calculate the Pigouvian tax, a policy maker needs to know the value of the environmental cost and benefits of abatement, and the abatement costs of firms. Since there is a great deal of uncertainty about the exact magnitude of these costs and benefits, the government may fail to set the appropriate value of the tax, thus missing the environmental target.[154]

The advantage of regulation over other instruments to reduce CO_2 emissions is that it may be designed to precisely achieve a target. Yet, the cost of the policy is uncertain in this case. Since a tradable permit combines certainty of outcome and least costs, the argument is made as to the superiority of this instrument.

An important issue related to the use of certain environment standards is that of the optimal level of environmental protection. For a certain country, this will depend on its level of development. To the extent that imposing a strict environmental standard may turn out to be costly, international competition may trigger a race-to-the-bottom[155], thus undermining the possibility of protecting the environment through regulation in a free trade environment.[156] An argument can be made, in this context, to justify subsidies to help firms to adjust to new regulations and avoid pressures toward a gradual slipping of environmental regulations. These subsidies are intended to help producers to adapt to the new regulations, insulating them from the full cost impact of new products, processes or production method requirements. However, the risk exists that this type of support may result in a perverse incentive to make regulation more stringent than necessary to keep competition out.

Another source of government failure to achieve environmental protection is the trans-national nature of some environmental problems. Air pollution and acid rain, for example, transcend national borders. These types of environmental externalities are not local in nature, but global. It may be the case that the government of one country does not have the necessary inclination to reduce these trans-boundary emissions. The question then arises of what other countries can do to combat these emissions. One solution is for the downwind country to pay for the abatement costs of upwind countries. This may prove to be an optimal policy, especially if abating emissions abroad is more efficient that abating emission at home. Yet this policy may be subject to mounting pressure from public opinion to use harsher solutions against the polluting country. Another approach is to negotiate an international agreement.[157] Finally, trade barriers against the upwind country can be raised in the hope of dissuading it from continuing to pollute. However, these measures may prove to be effective as a means to force upwind producers to install abatement equipment only if the downwind country absorbs a large share of the production of the upwind firm.[158]

An important issue is whether environmental subsidies should be cross-sectional or targeted to a specific sector. To the extent that the environmental problem is sector-specific, there is an economic argument for targeting the subsidy to that sector. For this reason, environmental subsidies are more likely to be found in sectors that are relatively more polluting (such as energy and transport) or natural resource intensive (such as fisheries or forestry).[159] In addition, the type of subsidies – production-enhancing or reducing, for example – is likely to depend on the particular type of externalities of the sector.

153 A similar argument also holds for the use of an information campaign to achieve environmental protection objectives: it is difficult to estimate to what extent a certain campaign may affect individual decisions.

154 Many environmental resources exist as a stock – from an economic perspective an asset yielding flows of environmental services over time. In considering the efficiency and optimality of their use we must take into account the pattern of use over time. That is, efficiency and optimality have an inter-temporal or dynamic dimension as well as a static one. Imperfect information and uncertainty become particularly important in these circumstances, especially when actions have irreversible effects.

155 See Swire (1996) and Wilson (1996) for a survey.

156 For a discussion on standards and environmental protection see WTO (2005c).

157 See UNEP (2004).

158 Nordström and Vaughan (1999).

159 As a way of confirmation, figures for environmentally-motivated subsidies based on national statistics data for Sweden and Denmark show that the highest share of environmental subsidies are related to the transport sector. Natural resource-related environmentally-motivated subsidies (including agriculture, forestry and the fishery) represent nearly 5 per cent of Sweden total subsidies (Larsson, 2003).

Table 5 provides some examples of subsidies whose stated objective is to improve the environment.[160] Environmental subsidies have been classified into four groups, depending on the specific market failure they target: the first type of subsidy (Type 1) includes subsidies provided to eliminate or reduce an external cost generated by the activity of a firm, such as a subsidy provided as an incentive to reduce emissions, energy efficiency measures, conservation of nature and so on. Type 2 subsidies are subsidies designed to capture an external benefit generated by the activity of a firm. These include subsidies such as support for forestation, bio-energy research, the introduction of new environmentally friendly technology, and so on. The third group (Type 3) of environmental subsidy includes subsidies related to the costs of compliance with environmental regulation. Often such support relates to the purchase of new equipment, characterized by better environmental standards. Other types of environmental subsidies, Type 4, are subsidies provided to enhance consumer information about the environmental benefits of consuming some goods rather than others. An example is Denmark's support to the distribution sector to foster the use of eco-labeling.

Table 5
Stated objectives for a sample of environmentally-motivated subsidies

WTO member	Beneficiary	Stated Objective	Type of subsidy
European Communities	Agriculture and forestry	Agro-environmental measures and afforestation of agricultural land (among others)	1 and 2
	Coal	To help the coal industry adjust to environmental protection standards (among others)	3
Denmark	Transport	To promote the use of hydrogen in the energy sector, primarily in transport	1
	Rail transport	To secure a more environmentally sustainable freight transport	1
	Agriculture	To facilitate the transition to and improve the conditions for organic farming	2
	Forestry and wood working industry	.. with the view to obtaining satisfactory utilisation of natural resource wood, which is an environmentally friendly raw material	1 and 2
	Energy	To support international endeavours to reduce emissions of carbon and sulphur and to conform nationally and internationally to agreed environmental targets	1 and 3
	Distribution services	To promote the energy label	4
	All companies	To ensure better energy efficiency or energy savings in private companies to reduce CO_2 emissions	1
Sweden	R&D (universities, institutes of technology, firms)	To establish fundamental competence and expertise, to facilitate the transformation of the Swedish energy system in order to reduce the environmental and climatic effects of energy systems	2
	R&D (transport, communication, energy)	To provide aid primarily for R&D but also for environmental aid and support for energy saving	2
	Firms	To obtain higher levels of environmental protection compared with what is demanded by international standards	3
	Energy (wind power)	To ensure viability for producers of wind energy	2
	All enterprises	To reduce emissions of CO_2	1
	Fishery	To enhance stocks of eel and salmons for the commercial fisheries in coastal and inland waters	2
Korea, Republic of	R&D	To obtain internationally-competitive environmental technology, to promote environment industry and to provide financial support to research institutes ... dedicated to R&D on environmental technology	2
Thailand	All industry	To favour ... investments for energy and environmental conservation	1
Tunisia	All industry	To encourage companies to make energy savings and conduct research into and develop renewable sources of energy as well as geothermal energy	1 and 2

Source: WTO Environmental Database (EDB) for 2001 (WTO, 2002a).

To sum up, the discussion above suggests that subsidies can be designed in an optimal way to internalize both negative and positive environmental externalities, to help in adjusting to new environmental regulations or to correct information asymmetries on the environment-related characteristics of a product. However, the desirability of a subsidy relative to an alternative instrument (a tax, a regulation or a tradable permit) to achieve

[160] Since 1998 the WTO Secretariat compiles annually an Environmental Database (EDB) containing all environmental-related notifications to the WTO, including subsidy notifications. The information contained in the table draws on the EDB for 2001.

a given environmental objective depends on the specific cause of the market failure, the socio-economic level of development of the country implementing the policy and the likelihood of a government failure. In order to identify the most efficient policy instrument, we must first identify what the source of the problem is. However, a national government may fail to set the appropriate policy, especially when the negative externality is global in nature. This may require international financial assistance and international agreements.

5. OTHER OBJECTIVES

This subsection discusses the use of subsidies whose stated objectives are: national security, non-trade concerns and cultural policy. In each of these cases, the existence and desirability of possible policy alternatives are analysed.

(a) National security

There are circumstances when the government-stated objective for the use of subsidies is the need to maintain national security. One example is that of food security.[161] This may be an issue for developing countries that are not able to produce or import and distribute the adequate amount of food for their population. For this purpose, governments sometimes provide subsidies to the poorest (consumer subsidies) or incentives to firms to invest in the production of food. At the global level this is an issue of redistribution and involves financial aid across countries.

However, food security is also an issue for developed countries. Japan, the Republic of Korea and Norway, for example, have stated a concern with the risk that their imports of food may be disrupted because of wars, embargoes, price shocks or natural disasters. In these cases, subsidies to increase the production of food have been justified on the grounds that maintaining capacity to produce food domestically is an insurance against moments of crisis.

The argument is that a country needs to have the capacity to produce a share of the national food demand in order to guarantee adequate food to all citizens. To the extent that the production of food requires learning-by-doing (that is, knowledge that can be acquired only by engaging in the production activity) and time is needed to make land fruitful, a certain level of production needs to be maintained. The market failure arises because of a problem of asymmetry of information, whereby it is difficult for each individual to have a correct perception of the actual risk. As a result, producers will under-invest in the production of food.

A similar argument is made for subsidies to other sectors, such as the energy sector, considered essential for any economic activity. The argument is that since a shortage of these resources would trigger a crisis in the whole economy, subsidies to these sectors to maintain a certain level of production would shelter the country from a risk of a negative external shock. Traditionally, subsidies to coal, for example, have been justified, among other reasons, on the basis of national security (see Section E). The recent dispute between Russia and Ukraine on the provision of gas has renewed political discussions on energy security in Europe.

There are ways, however, to achieve food or energy security other than subsidies to domestic industries. These include holding stocks, trading with a diversity of suppliers in order to minimize the dependency on one single country, or investing in other countries in the production of food or energy. A government policy could be, for example, to maintain a certain reserve of food or energy, say, that would partially cover the risk of emergency situations. The decision over the specific amount of the stock required would depend on the evaluation of the risk (its magnitude, duration and the likelihood of the event) and the country aversion toward risk. The stock could be maintained through import flows and the level of the stockpile could be guaranteed at any time by the diversification of countries from which the imports are originated. To the extent that the occurrence of events is not positively correlated among source countries, diversification of imports reduces the risk of emergency situations. In many circumstances, this is likely to represent a more cost-effective policy option than subsidizing domestic production.

[161] See Ingco and Nash (2004).

(b) Non-trade concerns in agriculture

The term "multifunctional", as applied to agriculture, seems to have first appeared in an international document in the World Food Summit of 1996. The Rome Declaration on World Food Security makes at least two references to the "multifunctional character of agriculture". But it was the OECD Ministers of Agriculture in 1998 who first gave it a definite meaning: "beyond its primary function of supplying food and fibre, agricultural activity can also shape the landscape, provide environmental benefits such as land conservation, the sustainable management of renewable natural resources and the preservation of biodiversity, and contribute to the socio-economic viability of many rural areas". The term "multifunctionality" is not found in the WTO Agreement on Agriculture although the related idea of "non-trade concerns" is mentioned.

There are a number of objectives that the United States, the EU and others state when providing subsidies to agricultural sectors.[162] These include socio-economic goals, such as maintaining farm income and employment in less-favoured areas, but also other goals such as protection of the environment and preservation of the countryside, control of soil erosion, extensification, aid for environmentally sensitive areas, support and protection of organic production, conservation of genetic resources, food security and providing agro-environmental amenities (for example, WTO, 2001 Committee on Agriculture, Notification EC-Domestic Support - Marketing Year 1998-99, G/AG/N/EEC/30).

The justification provided for subsidies to the agriculture sector on the ground of non-trade concerns is as follows. Agricultural production is seen as a process of joint production, where not only "commodities", such as food and fibre, are produced but also "non-commodities" which exhibit the characteristics of positive externalities and public goods (OECD, 2001b). Examples of these non-commodities include agricultural landscape and cultural heritage values, biodiversity, rural employment, food security and animal welfare. If the joint non-commodity output has a public good aspect, government provision may be necessary. If the joint non-commodity output is characterized by positive externalities, subsidies may be appropriate. For example, agricultural protection may be justified because it maintains scenic views and countryside. If there is a strong degree of complementarity between the agricultural activity and its benefit, there is a market failure. Complementarity implies that, for example, a nice landscape view is a by-product of the agricultural activity and would not exist without it. The market failure can be due to the fact that the scenic view is a sort of public good, having the characteristic of non-rivalry in consumption and non-excludability. There is a market failure because the person cultivating the land cannot appropriate all the property rights for the landscape. Under these conditions, it may make sense for the government to subsidize the agricultural activity to produce more of this public good. The notion of complementarity between agriculture production and the provision of non-commodities has been questioned. Non-commodities are not necessarily only supplied through agricultural production. One could argue that golf courses, for example, are equally attractive. Also, there are opportunity costs, including in terms of landscape and nature, to take into account when maintaining agricultural production.

In general, the concept of non-trade concerns and its analytical formulation have not been without critics. The OECD study itself admits some difficulty with the inclusion of rural employment and food security as joint outputs. In particular, rural labour is an input into the agricultural production process rather than an output. Some see the emergence of the concept of non-trade concerns as a reaction to the reduction of trade barriers in agriculture (Anderson, 2000). Others see it is a repackaging of the old rationalizations for protecting and subsidizing the agricultural sector (Freeman and Roberts, 1999). It is notable that the non-trade concerns encapsulated in the multifunctionality argument are so specific to agriculture. The argument for positive externalities in industry, such as learning-by-doing or other technological spillovers, has a much longer history in economic thought. The "infant industry" argument first appeared in List (1841). In fact, some see a parallelism in the theoretical underpinnings of multifunctionality and industrial protection in developing countries (Diaz-Bonilla and Tin, 2002).

[162] See Section E.

(c) Cultural policy

The protection of cultural heritage and promotion of cultural diversity are considered by several countries to be a public policy objective.[163] For example, audiovisual services are valued in some societies as a reflection of the social and cultural values of countries and their people. As a consequence, the manner that these services are provided and by whom are considered matters of social and political significance. The EU regulations in this area, for instance, state that "the primary purpose of regulation in the audiovisual sector is to safeguard certain public interest objectives such as pluralism, cultural linguistic diversity and the protection of minors" (European Commission, 2001, p. 3).

A policy intervention in pursuit of such objectives might be justified on the grounds that the production of local cultural products (e.g. movies, literature, theatre, music) is important for the preservation and development of a local identity, which has intrinsic value. Its value may emanate from various attributes, such as contributing to social cohesion. Products with these attributes may not be supplied by private providers in sufficient quantities to reflect their true social value. In that case, a social externality exists and governments may wish to intervene to increase production. A debate exists as to how far trade liberalization represents a menace to cultural heritage and diversity. Some argue that trade liberalization in cultural products erodes the national identity and narrows individual choice. Local cultural products are crowded out because they cannot gain enough market share to cover fixed costs. On the other hand, others tend to emphasise that trade liberalization enhances choice, which would be the case if local production were complemented by foreign competition and not squeezed out by it.

Across the world a number of different instruments have been used to achieve the objective of maintaining cultural heritage and diversity. Among these are restrictions on market access and the imposition of domestic content requirements in the audiovisual sector. For example, India has had a policy of explicitly limiting the number of foreign films. Canada has a local-content requirement in respect of television programming, as do many other governments. Where market access restrictions are imposed, these will typically take the form of quantitative restrictions of one sort or another since there are practical technology-related difficulties in applying price-based measures to imports of some of the products concerned. A number of countries exclude national treatment in respect of domestic subsidies and limit foreign shareholders (WTO, 1998a). For example, EU subsidies to the audiovisual sector are mainly targeted at supporting the production and distribution of European audiovisual products.[164] A recent study by Francois and van Ypersele (2002) identifies cultural products as products that are valued differently by consumers at home and abroad, and which are produced under economies of scale. In those circumstances, restrictions on trade in cultural products (such as quotas and tariffs), if operated by impartial, well-informed governments, can be welfare improving.

In general, subsidies and local-content requirements seem to prevail relative to tariffs as an instrument of protection in the audiovisual sector. As Janeba (2003) noted, this is probably due to three factors. First, the audiovisual sector is traditionally characterized by increasing returns to scale, and higher prices induced by tariffs or quantitative restrictions may not be sufficient to guarantee production. Second, many countries need to form local talent and local production facilities and this is more directly targeted through a subsidy. Finally, higher tariffs or more restrictive quotas increase prices and thus reduce overall consumption. To the extent that the consumption of a heritage or cultural product is deemed to have a value per se the government may want to increase the consumption of such products.

163 Literature on this topic is extensive and diverse. See, for example, Messerlin (2000), Acheson and Maule (2001), François and Ypersele (2002), Bernier (2004), Roy (2005).

164 See Section E.

6. CONCLUSIONS

This Section has illustrated how governments use subsidies to pursue a variety of objectives, either because they consider that some malfunctioning of the markets impedes them from delivering efficient outcomes or because they consider market outcomes unsatisfactory. Subsidies in the context of environmental policies and R&D support tend to be justified on the basis of positive or negative externalities. Subsidies in the context of industrial policies have been related to a variety of market failures, including learning-by-doing spillovers, information asymmetries and capital market failures. The use of subsidies to redistribute income is not linked to imperfections in the market, but to society's desire to change the market outcome.

Whatever the objective governments pursue, subsidies tend to be only one of a range of possible instruments to achieve it. The optimal policy instrument is situation-specific and needs to be determined on a case-by-case basis. Subsidies have a number of advantages compared with other instruments. They represent a relatively transparent form of government intervention, to the extent that expenses and recipients are reported in the government's budget. Given their direct impact on price signals, subsidies tend to have less undesirable side-effects than other instruments in situations where the government wishes to change market signals, for example in the presence of environmental or knowledge spillovers. But subsidies also have disadvantages. Because they have such a direct impact, beneficiaries have a strong incentive to lobby in favour of continued subsidization. In other words, the use of subsidies makes the government prone to capture by recipient industry groups or other groups in society. One way of reducing this danger is to link subsidization to objective performance criteria whenever possible.

As with any government intervention, it is difficult in practice to design subsidies in such a way that they do not have any unintended negative side-effects. This Section has shown that undesired side-effects can be minimized by targeting a subsidy policy as precisely as possible in terms of recipients. This is, however, not a general rule and it could be argued that the risk of government capture increases the smaller and better defined the recipient group.

The discussion in Section C showed that subsidies can have trade-distorting effects. Such effects may be intentional, for instance in the case of subsidies that respond to pressure from import competing industries, or they may be unintentional. The question therefore arises how WTO subsidy rules ensure that when subsidies are used, they serve an economically sound policy objective. This question will be analysed in more detail in Section F. The discussion in this Section indicates that such an economic analysis of the WTO rules on subsidies can only be carried out in the light of existing rules on the use of alternative instruments – like tariffs (to assist infant industries) or regulation (to protect the environment) – given that governments can pursue a given policy objective with various instruments.

Another issue that has been raised in this Section on government objectives will reappear in Section F. This is the issue of the targeting of subsidies. The SCM Agreement aims at disciplining so-called "specific" subsidies, i.e. subsidies that are limited to certain enterprises. It could therefore be argued that "more targeted" subsidy programmes are more likely to be considered "specific" under WTO law and more likely to be submitted to SCM rules. The discussion of each of the policy objectives has therefore included a discussion of the advantages and disadvantages of targeted or general subsidies in the different contexts.

This Section's examination of infant-industry arguments in favour of using subsidies for industrial development purposes shows that the controversy over this variant of the infant-industry argument does not centre on theory but rather on empirical and practical matters. In the presence of learning-by-doing spillovers, and of certain types of information asymmetries and capital market failures, selective subsidies can be theoretically shown to be welfare improving for the domestic economy. What is a matter of intense debate is whether, when political economy considerations and implementation problems are taken into account, such interventions are still advisable. Those who believe that government failures are more important than market failures support laissez-faire policies. Those who believe that government failures are not more important than market failures would not reject the use of subsidies for industrial development.

A survey of the industrial policy literature also showed that from the point of view of implementation, export promotion has some advantages over import substitution. The first is that chances to pick an industry where the country has a comparative advantage are better. The second is that the costs of subsidies, which, ideally, show up in budgets, are more transparent than those of tariffs. A third argument is that export performance is a criterion not too amenable to rigging by the firms or their bureaucratic counterparts.

The presence of knowledge spillovers linked to R&D activities is a well-known phenomenon and there is wide agreement on the need for government intervention in this field. The protection of intellectual property can partly correct for the existing market failure and increase private sector incentives to invest in R&D activities. But additional measures in support of R&D may be desirable, in particular in the case of R&D activities that require very high investments. It is generally accepted that R&D subsidies can form an appropriate tool to encourage knowledge creation, but there is no agreement on the form such intervention should take. Location and proximity matter for knowledge spillovers and some observers would argue that spillovers occur mainly within an industry. If such is the nature of knowledge spillovers, R&D subsidies should target specific locations and/or industries. This is to some extent what governments do when applying so-called cluster policies. Yet such policy approaches are prone to capture and imply that governments know how to "pick" or "recognize" winners. Many therefore continue to oppose targeted R&D policies and argue in favour of more general policies that aim at raising the economy-wide level of research expertise, like support to university education and research.

High R&D intensity is frequently associated with imperfect competition in the sectors concerned, which might induce governments to use subsidies to shift rents or pursue other strategic objectives. The use of subsidy programmes in support of "national champions" that are considered to be of particular value for the economy is a frequent phenomenon and is often observed in R&D-intensive sectors. Such policies are likely to be hurtful to trading partners that are themselves active in the same industry. On the other hand, they may be beneficial for trading partners that only import the relevant service or good, as increased competition may lower consumer prices. Given the nature of strategic subsidy schemes, the risk of government capture is particularly high. The more governments enter the rivalry, the more likely that funds end up being dissipated in excessive entry, possibly leading to consumer prices that are higher than necessary, as none of the supported companies can produce at an efficient scale.

Environmental subsidies can be designed in an optimal manner to internalize both negative and positive environmental externalities and to correct information asymmetries on the environment-related characteristics of a product. In addition, they may serve to favour the adjustment to new environmental regulations. However, the desirability of a subsidy relative to an alternative instrument (tax, a regulation or a tradable permit) to achieve a certain environmental objective depends on the specific cause of the market failure, the socio-economic level of development of the country implementing the policy, and the likelihood of a government failure. Whether environmental subsidies should be cross-sectoral or rather targeted at a specific sector also needs to be decided on a case-by-case basis. To the extent that the environmental problem is sector specific, there is an economic argument to target the subsidy to a specific sector.

Governments also frequently employ subsidies to pursue income distribution objectives, although this may not always be the most efficient instrument. Where they are used, however, subsidy programmes should be as targeted as directly at the beneficiary as possible, otherwise the amounts earmarked may end up benefiting those who are not deserving. This problem was highlighted in this subsection with the discussion of subsidies for water utilities.

By targeting the assistance so that it is delivered to the target population, industry or firm, the welfare cost of the subsidy programme is lowered. But, in a sense, this principle goes against the grain of WTO agreements which consider a subsidy a problem the more specific it is. This is because the more specific subsidies are, the greater the assistance that they will be able to provide to an industry or to a firm, with potentially a greater output and trade response. It is not the intention here to exaggerate this possible conflict, but only to highlight the careful balancing act that governments must perform to ensure that their pursuit of legitimate policy goals, with the use of subsidies, do not run counter to their obligations under international agreements.