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Introduction

This chapter presents a historical and empirical account of the role played by government intervention in the form of industrial policies in spurring development and growth in developing countries in the last fifty years.

Here, in line with Chapter 2, we adopt a broad definition of industrial policies meant to include: 1) innovation and technology policies; 2) education and skill formation policies; 3) trade policies; 4) targeted industrial support measures; 5) sectoral competitiveness policies; 6) competition-regulation policies.

The starting point of this chapter is the acknowledgment that industrial policies have always accompanied the growth process of rich countries and that, for this reason, they should be considered as a permanent feature of the 'constitution of markets' and an essential part of their functioning (Dosi, 1988). Government intervention has indeed a long history.[2] In fact, there is abundant historical evidence showing that all the current developed countries have widely adopted targeted government interventions in trade and industry during their catching-up process (Landes, 1970). Starting from the Renaissance period, several European kingdoms created, supported and protected activities characterized by increasing returns and high technology intensity. According to Reinert (1994), historical evidence clearly shows that a state forcing entrepreneurs into specific activities has indeed been a *necessary* step in the development process of most countries. Moreover, in a number of cases, when this was not possible, it became itself an *entrepreneur of last resort* (Reinert, 1999). The state also played a very important role in pushing the technological frontier by being a source of high-quality demand for national production. Infrastructure projects and warfare have been particularly important in this respect.

Two historical examples are particularly instructive in showing the role of government intervention through industrial polices in the development process of existing developed countries: Germany and Japan. The catching-up process of Germany in the second part of the

19th century is a clear example of successful use of industrial policies for inducing growth. The German development model was based on the Listian idea that acquiring new technologies, learning how to use them, and improving upon them were the three necessary steps for catching-up (List, 1845). To this end, the government designed an education and training system with the objective to transform the process of creation and diffusion of innovation in a continuous activity at the national level. For instance, German universities were the first to institutionalize a system of science laboratories and post-graduate training. In fact, far beyond protectionism, the key to the German (and US) catching-up process was precisely the leadership in the new technologies (namely chemistry and electrical engineering) and their widespread application to the economic system. This has been achieved through the development of an excellent education system and the government provision of incentives for innovators (Freeman, 2004).

A Listian philosophy also shaped the Japanese development model involving the modification of the country's economic structure through innovation and the *creation* of comparative advantages in dynamic sectors. As in the case of Germany (and the US), the Japanese model also entailed a strong emphasis on the education and the creation of a domestic innovation system. The government played a fundamental role in this. Moreover, a high quality education system was complemented by what Freeman (2004) identifies as the second ingredient of the Japanese success: a long-term approach to investment in which consideration of the dynamics of the world demand had a pre-eminent role in identifying strategic priorities in R&D investments, and in which government, again, played a central role, directing investment through the provision of a wide set of incentives (and directives).

Government intervention has also played a fundamental role in the development process of Latin America and Far Eastern countries other than Japan.

The objective of this chapter is to describe the attempt made by latecomers after WWII to use industrial policies in order to speed up the rate of industrialization and economic growth

rates. We will see that their results have been mixed, with similar policies producing very different outcomes. A thorough comparative exercise is a necessary pre-condition to the understanding of their varied degree of success. This chapter is meant to contribute to this task.

The work is structured as follows. Section 2 describes, adopting the taxonomy proposed in Cimoli *et al.* (this volume), the set of industrial policies implemented since the end of WWII in a number of developing countries. In particular, the focus is on the experiences of Latin American countries and the so-called East Asian Tigers (South Korea, Taiwan, Singapore, Hong Kong.). The objective is to identify the main lines of intervention asking a number of important questions namely, which are the characteristics of successful industrial policies? Are there industrial policies, among the ones that have worked in the past, which can be also useful in the present context? Is there a one-size-fits-all recipe, or does the high degree of country heterogeneity make it impossible to identify any 'general' effective industrial policy? Section 3 analyses how the acceleration of the globalization of production and the introduction of the new World Trade Organization (WTO) rules have modified the available set of instruments, practices and institutions to support industrial development and how the governments of developing countries have reacted to it. Together, the section describes the set of industrial policies that have been implemented by latecomers in the last fifteen years, emphasizing the similarities and diversities among the experiences of different countries.

Industrial policies: historical experiences and empirical evidence

Industrial policies in developing countries after WWII

In the 1950s, if not earlier, many governments of developing countries started to extensively intervene in the economy with the objective to spur the industrialization process. Government intervention took different forms, from complete economy-wide plans to different packages of industrial policies. Let us follow the taxonomy put forward by Cimoli *et al.* in this volume and

distinguish between policies affecting 1) opportunities of scientific and technological innovation; 2) socially distributed learning and technological capabilities; 3) the set of economic signals and incentives profit-motivated agents face; 4) modes of governance of private firms.

We begin discussing the least controversial areas of government intervention, namely technological and innovation policies on the one hand and education and skill formation policies on the other.

Opportunities of scientific and technological innovation: innovation policies and technological projects

While at the beginning of the development process all countries bought rather than made technology (Amsden, 2001), later on a few governments made an effort to stimulate the domestic production of technological knowledge. These attempts showed mixed results.

Beginning in the 1940s, a large number of public firms and public research institutions were created in almost all Latin American countries. At the time, public laboratories and publicly-owned firms were the most important source of domestic research and development (R&D) activity. Indeed, it was inside the latter that the first engineering departments of the region were created to modify imported technologies and products in order to make them fit the local environment. In the 1950s, specific public institutions started to be established to promote science and technology advances and to coordinate scientific research with firms' production activities.[3] National Research Councils were established in most of the countries. They had a number of missions: (i) funding technological development; (ii) coordinating R&D programs; and (iii) diffusing technological information.

During the 1960s and 1970s, a rich institutional infrastructure to support innovation and technological change was already active in several Latin American countries. At the time *National Development Plans* usually also incorporated a *Science and Technology Program.*

Generally, their declared objectives were to coordinate public research, to establish priorities in R&D activities and to increase the cooperation between public research institutes and the private sector. Governments have also used the national legislation to facilitate and foster domestic knowledge accumulation. For instance, in several countries[4], national laws meant to force (with limited success) foreign investors to disinvest in favor of local ones after some years were instituted, and profit repatriation was legally limited (Alcorta and Peres, 1998). The preeminent role of the state in the knowledge accumulation process is testified by the fact that, during the ISI period, more than the 80% of Science and Technology (S&T) total expenditure was publicly funded (Katz, 2000). Business-performed research and development activities were mainly carried out by large public firms operating in sectors such as telecommunications and transport, together with research institutes working in the areas of agriculture, energy, mining, forestry and aeronautics (ECLAC, 2004). Specific public research institutes were created to support this technology accumulation strategy. In Argentina in 1954, the National Atomic Energy Commission (CNEA) was set up, followed by the National Institute of Industrial Technology (INTI) (Yoguel, 2003) while Brazil created, in the early 50s, the Aerospace Technology Centre (CTA). Similarly, the National Institute for Nuclear Research (ININ), the Electrical Research Institute (IIE), the Mexican Institute of Water Technology (IMTA) and the Mexican Petroleum Institute (IMP) were set up in Mexico to promote technological innovation and development in their respective industries (Casalet, 2003).

Interestingly, governments' effort to develop R&D capabilities was not confined to the manufacturing sector. For instance, in 1957 the Argentinean government established the National Institute of Agricultural Technology (INTA) while at the beginning of the 1970s, the Brazilian government created Agricultural Research Enterprise (EMBRAPA) with the objective to coordinate the R&D activities in the agricultural sector (Pacheco, 2003).

Development banks also had an important role in financing programs for technological development during the 1970s. For instance, in Brazil, the National Development Bank (Banco Nacional de Desenvolvimiento Economico e Social, BNDES) had two special funds to finance, respectively, the training of specialized technical personnel and the development of a local capital goods industry (Dahlman and Frischtak, 1993). In Mexico, the industrial technology development program (Fondo de Equipamiento Industrial, FONEI) had a risk-sharing program in collaboration with the CONAYT, and another one funded by the World Bank, to subsidize technological adaptation and innovation (Alcorta and Peres, 1998).

An important and widely used instrument to induce domestic technological accumulation was local content rules, sometimes in the form of a condition for receiving development banks' loans. While this type of condition may have severe drawbacks (Pack, 2000), there is anecdotal evidence showing that in some cases they have been very successful. A very interesting case in this sense is the automobile sector in Brazil. Brazil started an automotive plan in 1956 as part of its ISI strategy (Shapiro, 1989). The automotive sector was targeted because it was thought to be able to attract foreign capital and technology and thus, through the creation of backward linkages, to act as a leading sector for the whole economy. In particular, the plan restricted imports and forced multinational companies to accept local content rules in exchange for permission to access the (potentially large) domestic market[5]. This early experiment in sectoral planning proved to be successful. Internal prices started to decrease in the mid-1960s, and foreign exchange savings were significant. By the beginning of the 1970s, the industry was relatively cost-efficient by international standards. What made this success possible was that the Brazilian market was large enough to make a domestic industry viable and to induce foreign investors to accept local content rules. Moreover, the automobile was still a luxury good, which made it easier for the producer to pass the burden of the cost of local content rules onto the consumers. This successful story[6] shows that there are conditions under which industrial policies and MNC strategies can be made to be complementary.

Government's commitment to technology development has been even stronger in the case of the East Asian Tigers. Since the early 1960s, the South Korean government supported domestic technological upgrading in several ways. The import of technology was strongly subsidized: transfer costs of patent rights and technology import fees were tax deductible, income from technology consulting was tax-exempt and foreign engineers were exempt from income tax. Private R&D was directly promoted with the creation of public funds to finance domestic technological innovation. In addition, the process of technological upgrading of domestic production has been accompanied and facilitated by the simultaneous increase of the government's activity in financing domestic technological innovation. As early as the 1960s, the South Korean government already started to promote a rich set of public policies whose primary goal was to foster the development of indigenous technological capabilities, and thus to reduce the dependence of domestic companies on foreign technology (Amsden, 1989).[7]

Even more so than in Latin America, the East Asian Tigers governments' acted as venture capitalists and as pioneers, especially in high technology sectors as informatics, semiconductors and telecommunications. Taiwan is the clearest example of this. Given an industrial structure characterized by small and medium enterprises (SMEs), the creation of high-tech firms needed an initial period of acquisition of foreign technologies. To this aim the import, adaptation, diffusion and development of new technologies was heavily stimulated. The Taiwan's Industrial Technology Research Institute (ITRI), founded in 1973, was established precisely to import and rapidly diffuse advanced technologies among Taiwan's firms. In addition to the welcome policies for foreign direct investments (FDI), a favorite instrument of technology development has been the creation of *science parks* and *technology clusters*. Even when the cooperation between the public and the private sector is a characteristic feature of the technological upgrading strategy of the country (Lall, 2003), the public sector has also developed new technologies on its own. Public enterprises entered several "heavy" and high technology industries when the private sector was unable to develop the necessary capabilities. In addition,

the government elaborated a number of venture capital projects and comprehensive *Technology Plans* to guide the allocation of resources.

In most of the East Asian Tigers, accumulation of technological capabilities was also stimulated by high quality government demand. Two interesting examples of this are the (now well-known) story of the shipping industry in South Korea (Amsden, 1989) and the development of the ICT industry in India which took the start from government demand for defense industry (Singh, this volume).

An important aspect under which latecomers differ with each other is the way they manage FDI. While the access to foreign technology is an obvious pre-requisite in order to take off, the *form* in which this happens (i.e. FDI, the purchase of capital equipment, licensing, venture capital agreements, etc.) matters a lot. Indeed, it determines the possibilities and modes of developing *domestic* technological capabilities and thus has a great impact on the characteristics of the growth process (Amsden, this volume). Historically, FDI inflows have been (and still are) the most important of these forms of access, but developing countries have used this channel to very different extent (see Table 5.1).

Table 5.1: Net foreign direct investment as percentage of gross domestic capital formation

	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89
Argentina	1.0	0.5	0.2	1.2	2.0	4.4
Brazil	-	7.6	5.7	4.2	3.8	2.0
Chile	-1.3	3.0	-7.0	3.9	7.8	4.6
Mexico	3.5	4.4	4.1	3.4	3.2	7.1
South Korea	0.2	0.6	2.7	0.8	0.2	1.5
Taiwan	4.4	-4.9	1.5	1.0	0.8	1.7
Malaysia	-	10.2	12.3	12.5	11.9	8.7

Source: Amsden (2001) based on IMF data

Concerning the attitude towards FDI, Amsden (2001) identifies two groups of countries. The characteristics of the first group, called *indipendentist*[8], are: 1) minimal reliance on FDI and

MNCs. 2) the technology development of a country relies on the strengthening domestic firms and a heavy emphasis on domestic skill building and R&D; 3) a pervasive use of industrial policies in order to create *national champions*. In some cases the State acts as a venture capitalist or as a pioneer. The second group, called *integrationists*[9] , is itself comprised by two groups. The a*ctive integrationists* rely on the *spillovers* from MNCs to access new technology and make a significant use of selective policies to move into high value added activities. The *passive integrationists,* instead, do not select MNCs and attract them through the use of a large number of welcoming policies, offering a stable macro environment, low wages, disciplined and semi-skilled labor and good location.

South Korea clearly belongs to the *indipendentist* group. In the 1960s and 1970s, FDI were permitted only if they were the only way of obtaining some technologies or gaining access to world markets. But, also in those cases, they were subject to tight State control. Somewhere in between, FDI has been an important engine of the Brazilian development process (Amsden, 2001, Castro, this volume). During the industrialization process, the Taiwanese government also made a substantial effort to attract FDI in technologically advanced sectors in which domestic firms were still very weak. The government sought to maximize benefits from FDI for domestic firms by (i) promoting local sourcing and subcontracting; (ii) imposing local content rules and (iii) introducing the obligation for foreign firms to transfer skills and technology to subcontractors, with the objective to raise the technological capabilities of domestic firms. At the other extreme, Singapore's technological upgrading process has been dominated by MNCs, which provided state-of-the-art technologies and access to their global networks (Lall, 2000). Singapore's government attracted MNCs by using a wide set of welcome-policies, selective investments in skills, technology and infrastructure. Interestingly, all these policies were directed at meeting the specific needs of selectively *targeted* FDI (Lall, 1996).

Socially distributed learning and technological capabilities: education and skill formation policies

A natural complement to innovation policies and indeed a pre-requisite are education and skill formation policies. While there is no doubt that firms from late-coming countries need to access and acquire technologies developed in advanced countries the necessary condition is a training and education system that gives a multitude of firms access to a labor supply with the needed skills.

We have already mentioned how important education policies have been in the historical experiences of Germany and Japan[10]. Similarly, they have been a fundamental part of the development strategy of *latecomers* after WWII. But the experiences of the East Asian Tigers and Latin America have differed considerably in this respect, as well.

The progress developing countries have made in all dimensions of education in the last century are evident, but highly uneven. Even concerning the level of illiteracy (Table 5.2), differences across regions are large. Indeed, the reduction of illiteracy that took place in Latin America during the 20th century was impressive considering the levels of illiteracy at the beginning of the century, but less so if compared with the dynamics in other countries. The Philippines and Thailand, for example, which in 1950 had illiteracy rates as high as Mexico and slightly lower than Brazil, achieved reductions in illiteracy much larger than did those countries.

Table 5.2: Illiteracy rate, total (pop>15)

	1900	1950	1960	1970	1980	1985	1990
Argentina	53	14	9	7	6	5	5
Brazil	65	51	29	34	26	22	19
Chile	50	20	16	15	19	8	7
Mexico	77	35	25	26	17	15	13
South Korea	na	78	na	11	7	5	4
Philippines	51	na	40	17	17	10	5
Thailand	na	48	na	21	12	7	na

Source: UNESCO Statistical Database

A similar picture emerges from the data on tertiary education (Table 5.3). Access to tertiary education in all developing countries expanded most during the 60s and 70s, albeit from extremely small levels. But by 1990 the access to higher education was much lower in Latin America than in the East Asian Tigers. While Argentina had one third of the students attending colleges and universities, the rest of the Latin American countries were well below this level.

Table 5.3: Gross enrollment ratios in tertiary education by access

	1950	1960	1970	1975	1980	1985	1990
Argentina	5	11	13	27	22	36	38
Brazil	1	2	5	10	11	na	11
Chile	2	4	9	15	12	16	21
Mexico	2	3	5	10	14	16	15
South Korea	-	-	7	9	15	34	39
Philippines	-	-	17	16	24	25	28
Singapore	-	-	6	8	8	14	19
Thailand	-	-	3	3	15	19	na

Source: UNESCO Statistical Database

There are few doubts that the available supply of highly skilled workers is one of the conditions that allowed the Asian Tigers to take off. Indeed, by the 1960s their educational indicators were much higher than those of other countries of comparable income. In particular, there was near-universal primary-school enrolment, and the literacy rate was nearly double that of other developing countries (Rodrik, 1995a). In those countries, the education systems were strongly biased in favor of technical degrees and were (and still are) characterized by an extremely high number of engineers (Table 5.4).

Table 5.4 - Share of Engineers in total tertiary students (%)

	Share in	
Country	**1960**	**1990**
Argentina	13.0	12.0
Brazil	12.0	9.6
Mexico	20.0	16.9
South Korea	19.0	21.7
Taiwan	19.8	30.2

Source: Amsden (2001)

In this respect, it is interesting to note that Singapore, which with Hong Kong has been the least 'interventionist' among the Asian Tigers, has also widely invested in education and technical training, obtaining very high levels of scientific education indicators. Indeed, by mid 1980, it ranked second in the world in number of engineers and students enrolled in scientific discipline as a percentage of total population (Kim, 1993). There is little doubt that the high-skilled labor force has been key to the rapid acquisition of imported technology and to its efficient exploitation and subsequent improvement.

The positive achievements of the education systems in the East Asian Tigers have been the result of active public policies[11]. This is particularly evident for South Korea and Taiwan. Starting from very low education indicators, South Korea has constantly and heavily invested in education and high skill formation: the number of researchers went from nearly zero at the beginning of the 1950s to about 6000 in 1970, most of whom employed in government research institutes and universities (Kim, 1993). At the beginning of the 1970s, South Korea was able to quickly match a fast increase in the demand of technical skills. As soon as South Korean industrial policy moved towards targeting high-tech sectors, the government started investing in the creation of general and technical skills too. As a result, the average number of years of schooling and the number of engineers increased at an impressive rate: in fact they are now among the highest in the world (see also Castaldi et al., this volume).

Similarly, the Taiwanese government has been very committed to increasing the country's supply of educated workers. Compulsory education was extended to nine years in 1968, and vocational education and man power training was strongly promoted since the early 1970s.

The importance of educational policies for catching-up is also confirmed by the Indian case. As shown by Singh (this volume), Indian government intervention in supplying high quality education (especially engineering) has been a fundamental ingredient of its industrial policy. The considerable effort by the government in establishing engineering colleges laid the basis for the export boom of the 1990s in ICT, and also for the establishment of the biotechnology and pharmaceutical industries (see also below).

Similarly, also Latin American governments have tried to support high-skill formation as part of their ISI strategy. Among them the most active was again Brazil. Already in late 1950s, the Coordenação de Aperfeiçoamento de Pessoal do Ministério da Educação (CAPES) and the la Financiadora de Estudos e Projetos (FINEP) were established to provide scholarships for advanced studies. Yet in most of the countries of the region, research in public universities and laboratories has worked in isolation with respect to the needs and priorities of the private sector (Katz, 2000; Cimoli e Primi, 2004).

From this brief historical overview it is clear that a high-level education system has been a fundamental ingredient for catching-up. Accumulation of physical and human capital turns out to be a necessary if not sufficient condition for growth. It is important to note that successful latecomers have also implemented, in addition to policies directed to increase the general level of education, focused educational policies with the objective of building engineering skills. This strategy has been essential for both the *indipendentist* and the integrationist models. Indeed, the building-up of domestic technological capabilities obviously calls for heavy investments in higher education. But this is also true for the integrationist model because the acquisition of

technology is far from being an easy process: without infrastructural investment in education, training and domestic R&D, very little can be accomplished only through technology imports.

The economic signals and incentives profit-motivated agents face: import substitution, trade policies and openness

Trade policy, affecting the degree of international competition to which firms are exposed to, contributes to determining the profitability of different production activities and thus plays an important role in influencing firms' investment decisions. For this reason, such policies have been a key part of the Import Substitution Industrialization (ISI) strategy that has characterized developing countries at least after WWII. In fact, in using trade policy to support industrialization, they did not do anything different from what developed countries did before them. Indeed, Britain was protectionist when it was trying to catch up with Holland. Germany was protectionist when trying to catch up with Britain. The United States was protectionist when trying to catch up with Britain and Germany, and Japan was protectionist for most of the twentieth century up to the 1970s (Wade, 2003).[12] Yet, while there is historical evidence that all now-developed countries have been protectionist during their catching-up process, the motivation for using trade policies and their effects is still highly controversial.

At the beginning of the 1950s, protectionism and import substitution were common practices to all developing (and some developed) countries. The idea was to protect the domestic market in order to make it easier for domestic firms to learn, innovate and grow. Later on countries started differentiating their strategies, with some of them transforming 'protected' sectors into exporting ones. Two elements characterize all the successful examples of sustained export growth. The first is the level of commitment of the government (and of the bureaucracy) to export success. An interesting example of this is South Korea where, under the Park Chung Hee military regime, there were monthly meetings between top government officials (chaired by the President) and leading exporters. Export targets were set at the industry, product and firm

levels by bureaucrats who were also held responsible for the achievement of these export targets in the industries assigned to them, and who obviously had to keep in close touch with exporting enterprises (Rhee et al. 1984). A second fundamental element is the existence of a set of policies and institutions created to mobilize exports. Starting in the 1960s, in all the East Asian Tigers the import substitution policies have been usually *coupled* with export promotion policies. Firms were given subsides and the right to sell in the protected domestic market under the commitment to export. The super-profits earned through selling in the domestic market were then invested in order to create the learning and scale economies necessary to export and thus to acquire new licenses. In South Korea, import protection was high, prolonged, and selective but, at the same time, the export performance was used as the disciplinary device for both firms and bureaucrats (Amsden, 1991). In Taiwan, exporters were given preferential tax treatment and access to credit on favorable terms. The government extensively used tariffs and quantitative restrictions in order to direct the sectoral evolution of the economy (Wade, 1990)[13]. Export growth has also been favored by the provision of long-term investment capital to those import substituting industries that were expected to become exporter. The commitment of the governments to increase export is also demonstrated by the creation, during the ISI period, of highly skilled and professional trade promotion centers in all the East Asian Tigers.[14] These institutions played a fundamental role in increasing export by facilitating SMEs in establishing contacts with foreign buyers and to enter new markets (Lall, 2003).

Also Latin American governments largely used trade policy to promote domestic industrialization during the ISI period. But, differently to what happened in East Asian countries, protectionist policies were not coupled with incentive schemes to promote production efficiency and domestic competition. In particular, in Latin America, the implementation of active export policies has been much more limited. The only partial exception has been Brazil. In fact, starting in the 1960s, the Brazilian government designed a set of export incentives in the form of tax

rebates and duty drawbacks and a special program authorized duty-free imports or a firm-specific incentive package in exchange for the commitment to export.

An interesting example of the contrasting effects of trade policies implemented in Latin America is given by the case of the machine tool industry. During the 1960s and 1970s, several Latin American countries attempted to develop a domestic machine tool industry as part of their ISI strategy. Machine tool was considered a strategic industry in that it embodied innovative knowledge with widespread applications. Indeed, after an initial period in which companies were acquiring licenses for foreign technology and designs, own design and engineering have quickly became common among several Latin American producers. But the protectionist polices that were part of the ISI strategy created a number of problems for the users. First, the prices of domestically produced machine tools were higher than world prices. The reason for this was mainly the lack of scale economies and of production specialization. A second (and related) problem was the high costs of components. While domestically produced components were expensive due to a too small scale of production the imports of foreign ones was made expensive by the high trade barriers (tariffs and quotas) and transport costs. Third, imports were strictly controlled to reduce foreign competition. Even if imported machine tools were locally available, they were normally subjected to an import license. Although licensing requirements varied across countries and over time, they were quite restrictive and normally involved: (i) justification of the purchase; (ii) proof of lack of local production; (iii) a certificate of availability of foreign exchange. The process was extremely complicated, subject to delays and (sometimes) to the approval of local manufacturers, who were afraid of foreign competition. As a result small firms' access to advanced machine tools was extremely limited and only public or multinationals firms could acquire foreign equipments (even if not always at the required moment) (Alcorta, 2000).

The historical experiences of East Asian Tigers clearly show that the use of trade protection policies is not *per se* harmful to growth. On the contrary, one of the keys to the

success of those countries has been indeed the selectivity of the country's seclusion (e.g. opening some markets to international competition while keeping others closed) (Amsden, 1989). In fact, import substitution policies only performed poorly when: (i) they were not complemented by export promoting policies; and (ii) there was no external or internal competition. In particular, protection has resulted in a failure when there were no check mechanisms (i.e. competition either at home or abroad, benefits transfers based on some predefined standards, etc.) (Amsden, 2001). Indeed, in some cases, the negative effect of trade policies was simply the result of badly designed measures. There are a number of examples of this in the way Latin American countries implemented the ISI strategy. We have already mentioned that several governments in the region imposed licenses to import capital goods to favor domestic capital good firms. However, since licenses were granted on the basis of installed capacity, the final effect was an extremely low level of capital utilization. The mismanagement of the exchange rate has been equally harmful. In contrast to the East Asian Tigers, Latin American countries have often adopted a largely over-valued exchange rate. This, by making the import of capital goods cheaper, was a way to indirectly subsidize capital formation and, at the same time, to control inflation. But this strategy had important shortcomings too. First, it greatly penalized export. Second, by favoring imports, hindered the creation of those (domestic) production linkages that Hirschman (1958) argued were the key to development and that were precisely at the core of the restrictions on imports of capital goods discussed above.

As a matter of fact, it is rather difficult to identify instances of export successes in Latin America and in East Asia (outside raw materials) which did not involve government support at some earlier stage. Among these, the most notable are the establishment of POSCO in South Korea, EMBRAER in Brazil and the salmon industry in Chile, with the first two being clear examples of import substitution under public ownership and the last one a case of the success of a quasi-public agency acting as a venture fund (Rodrik 2007). Similarly the now prevailing view that India’s growth at the beginning of the 1990s has been induced by the reduction of high

import duties and non tariff barriers is very controversial. As argued by Singh (this volume), the growth of the Indian economy started well before the trade and liberalization episode in the 1990s. Instead, industrial polices implemented in the decades before played a fundamental role in creating conditions for the take-off. As the empirical evidence shows, protectionist trade policies alone are (obviously) not sufficient to induce growth, and if they are badly designed can even depress the economy. But combined with other policies, they can be extremely effective. In particular, their positive impact is higher when they are coupled with export policies and targeted technological policies. In any case their main importance rests in the creation of the temporary 'vacuum environment' that is so crucial for infant industries to grow and that is normally enjoyed only by the technological leaders (Dosi, 1988).

Modes of governance and targeted industrial support measures: development banking, credit rationing and fiscal incentives

Targeted industrial support measures are among the most controversial industrial policies. Criticisms are obviously related to the rent-seeking argument (Krueger, 1983) and to the purported lack of effectiveness of any "picking winner" strategy (Noland and Pack, 2002). As a matter of fact, during the take-off phase, governments of both developed and developing countries have made a large use of targeted measures.

Historically, an important domain of targeted intervention has been discretionary credit landing to specific sectors or firms by development banks (Amsden, 2001).

At different times after WWII, in many developing countries, governments created national development banks with the objective to facilitate the creation and growth of the domestic manufacturing industry through preferential credit. This was nothing new in economic history. Indeed, state-supported development banks had a fundamental role in spurring industrialization for late industrializers in Europe during the 19th century (Gerschenkron, 1962).

Table 5.5: Share of development banks in total manufacturing investments, 1970-1990

Country	1970	1980	1990
Brazil (BNDES)	11.0	18.7	18.1
India (AIFIs)	7.6	16.8	26.0
South Korea (Korea Development Bank)	44.7	10.1	15.3
Mexico (NAFINSA)	35.5	11.4	10.3

Source: Amsden (2001) based on National Development Banks data

The development bank was the state's agent for financing private and public investment and a crucial source of long-term lending to industry (Table 5.5). Development banks raised capital at home and abroad using it to lend to domestic firms at below-market interest rates and sometimes to buy equities in private and public firms. Interestingly, their activity showed similar sequence and target criteria in most of the countries. Although targeting criteria varied across countries, the most common ones were: (i) the presence of a large backward and forward linkage effect; (ii) high market potential; (iii) high technology intensity; (iv) high-value added.[15]

In the case of the East Asian Tigers, development bank loans were usually conditioned on the fulfillment of some requirements that were firm-specific and included in the client's contract. One of the most used conditions for loans was the local content rule for the inputs used (Shapiro, 1989). This condition aimed at: (i) inducing domestic firms to develop their own technology and to source local engineers and machinery, (ii) facilitating the establishment and growth of national firms; (iii) enriching the technological content of domestic production; (iv) saving foreign exchange. Development banks also played a crucial role in supporting the process of technological accumulation (reserving special funds to finance programs for technological development) and the country's effort to increase export (giving exporting firms access to *long-term subsidized capital*).

Governments largely used development banks to condition the firms' behavior. This attitude was particularly clear and also effective in South Korea. In the 1960s, the South Korean

military regime nationalized all banks, giving the state control of all financial flows and thus of all investment decisions in the economy. In addition, the regime started to tightly control foreign exchange, foreign loans and foreign direct investments. Investment subsides were mainly given under two forms: (i) loans at negative real interest rates; and (ii) direct subsidies. The government subsidized investments also through the socialization of risk: entrepreneurs were induced to enter new strategic sectors by the guarantee that the state would bail them out in case the business was not profitable (Rodrik, 1995a)[16]. Finally, the government also introduced extensive tax incentives for the selected industries.

The Taiwanese government too made a widespread use of subsidized and direct credit (Amsden, 2001). But, unlike the South Korean case, the government did not promote giant conglomerates or the entry of domestic firms into heavy industries. On the contrary, since the Taiwanese economy was characterized by a large number of medium and small firms, the development bank's intervention took the form of credit for technology adoption and innovation (Lall, 2003). Taiwan also had a very effective fiscal incentive program (Statute for Encouragement of Investments - SEI**),** under which participating firms could choose either tax exemption or accelerated depreciation on capital equipment. The SEI has been up from 1961 to 1990, available to both domestic and foreign firms, with the targeted industries changing during the decades: all exporting sectors (1960s), capital-intensive sectors (1970s), technology intensive sectors (1980s).

The role and effectiveness of development banks' activities in Latin America have been much more heterogeneous than in the case of the East Asian Tigers. At the two extremes one finds Brazil and Argentina, with the Chilean experience in the middle. The Brazilian national development bank (Banco Nacional de Desenvolvimiento Economico e Social, BNDES) played a central role in the country development process. As in the case of East Asian Tigers, the government's main objective was to create a domestic industry, but an additional constraint was

present. The BNDES had to achieve this result while preventing, at best, economic concentration from increasing, in a country where income distribution was already highly unequal, the consequence being the unwillingness to create national manufacturing champions (Amsden, 2001). BNDES activity has been important for financing Brazilian firms entering strategic heavy industries (e.g. aircraft and space industry, communication). In Chile, a similar role has been played by CORFO (Corporacion de Fomento de la Produccion); during the 1950s and 1960s it financed both public and private investments in different sectors (in particular machinery and equipment). The CORFO programs allowed the creation of the industrial production structure and facilitated the investment in human capital formation and innovation. Even though these programs were clearly effective, the neo-liberal structural reforms by the military regime after the *coup d'etat* in 1973 drastically reduced CORFO's role and the number of sectoral interventions (Cimoli and Di Maio, 2004). Argentina, on the other hand, represents the example of a total failure. Created in the 1940's and active until 1977 when financial reform was introduced, the national development bank (often) granted loans at negative interest rates following the directives of the government economic policy (see also Kosakoff and Ramos, this volume). Yet the development bank has never really contributed to the development process because of lack of any coherent industrial strategy and also of mismanagement and corruption (Lewis, 1990).

Governments did not only use development banks to direct the evolution of economic activity. In many cases, the government intervention has been even more pervasive. The case of Korea and India are the most noteworthy in this sense. In South Korea, the government tightly controlled the economic activity through price ceilings and controls on capital movements. The government also used a large set of tax exemptions and government subsidies to direct investment activity in selected 'strategic' sector (Amsden, 1991). Like South Korea (and China), also in the case of India the government played a central role in guiding the industrialization process. Since the end of World War II, the government has tried to guide industrial

development through centralized planning meant to facilitate coordination of decisions both in the public and the private sectors[17] and a large number industrial policy measures, such as protecting and/or subsidizing some industries and investment (Borges and Possas, this volume).

The concession for credit at favorable conditions to targeted sectors and firms has been an essential piece of the developmental state's toolbox, but development banks' activity has been characterized by a very different level of effectiveness. International historical comparisons show that bank performance depended on: (i) the presence, or lack thereof, of some form of conditionality on the loans; (ii) the ability of the bureaucracy to control and direct firms behavior; iii) the lack of corruption of the bureaucracy itself. With few exceptions, in Latin America control mechanisms or conditionality rules were in most cases lacking, while in East Asia they were always present. This is one important difference explaining the diversity in the contribution of development banks to the growth process of the countries in the two regions. In the next section we describe other complementary explanations to the differing impacts of similar industrial policies in Latin America and East Asia

Evaluating industrial polices under the Developmental State

Though still dominant in the profession, the market-fundamentalist view arguing against any industrial policy is now challenged by an increasing number of contributions showing that government intervention has been much more effective than the orthodox account suggests. It is interesting in this regard to consider the way in which the discipline has analyzed the impressive economic performances of the East Asian Tigers. For a long time their economic success have been described as the 'natural' effect of correctly implemented export led-growth strategies (Krueger, 1985; World Bank, 1993). The orthodox account focused, in particular, on the change in policies that took place between the mid 1950s and the 1960s in South Korea and Taiwan. In effect, at the end of 1950s, when the first stage of the import substitution strategy was already

exhausted, governments in both countries started to implement polices aiming at inducing export growth (e.g. unification of exchange rates, a partial liberalization of the import regime, etc.). Thus the export boom that took place in mid 1960s has been interpreted as the consequence of such policy change and of the fact that the countries had specialized according to their (static) comparative advantages. It is evident that in this account the role of the State in the development process is very marginal. The government supposedly only set the new rules favoring export and allowed the markets to work freely: then, automatically, the economy took-off (Krueger, 1990). In fact the causal relationship between export and investments (and growth) has been the other way around, with the government playing the leading role. Rodrik (1995a) presents convincing evidence that in both the South Korean and Taiwanese case, export followed investment growth. Export growth was a *consequence*, a forced response, to the increase of the demand for imported capital goods triggered by the investment boom, in turn induced by governments which implemented a wide range of industrial policies aimed to overcome the (investment) coordination failures and to induce entrepreneurs to invest in new strategic industries.

The orthodox view is also contradicted by the historical evidence that in the period following WWII, if not earlier, governments all around the world have largely used trade policies, subsides, public enterprises, direct credit allocation as instruments to *shape* comparative advantages and to guide investments and industrialization, obtaining, in quite a few cases, remarkable results (Amsden, 1989, 2001; Wade, 1990). In particular, even if the orthodox view argues that *good* selectivity is impossible (see for instance Noland and Pack (2002)), there are a number of cases showing that the *picking winners strategy* may work. For example, in the 1960s the Taiwanese government hired the Stanford Research Institute to identify promising industries in order to promote them using trade and industrial policies. In most of them, Taiwan is now a world leader. To explain why this strategy has been successful, Amsden (2001) correctly points out that, contrary to the orthodox view, the picking winners strategy is indeed simple because, in the case of latecomers, the information requirement for implementing it is relatively small. To

select the *right* sector thus it would be sufficient to see what developed countries have already done and (creatively) imitate them. Moreover, as we have seen, in most cases governments have also *created* winners using mainly two instruments. First, they allowed the possibility of borrowing (and copying) more advanced technologies from abroad, eliminating the high sunk costs related to discovery and innovation. Second, government intervention (i.e. in the form of subsides) offered the *additional* incentives that firms in developing countries needed in order to adopt new technologies. The final result has often been that, because of lower labor cost (and sometimes higher availability of raw materials), developing countries' firms have ended up producing at lower costs than developed countries' competitors. Actually, as Rodrik (2007) points out, the performance of the countries that in their recent economic history have made a large use of industrial policies is much less disappointing than usually argued by the conventional wisdom.

Still, why did (apparently) similar industrial policies produce such different results in the East Asian Tigers and in Latin America? It is by now a shared view that the recipe of the success of the East Asian Tigers has been the effective combination of incentives with discipline (Amsden, 2001; Hausmann and Rodrik, 2003). The former were provided through subsides and protection, while the latter was obtained through direct government control and the use of export performance as a selection and monitoring device for both the entrepreneurs and the bureaucrats. The failure of the Latin American experience lies precisely in the lack of the joint presence of these two elements. Indeed, during the ISI period Latin American firms received considerable incentives, but faced very little discipline. The mistake has been to ignore efficiency considerations and to assume away capability problems. The assumption was that the necessary capabilities were already available within the country, or, in case of necessity, they would be created automatically and without extra cost (Cimoli et al., 2004). This is certainly an important difference between the two models but it is not the only one.

According to Lall (2003), the East Asian Tigers' model was also based on: i) strict selectivity and time limitation of government intervention; ii) the use public enterprises to enter risky sectors (for limited periods); iii) massive investment in skill creation and technological and physical infrastructure building; iv) the centralization of strategic industrial decisions in competent authorities; and v) a highly selective use of FDI.

There are two further features about the East Asian Tigers' model that are important in order to understand its success. First, governments have provided stable and predictable incentive frameworks that have favored investments. Second, governments have kept a close and continuous dialogue with the private sector, and, most importantly, it was 'strong' (Chang, 1994). Indeed, as in all the other developing countries where they have been implemented, industrial policies in the East Asian Tigers did create inefficient firms too. But, unlike what happened elsewhere (e.g. many Latin American countries), the state was able to withdraw support whenever firms' performance was not satisfactory and imposed exporting performance and fierce competition in domestic markets as selecting devices for firms to be targeted (Westphal, 1990).

The Latin American model, on the other hand, was characterized by: i) an 'anti-export' biased version of the ISI strategy; ii) the lack of clear performance criteria to evaluate the policies implemented; iii) the inexperience and inability of civil servants to implement the different policies; iv) a lower (with respect to the East Asian Tigers) expenditure in education and S&T as share of GDP. Brazil is an exception on many grounds but not with regards to their educational policies.

A particularly important element that differentiates the Latin American countries with respect to the East Asian Tigers concerns science and technology policies implemented after WWII. In fact, the evaluation of the effects of government intervention on innovation during the ISI period in Latin America shows mixed results. While there are a number of case and country

studies showing a positive effect of industrial polices on the accumulation process of technological capabilities in the region (Katz and Kosakoff, 1989), the innovative apparatus built around public intervention that started to take form during the ISI period has never become, contrary to the expectations, the engine of growth. The reasons for that are mainly three. First, governments in the region have always considered increasing foreign investments the most effective innovation policy. Second, the Latin American national innovation systems (that have been predominantly built around public firms and public research institutes) have never been able to create strong cooperative links with the private sector. On the one hand, the public centers have been increasingly characterized by a "bureaucratic" production of knowledge: in particular knowledge transfer to local firms was not a priority at all (Katz, 2000). On the other hand, technology policies have never been effective because of the lack of any control mechanism. Since the micro economic conduct was not regulated, Latin American firms did not respond to government incentives designed to induce the adoption of technology produced by public research institutes. Third, as we have seen, the Latin American version of the ISI strategy was characterized by high trade protection. This protectionist environment, coupled with ill-conceived technology policies, favored the emergence of a multitude of small and medium firms producing products well below the international standard. In these firms, in many cases, capital goods were second hand, most of the instruments were homemade and the organization of production was rudimentary (Katz, 1987). The East Asian experiences show, on the contrary, the positive effects of a direct and extensive government intervention in the technological domain. In particular, the effectiveness of the implemented policies is witnessed by the high technological dynamism that has characterized the Asian Tigers starting from the 1960s and by the continuous increase in the number of firms producing technologically complex products and competing in the world market (Kim and Nelson, 2000).

All this said, a question remains: *Why was it possible* to implement growth-friendly industrial policies in the East Asian Tigers and not elsewhere? There are three crucial differences

between the East Asian Tigers and Latin American countries that have made (and still make) the former more industrialization-oriented. First, in the East Asian Tigers there was no opposition to social change coming from the traditional land-owing class, which, on the contrary, was extremely powerful in Latin American countries. Second, East Asian Tigers were characterized by a more equal distribution of income that allowed the rapid expansion of domestic markets without reducing the savings rate. Finally, the *direct* economic power of the state in the East Asian Tigers was substantial, with the government controlling strategic inputs, banks and industries (e.g. through state-owned enterprises) while keeping a grip on firms' behavior. The situation was completely different in Latin America where financial interests (and the landed class) *controlled* the state and not *vice-versa*. The final outcome of this was the establishment of a *rentier* attitude of the capitalist class**.**[18]

'New' industrial policies in a neo-liberal world

The 'old' policies and the 'new' world

The industrial policy toolbox of the developmental state was severely attacked starting from mid-1970s. On one hand, on the "rhetorical" side, an increasing number of theoretical arguments showing the negative effects of industrial (and in particular trade) policies in developing countries made the case for policy reform increasingly louder (Rodrik, 1995b). On the other, two 'real world' events forced governments to deeply modify their use. The first one was the explosion of the foreign debt and the consequent 1982 debt crisis. The second was the proliferation of multilateral, regional and bilateral trade agreements that, to a large extent, limited the scope for government intervention. In particular, the multilateral agreements progressively obliged countries to reduced tariff and non tariff barriers to trade. In addition, the new WTO rules have also restricted the use of both selective subsides and safeguards. I shall briefly consider these in turn.[19]

The use of selective subsides has been severely limited by the new WTO agreements. Export subsides (also in the form of creation of Export Processing Zones, *EPZs*) and subsides for the use of domestic (rather than imported) inputs is now prohibited[20]. Local content requirements and quantitative restrictions on imports are now banned. As we have seen, export promotion policies have been a fundamental instrument of industrial policy during the developmental state era, even if their effects in terms of induced technological spillovers are somewhat controversial (Rodrik, 2004). In any case, the WTO rules still allow the use of trade policy interventions in the form of selective subsides to promote (i) domestic R&D; (ii) regional development; (iii) environment friendly activities.

The WTO, like the GATT, enables members to use safeguard measures to protect themselves only in two cases: 1) when imports can destabilize their balance of payments (*Article XVIII*); and 2) when foreign competition threatens a specific industry, due to an import surge (*Article XIX* on temporary safeguards) or an unfair trade practice (*Article VI* on anti-dumping and countervailing duties). The novelty is that WTO rules strictly limit the duration of safeguards to a maximum of eight years. The imposition of a time limit to the use of safeguards is coherent with the attempt to make trade policies as transparent as possible. For the same reason the WTO rules have forbidden the use of voluntary export restraints. The new WTO rules still give countries chances to promote and select strategic sectors: a good deal of discretionary power is left to governments in promoting science and technology activities, in particular by subsidizing private and public R&D and giving firms incentives to locate in 'science parks'. In effect, Rodrik (2004) argues that in fact the most serious obstacle for implementing industrial policies comes from bilateral agreements with the U.S. in which developing countries 'voluntarily' relinquish a relevant part of their policy autonomy. The U.S. is also responsible for the extension of the Uruguay Round to trade in services, which includes foreign investment. In the interest of developed countries, the TRIPs agreement has been designed to protect rather than liberalize the access to proprietary know-how. The effect is greater difficulty in employing the strategies of

reverse engineering and copying that have been so important during the developmental state period (see, for example, the South Korea case) (Amsden, 2000). This hinders possibilities to catch-up for developing countries at least in some sectors (Nelson, 2004; Cimoli, Coriat and Primi, this volume). Yet, some good news may come from new regional and multi-regional trade agreements if they become opportunities to implement larger industrial policy plans (see e.g. the MERCOSUR experience in the automobile sector, Rodrik (2004)).

New policies: a regional overview

A closer look at the current behavior of developing countries' governments shows that industrial policy and direct state intervention have far from disappeared. They have changed names and sometimes content, but they are still there. Let us briefly discuss the characteristics of the most important industrial policies as they have been implemented in Latin America and in the East Asian NICs in the last two decades.

Latin America

Three common elements are found in most of the official documents describing governments' plans for industrial development in the region produced in the last fifteen years. First, they are clearly designed to take into explicit consideration the characteristics of the new international scenario and the new WTO rules, especially concerning direct subsides and trade protection. Second, they are characterized by a certain degree of national experimentation, with governments trying to find original ways to stimulate innovation in the region. Third, one of the governments' objectives is (still) to modify the current international division of labor, attempting to increase manufacturing exports and decreasing countries' dependence on primary-sector related exports (Peres, 2004).

In general, it is possible to point out a (partial) abandonment of the ISI philosophy of discretionary industrialization policies in favor of "horizontal" policies. Among these, an important novelty is the introduction of competition policies to create a more competitive and efficient market context (see Borges and Possas, this volume). These policies were generally part of the reform package Latin American countries introduced in the 1980s, after the debt crisis, as part of the requirements by the international institutions, i.e. World Bank and IMF. Yet, most of these competition regulations have not been fully implemented.

As a matter of fact, despite the official declarations, in the last decade there has been a revival of industrial policy by Latin American governments (more on this in Peres, this volume). This is clearly witnessed by the proliferation of new programs to increase exports, productivity and outputs but also innovation capabilities and diversification of production.

There are two main characteristics of the set of industrial policies that are currently employed by Latin American countries. First, tax incentives are used only marginally. The reason for this is that they are seen as both sources of distortion in resource allocation (whatever this means) and contributing factors to recurrent fiscal imbalances, with their sequel of macroeconomic destabilization (Melo, 2001). Second, in the last two decades, industrial policies have (primarily) been *competitiveness policies*: the aim has been to increase production efficiency and thus the shares in the world market of existing sectors rather than the entry into new activities.

In the last two decades governments in the regions have dedicated a lot of effort to design effective export promotion polices. This aim has been mainly pursued through international trade negotiations to obtain access to *new markets* and the design of a number of policies directed to attract FDI (ECLAC, 2004). In order to attract MNCs with the objective of increasing export three set of instruments have been used (Mortimore and Peres (1998)). First, a number of governments have created Export Processing Zones (EPZ) and *maquiladoras* and have also

provided tax breaks and incentives for foreign investors. In some cases, these measures are also coupled with special trade agreements. In Ecuador, for example the *maquila* sector operates under a special tax regime and benefits from trade preferences granted by the U.S.[21]. Second, there has been an attempt to build a more efficient market environment (better law enforcement, amelioration of the physical infrastructures to reduce the country's distance from world market, etc.) in order to induce MNCs to decide to invest in the country. Third, in the same vein, governments have tried to increase the supply of skilled workers. In fact, MNCs have been attracted mostly by offering them the possibility to exploit the host country's natural resources (Peres, 1998).

Governments have also provided export promotion policies for domestic producers. Those can be classified into three categories: i) policies that affect the availability and/or cost of credit; ii) fiscal incentives; and iii) provision of non-financial services to exporters. As Tables 5.6 and 5.7 show, there is by now no shortage of incentives to increase exports, and each country has its own package. What are the results of this large effort? In fact, results are highly disappointing as these activities did not generate the positive externalities and the spillovers they were supposed to produce[22]. Thus, according to Rodrik (2004), given the available evidence, it would fair to say that subsidizing foreign investors with the objective of increasing exports is, in most cases, a 'silly policy' because it results in transfers from poor country taxpayers to rich country shareholders.

Table 5.6: Financial incentive to export

	Tax refund scheme	Drawback schemes	Temporary admission schemes	EPZ
Argentina	X	X	X	X
Bolivia	X	X	X	X
Brazil	X	X	X	X
Chile	X	X		
Colombia	X	X	X	X
Costa Rica		X	X	X
Ecuador		X	X	X
Mexico	X	X	X	X
Peru	X	X		
Uruguay	X	X	X	X
Venezuela	X	X	X	X

Source: adapted from Melo (2001)

Besides exports, governments have tried also to increase aggregate country's output. Table 5.8 reports the set of policies used by governments to increase the production capacity of each economy (i.e. policies intended not to change the composition of output but 'just' to increase it). Both horizontal and sectorally targeted policies are present. For instance, in addition to horizontal credit policies, several countries have special credit lines favoring particular sectors and/or regions within the country. In general, it is interesting to note that, while during the ISI period, the favorite target of any policy was the manufacturing sector, interventions are now mainly directed to the primary sector and to tourism.[23] Moreover, while horizontal tax incentives are not very diffused, tax incentive for particular regions or sectors are widely used[24] (Rodrik (2007)).

Table 5.7: Fiscal incentives to export

	Credit export agency	Export credit line in the Development Bank	Export credit insurance	Loan working capital	Finance for entire investment	Finance for Marketing	Buyer's credit
Argentina	X		X	X	X	X	X
Bolivia							
Brazil		X	X	X			X
Chile		X		X		X	X
Colombia	X		X	X		X	X
Costa Rica				X			
Ecuador			X	X			
Mexico	X	X	X	X	X	X	X
Peru		X		X			
Uruguay		X	X	X			
Venezuela	X		X	X			X

Source: adapted from Melo (2001)

Table 5.8: Industrial policies in support of production and investment – Latin America

Country	Loans to specific sectors	Credit program particular regions	Tax incentives specific sectors	Tax incentives particular regions
Argentina	X	X	X	
Brazil	X	X		X
Bolivia			X	
Chile		X	X	X
Colombia	X	X		X
Costa Rica			X	
Ecuador			X	
Mexico	X		X	X
Peru			X	X
Uruguay			X	
Venezuela			X	

Source: adapted from Melo (2001)

In most countries, policies to support small and medium enterprises (SMEs) have been the main component of the competitiveness policies pursued by governments in the last decade. This is so because SMEs have been deemed to become the engine of growth. For this reason, several national development banks have created specific credit lines for smaller firms. For instance, the Mexican industrial development bank Nacional Financiera (NAFIN) has played a

fundamental role in supporting and financing SMEs in Mexico after the entry into the NAFTA. While all countries in the region have introduced in one form or the other some policy to support SMEs, differences are found both concerning the total amount of resources devoted to them and the design and coordination capabilities of the institutions devoted to their implementation. During the 1990s, a number of new programs[25] were initiated, with some of them obtaining significant results. The primary novelty of these programs was the attempt to create and strengthen the linkages between SMEs and larger firms and to induce cooperation among SMEs in order to reduce some of the sunk costs that characterize the access to the export activity. One important limitation concerns the still low organizational and institutional capabilities of the agencies, with the notable exceptions of SEBRAE[26] in Brazil and CORFO in Chile. Indeed, in less advanced countries, programs are mostly one-shot and in many cases totally dependent on the availability of foreign aid for implementation.[27]

The design and implementation of policies to promote technological modernization have been one of the primary concerns of the governments in the region during the last two decades. National Science and Technology Councils, Agencies and Technology Programs to foster science and technology activities by domestic firms are now present in all countries. However, there are considerable differences among countries in terms of magnitude of administered budgets, objectives and mix of horizontal and selective policies employed (Cimoli et al. 2004). There are also notable differences concerning the financial instruments used. Resources to finance S&T activities are usually channeled through 'technology funds'. In some cases, technology funds are meant to create and strengthen a technological service market while in other cases they aim to coordinate innovation activity at the sectoral level. An example of the first approach is the Argentinean Fondo Tecnologico (FONTAR) that has, for example, a dedicated fund to support the technology development of SMEs trough technology import and technology consultancy.[28] The Brazilian case represents the main example of the second type of funds. In fact, the Brazilian program is currently the best articulated and most ambitious

technology program of the region. It groups sectors into two classes: the first group includes those sectors in which the country has already developed some technological capability, i.e., information technology and automation; aerospace technology; nuclear technology; and agriculture, and the second group consists of sectors where Brazil's technological knowledge is still very low, i.e., optical electronics and biotechnology. While the policies for the first group are intended to induce firms to make private investments, for the second one the main policy is the creation of publicly funded 'research centers of excellence' devoted to basic and applied research (Cimoli and Primi, 2004).

Government in the region still also used (traditional) fiscal incentives as policy instruments to support innovation. In the 1990s, fiscal incentive schemes essentially have taken the form of: i) tax credits and deductions for different types of R&D activities according to the categories of actors involved, or ii) public development bank loans. While there are some programs providing risk capital, this instrument is sill marginal in the technology development strategy of the government in the region.

In most countries, technology policies are now usually complemented by programs for human-resource development. Important examples in this sense are the Mexican program to financially support firms re-training their workers and managers and the Brazilian government program offering training to highly-qualified professionals.[29] In the same vein, regional S&T policies are increasingly directed to facilitate interaction and coordination between the public sector (mainly universities and research laboratories) and the private one in the R&D activity and technological upgrading. In Uruguay, for instance, a public-private partnership in seed development through the Instituto Nacional de Investigacion Agropecuniaria turned out to be extremely successful (Rodrik, 2007). Still, these efforts did not seem to have significantly increased technological accumulation capabilities of domestic firms in most of the countries. This is most probably due to the mismatch between demand and supply of technological

knowledge which hampers the impact of technology policies in the region (Cimoli and Primi 2004).

While there are few doubts that policies' design has improved in the last decades, there are still substantial problems for what concerns the implementation process and also its evaluation (see Peres, this volume). As the past experience of East Asian NICs suggests, a fundamental element for successful industrial policies is indeed the possibility to evaluate *both* (i) (how good has been) the process of implementation of a specific policy and (ii) the results obtained. From both points of view, many Latin American programs are (still) highly disappointing. In addition, since the economic signals these policies send to the private sector are much 'weaker' than the protectionist policies of the ISI period, there is much more uncertainty about their functioning. The final result is that the enterprisers do not 'believe' the incentive system of the new policies and do not exploit their possibilities for development. (Peres, 2004).

Even if rigorous evaluation is still missing, some good news come from anecdotal evidence about encouraging experiments of cooperation between the government and the entrepreneurs concerning the design and sometimes also the implementation of industrial policies. This is the case of Uruguay, where the public sector has played an identifiable and important role in providing key inputs and support for inducing private investment in a number of new economic activities (Rodrik, 2007). In some cases the entrepreneurial association have also taken the lead in the policy proposal (i.e. Colombia and Mexico). Peres (2004) considers this trend positively because it goes in the direction of a co-responsible attitude of the government and the private agents. On the contrary, apart from very few exceptions, workers unions and the academic community still do not take part in the design or in the policy implementation process.

East Asian Newly Industrialized Countries (NICs)

During the last two decades, governments' interventions in NICs in East Asia have focused on the achievement of two main objectives. First, to induce domestic firms to enlarge their scale of production. Second, to foster innovation and knowledge accumulation. Both objectives have been pursued implementing a combination of old and new industrial policies.

In recent years, governments in the region have constantly induced, by using a number of different incentives and laws, domestic firms to become bigger, with the idea that size matters for competing at world level. With this objective in the 1990s, the South Korean government forced some of the biggest business firms to merge and to acquire each other's subsidiaries. In exchange, *chaebols* received extensive tax benefits and financial support. To partially counter-balance this concentration process, the government has also started promoting high-technology small firms through the creation of dedicated credit lines by local and regional banks and the establishment of a venture capital industry. The small scale problem is more acute in the Taiwan economy, which is still characterized by the preponderance of small and medium enterprises. To cope, the Taiwanese government guided the restructuring of the domestic economy providing direct subsides and incentives for the creation of cooperation agreements between firms. Starting from the second half of the 1990s, also the Chinese government, alike the South Korean one, also adopted policies to increase national firms' size inducing domestic mergers and acquisitions and the reorganization of different industries, in particular petrochemicals, steel, automobile and the consumer goods industries (Amsden, 2001). In fact, the government's attempt to favor the growth of domestic firms is pursued also in countries where antitrust law has been formally introduced. For instance, in India the new antitrust law gives the Competition Commission a strong discretionary power in deciding whether to act against an anti-competitive behavior by domestic firms and concerning the criteria for determining whether mergers and acquisitions have adverse effects on competition.[30]

During the last two decades, governments have also made a strong effort to increase countries' knowledge assets. The results have been impressive. In most of the countries in the region both the GDP share of science and technology investments and the share of R&D spending in the manufacturing sector have substantially increased. In addition, differently from what happened in Latin America, the private's sector share in R&D have also significantly increased, reaching in the South Korean and Taiwanese cases rating comparable with the U.S. and Japan. These results have been the effect of the combination of a number of policies. First, starting from the 1980s, governments in the region have gradually liberalized their technology transfer policies. This has increased the number of collaborations between domestic and foreign firms. Second, during the 1990s, governments' promotion of high-tech sectors changed also in response to the strengthening of the IPRs regime that has reduced the possibility of imitative reverse engineering. In the last two decades, the South Korean government has strongly funded the R&D activity of both large and small domestic firms.[31] The government has also launched an ambitious Highly Advanced R&D Project to support 11 selected R&D research projects by domestic firms. In addition the government, through the Korean Development Bank, has provided loans with low interest rates and guarantees for technology loans to SMEs (Lall 2000). In these years, the South Korean government has reorganized its numerous programs to foster innovation creating a unique national innovation “master plan”. The focus of the industrial policies has shifted from the promotion of strategic industries to the support and development of strategic activities within sectors, in particular innovation-related ones. In general the private sector has taken up a larger role. With broadly the same objectives, the Taiwanese government increased the number of science parks but restricted the admission criteria.[32] In addition, in order to overcome the scale problem concerning R&D and technology investments fro SMEs, the government has supported the creation of *R&D consortia* (Mathews, 2002). These have proved to be one of the most successful and distinctive tools of industrial policy used recently in Taiwan. Most of these consortia are in the information technology sectors but they have also

emerged in automotive engines, motor cycles, electric vehicles, and now in the services and financial sector as well.

Together educational and skill formation policies have been strengthened. The South Korean government, in order to support knowledge accumulation and the process of technological upgrading, has strongly invested in high education transforming a number of universities in research-oriented schools and establishing the Science and Research Centers and Engineering Research Centers (Kim, 1999). In Singapore, the government has largely financed tertiary education and the creation of links between the academy and the industry. In particular, the government finances a number of industrial training courses, some run by MNCs, some jointly with foreign governments. A Skill Development Fund to fund the full cost of training by SMEs was introduced beside a scheme of subsidies to large firms for providing training to low-skilled workers. Finally, the government complements these policies with a free entry policy towards skilled expatriates (Lall, 2003). Starting from the 1990s, the Indian government has financed the creation of 'centers of excellence' in order to make available well-prepared professional technicians for national firms in strategic sectors. In addition, the legislation concerning technology production was modified in order to make it more profitable for private firms to engage in R&D. In particular, the software and services industries have received support from the government (Singh, this volume) both in the form of tax incentives and of specific incentive measures. That has proved to be quite effective in favoring the development of these industries and their export growth. There is now no doubt that these industrial policies, albeit of a new form, have been necessary to allow these industries to be competitive at the world level in the new scenario of globalization and liberalization of markets. Similarly, the Chinese government has heavily invested in domestic human capital accumulation. In mid 1990s, the Chinese State Planning Commission announced the creation of approximately 100 national laboratories in selected fields of basic science in which Chinese capabilities already excelled (Amsden, 2000). In the last two decades, the government has made a large effort to design and

implement policies and programs to support innovation. The instruments used spanned from tax breaks and subsidized credit to the creation of science parks and national R&D projects. Targeted industries were given tax breaks and loans at favorable conditions from state banks. But the biggest innovation has been the creation of the Science and Technology (S&T) enterprises (Lu, 1997). Although these enterprises were nominally independent, the government forced them to meet a number of requirements including the percentage of technology personnel, the percentage of sales brought in by new products, and the percentage of products exported. This, admittedly, sounds quite 'old-fashioned' and not very orthodox. But, till now, it has shown to be quite successful: isn't there a lesson to be learned from this?

While the rules of the game have changed, governments in the region have clearly not abandoned industrial policies within the broader objective of guiding economic development (see Table 5.9). Even the Singapore government, one of the most "market friendly" of the region, has centralized the management of industrial policy and FDI targeting in the efficient Economic Development Board (EDB), part of the Ministry of Trade and Industry (MTI) that gives overall strategic direction. The government undertakes periodic competitiveness studies to chart the industrial evolution and upgrading of the economy and design strategy to improve the country's competitiveness. Since its 1991 Strategic Economic Plan, the government has focused its strategy around *industrial clusters*. The public sector, among other roles, still plays a catalytic one by setting up R&D laboratories. The latter strictly cooperates with the private sector and the MNCs, which, unlike most other countries are actively involved in the strategy formulation process. Also the survival of the Planning Commission in India demonstrated continuity in the process of defining a national industrial development program. While less interventionist with respect to the Developmental State period, the Indian government still plays a fundamental role in coordinating investment activities and promoting some specific sectors.

Table 5.9: Industrial policies in support of production and investment – East Asian NICs

Country	Loans to specific sectors	Credit program particular regions	Tax incentives specific sectors	Tax incentives particular regions
India	X	X	X	X
China	X	X	X	X
Malaysia	X	X	X	X
South Korea	X	X	X	X
Taiwan	X	X	X	X

Source: adapted from Rodrik (2004) and Lall (2003)

Concluding remarks

All the currently rich countries have in their past made large use of a variety of industrial policies in order to induce structural change and growth. The same has been done by more recent *latecomers* during their development process in the last fifty years. This chapter has described these policies and their effects with a particular focus on the Latin American countries and East Asian Tigers' experiences since the end of WWII. By way of a conclusion, the main findings of the chapter could be summarized as follows. First, the historical and empirical evidence here reviewed clearly shows that industrial policies are necessary for take-off and long-run growth. Second, the degree of effectiveness of industrial policies varies a lot.

In the search for effective industrial policies, there are important lessons to be learned from the historical experience of *latecomers*. In particular, even acknowledging that each country has specific initial structural and socio-economic conditions and that the "rules of the game" have changed a lot in the last decades, it is still possible to identify some stylized facts that should be taken into consideration when designing industrial policies. First, as recent empirical evidence convincingly demonstrates, trade liberalization, contrary to the orthodox view, is not a *panacea*. Instead, the most effective policies in spurring growth seem to be the ones directed to support investments in education and innovation. Second, selective-targeted policies need to be accompanied by *some* form of control mechanism. Third, there are no ready-to-wear policies. On

the contrary, experimentation and innovation are essential ingredients in the process of figuring out how to make government interventions and industrial policies growth enhancing. Four, 'initial' conditions and comparative advantages can be (and historically have been) created. If this is the objective, then, there are few doubts that a leading role in this process must be played by a strong educational system and by public research centers (Mazzoleni and Nelson, this volume). Thus, the main challenge for developing countries is to identify which characteristics their public research system should have in order to contribute to the increase of firms' learning and innovation performance. This is not an easy task and it is not a short process but this is not surprising. As emphasized by Freeman (2004), only adopting a very *long-term* view in designing and applying industrial policies, well beyond current market signals, it is possible to create a sustained growth process.

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[1]E-mail: m.dimaio@unimc.it.
[2] For a long term historical account of different modes of government interventions see **Reinert (this volume).**
[3] The Brazilian National Council for Scientific and Technical Development (CNPq) was established in 1951, the Argentinean National Council for Scientific and Technical Research (CONICET) in 1958 and the Mexican National Council for Science and Technology (CONACYT) in 1970 (Cimoli and Primi, 2004).
[4] These countries were Bolivia, Colombia, Ecuador, Peru, and Venezuela.
[5] The required average local content share varied from 90% to 95% of the value (Shapiro, 1989).
[6] In 1987, the first Volkswagen model totally constructed in Brazil entered the U.S. market.
[7] As note by **Mazzoleni and Nelson (this volume)** this was also a way to mitigate the brain drain problem. See below.
[8] South Korea, Taiwan, China, India.
[9] Indonesia, Malaysia, Thailand, Argentina, Brazil, Chile, Mexico, Turkey.
[10] On the evolution of the education system in Japan since the XIX century see **Mazzoleni and Nelson this volume.**
[11]For a throughout discussion on the role of education polices in the development process in East Asian countries see: Ashton et al (1999).
[12] As List put it : "In order to allow freedom of trade to operate naturally, the less advanced nation [read: Germany] must first be raised by artificial measures to that stage of cultivation to which the English nation has been artificially elevated" [cited by Wade, 2003].
[13] Note that the conclusions of Wade (1990) are in open contrast with Little (1979) classical study where Taiwan's exceptional growth performance was primarily attributed to a low level of trade protection, the availability to exporters of inputs at international prices and a conservative macroeconomic policy.
[14] The Hong Kong Trade Development Council (HKTDC), the Korean Trade Promotion Council (KOTRA), the Taiwan's China External Trade Development Council (CETDC), the Singapore Trade Development Board (SRDB) were all established at the beginning of the 1970s.
[15] In this respect India was an exception: the criteria were much more political. Indeed, the government favoured small firms, regardless of the sector of activity.
[16] A classical example of this type of government intervention is the entry of Hyunday in the shipbuilding industry, see Amsden (1989).

[17] For instance, the 1951 Industrial Development and Regulation Act (still in force) empowers the State to control the direction and pattern of public and private investments, as well as to bring strategic industries and firms under public ownership Chakravarthy (2004).

[18] This interpretation of the different results of industrial policy in South Asia and Latin America largely overlaps with an explanation, based on political economy of growth, pursued by **Blankenburg and Khan (this volume).**
[19] For a thorough discussion of the implication effect of the new WTO rules see **Akiyuz (this volume).**
[20] Export subsided are still allowed for countries with per-capita income $\leq$ 1000$.
[21] As noted by Rodrik (2007) this is clearly an industrial policy in all but name.
[22] For a thoughtful discussion of the characteristics and results of one of such program, namely the Industrial Specialization Regimen (ISR) in Argentina see Sirlin (1999)
[23] Agriculture is still largely supported Argentina, Brazil, Mexico, Costa Rica and Dominican Republic.
[24] Horizontal tax incentive are, on the contrary, largely used in Caribbean countries.
[25] These are the Servicio Brasileno de Apoyo a las Micro y Pequenas Empresas (SEBRAE), the Programas de Fomento of CORFO in Chile, Program de Calidad Integral y Modernizaccion (CIMO) and the Centre Regionales de Competitividad Empresarial in Mexico, the Centros de Desarrollo Empresarial (CDE) in Argentina and Centros de Desarrollo Tecnologico (CDT) in Colombia (Peres and Stumpo, 2002).
[26] During the 1990s, the SABRAE activities have supported more than 3.5 millions of SMEs belonging to all sectors of the Brazilian economy.
[27] For a throughout assesment of policies supporting SMEs **see Hobday and Perini (this volume).**
[28] Representatives of academies and research centres, members of the Minister for Science and Technology, of the business sector and regulatory bodies constitute a mixed management committee that run each of the 12 sectoral technological funds which are in place according to a coordinated and consensual strategy. For a detailed description of technology funds in Argentina, Brazil, Chile and Mexico see Cimoli et al. (2004)
[29] The Argentinean National Plan for Technology and Production Innovation, the Bolivian National Secretary for Science Technology and Innovation, the Colombian National Program for Industrial and Technological Development, the Mexican National Council for Science and Technology (CONACYT) and the Uruguayan National Service for Science and Technology (SENACYT), all support post graduate studies through credit and grants systems. The Brazilian government has an articulated system of grants and loans for financing university postgraduate studies which alone forms around 7000 PhDs per year (Cimoli et al, 2004).

[30] The Competition Bill argues that the contribution to economic development by a domestic firm may be a justification for allowing anti-competitive actions **(see Borges and Possas this volume**).

[31] The government designated R&D programs have funded 50% of R&D of large firms and 80% of SMEs' investments in new technologies (Lall, 2003).

[32] The admission to Science Parks depends on the evaluation of a committee that consisted of representatives from Government, industry and academia. The government objective is to attract firms developing the most advanced technologies (microelectronics, precision machinery, semi-conductor, biotechnology). Benefits includes tax exemptions, low interest loans, as well as special educational facilities. In exchange, companies have to meet criteria related to operating objectives, pollution prevention and management (Amsden, 2000).