



IDB WORKING PAPER SERIES No. IDB-WP-170

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December 2010

Inter-American Development Bank
Department of Research and Chief Economist

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Inter-American Development Bank

2010

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Agosin, Manuel R.

Industrial Policy in Chile / Manuel R. Agosin, Christian Larraín, Nicolás Grau.
p. cm. (IDB working paper series ; 170)

Includes bibliographical references.

1. Industrial Policy—Chile. I. Larraín P., Christian. II. Grau, Nicolás. III. Inter-American Development Bank. Research Dept. IV. Title. V. Series.

<http://www.iadb.org>

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Abstract*

This paper studies three horizontal policy instruments and two vertical ones in Chilean industrial policy, particularly regarding small and medium enterprises (SMEs). The horizontal instruments are (1) a guarantee program for borrowing by SMEs (FOGAPE), (2) a small subsidy to new exports that was applied from 1985 through 2003, and (3) the innovation subsidies provided by the *Corporación de Fomento de la Producción* (CORFO). The vertical policy instruments are the activities of *Fundación Chile* (FCh), a semi-public entrepreneur cum venture capitalist, and a CORFO program to attract foreign direct investment in information technology. Although most programs are well designed, they are numerous and insufficiently funded; Chile could benefit from a prioritization of needs and consolidation of these programs. Moreover, the instruments for making strategic bets on new sectors are particularly weak. In particular, FCh needs to refocus its activities on high-risk projects with long payoffs, something it cannot do with its small endowment.

JEL Classifications: F43, L52

Keywords: Industrial policy, Small and medium enterprises, Chile

* We wish to thank a large number of people who shared their time and knowledge of their institutions and of Chilean industrial policy in general. Eduardo Bitrán explained the major reforms currently under way and the problems the policy framework is facing. At CORFO, we received valuable assistance from Carlos Alvarez, Claudio Maggi, Mario Castillo, Bernardita Rivera, Sara Cabrera, and Erika López. At *Fundación Chile*, we are particularly grateful to Oscar Guillermo Garretón, Andrés Pesce, Javier Duarte, and Marcelo Vásquez, who gave us access to data and analyses that are not available to the general public. We also very much appreciate the contributions of the participants in the two workshops of the IDB's research network on industrial policies, in Washington, DC, in September 2008 and in Rio de Janeiro in November 2008. We wish to extend a special thanks to Chuck Sabel, Andrés Rodríguez-Clare, Ernesto Stein, Fidel Jaramillo, Eduardo Fernández-Arias, Ben Ross Schneider, and Christian Daude for their comments on the proposal and on the first draft of this study.

1. Introduction

Chile has had a long and varied history with industrial policy, from heavy reliance on the state to guide industrialization to a total free-market approach. Today, a basically horizontal approach to industrial policy designed to correct what are perceived to be important market failures is giving way to a renewed interest in vertical policies that concentrate government efforts in selected sectors. However, policymakers are groping to understand fully what this entails and which instruments are most likely to bring about a diversification of Chile's productive and export profiles, which are still dominated to a very large degree by mining, particularly copper.

This study reviews the productive development policies currently applied in Chile, evaluates their successes and failures, and makes recommendations for improving the functioning of the industrial policy framework. Our first task is to classify industrial policies. For this we use a matrix in which policies are categorized according to whether they are horizontal or vertical in nature and whether they are delivered through the provision of public goods or through interventions in the market mechanism (i.e., through taxes or subsidies). Horizontal policies address market failures which affect broad sectors of the economy, while vertical policies aim at promoting specific sectors, whether new or existing ones. Almost all of the policy instruments examined in this paper are implemented through market interventions. Most are horizontal and a few are vertical in nature.

It is beyond the scope of this study to carry out a full welfare-economic evaluation of industrial policy tools in Chile. We are interested in whether policies have been able to achieve their stated objectives and whether those objectives themselves are sensible from the point of view of economic theory. Answers to the following questions will be sought:

- (1) Horizontal policy instruments have been instituted based on the rationale that they are needed to correct economy-wide market failures. Are they achieving their objectives and, if so, to what extent?
- (2) Vertical policy instruments have been advocated on the grounds that the market alone is slow and inefficient in developing new comparative advantages. Some policies that we will study have a clear

vertical orientation. The appropriate question to ask is whether the institutional framework set up and the amounts of resources with which they are endowed are sufficient to achieve the goal of diversifying the economy. A subsidiary question is whether the direction in which these policies are seeking to move the economy is the correct one, given the country's resource endowments and the direction in which the world economy is moving.

In the first section, we examine the general landscape of industrial policy and how it has evolved over time. We then examine in detail selected policy instruments. These are:

Horizontal policies:

- (1) guarantees for loans to small enterprises (FOGAPE);
- (2) a small subsidy to new exports in use from 1985 through 2003 (the so-called "simplified drawback");
- (3) CORFO's *Innova Chile* program to foster innovation.¹

Vertical policies:

- (4) the activities of a semi-public entrepreneurial institution (*Fundación Chile*) responsible for the development of the salmon and blueberry industries (among other less notable examples); and
- (5) CORFO's program of FDI Attraction in High Technology.

The major conclusion of this study is that Chilean policy has recently embarked on a transition from an emphasis on horizontal policies stressing corrections of specific market failures that affect the economy as a whole, and particularly SMEs, which prevailed from the 1980s until around 2000, to a more vertical emphasis on specific clusters of industries, most of which have already shown that they have developed, or could develop, a comparative advantage. Some of these industries are well established. In

¹ We treat *Innova Chile* as a horizontal program although it does have an increasingly vertical component. As discussed below, since the more vertical approach has emphasized sectors with demonstrated comparative advantage, the firms that apply for these resources do not differ as to sector of provenance from those that used to apply when no effort was made to choose sectors.

this case, the aim of policy is to bring them up to the technological frontier. Others are still in the incipient stages, but in most cases they already have a track record in exporting. The most important industries being targeted are those related to mining and food. A new emphasis on IT can also be detected. The effort is to redirect instruments used to implement horizontal policies to the strengthening of selected clusters without excluding the possibility that new industries may appear spontaneously. Most policy instruments use up-front subsidies in a matching-grant modality. Tax incentives have generally not been part of the policy framework. The recently instituted tax rebate for R&D expenditures is an exception.

Most of Chile's industrial policy framework is of the type described by Hausmann, Rodrik, and Sabel (2007) as "industrial policy in the small." In other words, the main thrust of policy makers has been to solve market failures, improve productivity, and raise the technological content of existing sectors. There is only one institution devoted to making strategic bets ("industrial policy in the large"): *Fundación Chile*. Within CORFO, there is one program that also has this objective, the program of FDI attraction in high technology. As argued below, the resources devoted to these efforts have been too meager to bring about sustainable changes in the productive and export structure.

The major problem of most Chilean industrial policy instruments is that they are not endowed with sufficient resources to make them successful. A related problem is the proliferation of programs, which makes it very difficult for any specific program to attain the scale needed for success. This is true of all of the programs examined in this study. Given the fact that the premier development institution, CORFO, does have its own resources that would allow it to make a difference if these resources were concentrated in the most promising programs, the major recommendation of the study is that efforts should be concentrated on fewer programs. Some of the good candidates are examined in detail here: FDI attraction in high technology, the *Innova Chile* programs, and *Fundación Chile*, which is in need of an endowment yielding sufficient income to undertake projects with long gestations and provide infusions of resources that are beyond its capability at the moment. Other successful horizontal programs, such as FOGAPE, could be scaled up at very little cost to the state. The same can be said of CORFO's second-tier development

banking arm, the *Gerencia de Intermediación Financianciera* (GIF), whose operations are too varied and the resources devoted to each type of operation too small for it to be an effective development bank.

2. Overview of Industrial Policy in Chile

2.1 Import Substitution and State-Directed Development

The import substitution stage of Chilean development (roughly from 1938 to 1973) saw an increasing emphasis on industrial policy. Not only did the government protect domestic industry through high tariffs but, in addition, state agencies became the most important entrepreneurs. Whole swaths of the industrial sector sprung up under government entrepreneurship: steel, petroleum extraction and processing, sugar, vertically integrated electricity generation and distribution, and telecommunications, among others. Contrary to conventional thinking, many of these proved profitable. The center-left Popular Front government that came to power in 1938 proceeded quickly to institute an ambitious industrialization policy. The *Corporación de Fomento de la Producción* (CORFO), a new development agency established in 1939 with broad attributions, including those of being a development bank, was charged with implementing the policy. With the nationalization of copper, begun during the Frei government in the 1960s and completed by the socialist regime of Allende in 1971, the state became the major producer in the Chilean economy. In addition, the State Bank (*BancoEstado*) became a key actor in the channeling of credit to the productive sectors of the economy, much of it at subsidized, negative real interest rates.²

The allocation of credit even by commercial banks was centrally directed in what became a classic example of financial repression.³ The maximum expression of these policies was reached during the Allende government, which nationalized much of manufacturing and all of the private commercial banks.

² *BancoEstado* is a state-owned commercial bank set up in the 1940s to grant credit to sectors favored by industrial policy and to SMEs that did not have adequate access to commercial banks, and to provide savings vehicles for consumers. It remains one of the most important actors in the financial sector of the economy, providing a wide variety of financial services mostly to SMEs and small savers. It is profitable and does not require government subsidies.

³ That financial repression was swept away in the mid-1970s, to be replaced by liberalization without regulation that culminated in the crash of 1982. For a marvelous account of that episode, see Díaz-Alejandro (1985).

Since the military coup of 1973, with very few but significant exceptions, until very recently Chile had basically eschewed vertical industrial policies. Although the consensus is changing, it is still very difficult to talk about sector selection, as “picking winners” is still viewed with deep suspicion. Even during the military regime, and more so since the return to democracy in 1990, a number of market failures have come to be recognized: credit constraints affecting SMEs and university students from low-income backgrounds, workforce training, the public-goods nature of some types of export promotion or food safety regulations, and, especially, innovation.

The new military regime carried out a sweeping trade policy reform (arriving at a uniform tariff of 10 percent in 1979), returned to the private sector the manufacturing firms and banks nationalized during the Allende government, gradually removed all credit controls, and, generally, attempted to establish a model as close as possible to a pure market economy.⁴ It removed practically all restrictions on foreign direct investment (FDI), but it did not grant preferential treatment to foreign companies. In fact, it attempted to create a level playing field for all participants, favoring neither sectors nor specific types of actors.⁵ The reforms had a pervasive influence on Chilean economic policy, to the point that, until recently, any new intervention proposed by the government, think tanks, or academics has tended to be met with a great deal of skepticism.

2.2 Industrial Policy during the Military Regime

Industrial policy of the horizontal variety began to make a comeback even before the return to democracy. It was recognized that markets failed in significant respects, and certain policy instruments were deployed to correct these failures. Perhaps the earliest was the recognition that generic export promotion (improvement of the country’s image abroad, attendance at trade fairs, etc.) had important externalities. Thus, early on, the military regime set up ProChile, an agency attached to the Ministry of Foreign Affairs, and placed it in charge of such activities. Since then, it has grown and has branched out in a number of directions, carrying out activities with other state agencies such as CORFO.

In recognition of the externalities involved in training, the regime set up SENCE (*Servicio Nacional de Capacitación y Empleo*). To this day, it operates mostly in

⁴ Significantly, it did not privatize the state copper company, but it did open mining to foreign investors.

⁵ The reforms of the military regime are described in detail in Meller (1996).

unchanged form. SENCE certifies firms that are entitled to provide training services. Companies that require training can hire a certified institution and deduct the expenses from profits, up to a maximum of one percent of its wage bill. Paredes and Riveros (1994) provide a description and analysis of this institution.

Small and medium enterprises have long been supported through a variety of technical cooperation programs and special financial vehicles. These programs are managed by *Servicio de Cooperación Técnica* (SERCOTEC), an institution that existed prior to the dictatorship and has survived to this day. Among them are several technical assistance and loan programs. SERCOTEC also subsidizes the preparation of loan applications by micro and small enterprises (MSEs).

Another important program initiated in the mid-1980s (and abandoned in 2003 as a result of the agreements reached during the Uruguay Round of trade negotiations to eliminate export subsidies) was the so-called *reintegro simplificado* (see French-Davis and Sáez, 1994). This instrument represented a small subsidy to new exports. In lieu of having to apply for a drawback of duties paid on imported inputs, small exports received up to a 10 percent subsidy on the value of its exports. This percentage declined when the entire tariff line (defined at the eight-digit SITC level) surpassed a certain threshold and disappeared altogether at a higher value of exports (see below for details). In modern terms, the mechanism can be viewed as a clever way of subsidizing self-discovery (Hausmann and Rodrik, 2003) and letting the market select the sectors to be promoted. The amounts involved were small, and the feature of its automatic discontinuance discouraged rent-seeking. The fact that the continuation of the subsidy depended not on individual firm exports but on those of all firms exporting the product ensured that it was in effect a subsidy to infant exports.

Perhaps the most glaring departure from neutrality was the policy toward the forestry sector (see Rossi, 1995). Here, the military government made what amounted to a strategic bet on a non-existent but potentially profitable sector. It had long been known that radiata pine grew faster in certain parts of Chile than practically anywhere else in the world.

The authorities in effect solved a coordination problem that made this sector take off. This involved legal changes, a subsidy large enough to entice private investors into

the sector, the provision of credit, and efforts to train the human capital needed for this particular sector. Early in the military regime, *Decreto Ley 701* gave broad incentives to planting and replanting trees for commercial exploitation. It declared that lands planted under DL 701 could not be expropriated by the state and granted cash subsidies of 75 percent of the costs of planting and the initial management of forests. In addition, between 1974 and 1979, the Central Bank maintained special (and subsidized) credit lines, managed through *BancoEstado* and private banks, for forestry companies and individuals who engaged in forestry development. These subsidies were put to good use by recently graduated forestry engineers emerging from three universities (Universidad de Chile, Universidad Católica, and Universidad Austral). The state gradually abandoned the production of wood and the management of forestry plantations.

Although this policy package has not been subjected to an ex-post cost-benefit analysis, judging by the importance of the sector in today's Chilean export basket and by the rapid increase in export values, the policy does appear to have played an important role. From practically nothing in 1975, today's exports of wood, wood products, pulp, and paper amount to over US\$5 billion and account for about 8 percent of Chilean exports.⁶ Unfortunately, more sophisticated products have been slow in developing. For example, wood furniture exports still languish at values below US\$30 million. Although modified from time to time, this instrument is still used today.

The second departure from neutrality has been the activities carried out by *Fundación Chile*. As noted above, FCh has been practically the only instrument for industrial policy in the large. It can be considered an ingenious (semi-public) combination of an instrument for making strategic bets and a venture capitalist in a context where there is no such segment in the capital market. FCh was set up in 1975, its creation being part of the settlement between the Chilean government and IT&T for the nationalization without compensation of the Chilean telephone company during the Allende administration. FCh carries out a number of activities, most of them involving innovation or self-discovery (in the sense of Hausmann and Rodrik, 2003). One of its major activities has been to set up profitable companies in new sectors of the economy and then

⁶ Exports in nominal US dollars have been greatly influenced by the sharp increase in commodity prices since 2003, and particularly by the phenomenal rise in copper prices.

sell them off to the private sector (either national or international). In the late 1970s it was responsible for adapting Norwegian technology salmon cultivation technology to Chilean conditions (see Achurra, 1995).

2.3 Industrial Policy from 1990 to the Present

2.3.1 The Types of Instruments Used

Nowadays, the government deploys myriad instruments mainly through CORFO, but also through other institutions such as ProChile and even the line ministries (e.g., the Ministry of Agriculture, with *Servicio Agrícola Ganadero*, SAG). These are listed in Table 1 according to the classification of policies into the four quadrants identified above: horizontal programs implemented through the provision of public services (HP, of which law and order or the ease of doing business are prime examples); HM programs, or horizontal programs involving market interventions (through taxes or subsidies); vertical programs with public service delivery (VP); and vertical programs cum market intervention (VM). Since the early part of the current decade, this insistence on horizontality has been giving way to a more realistic appraisal of the need to achieve a critical mass in the provision of government support, in line with the “doomed to choose” argument of Hausmann and Rodrik (2006).⁷

Most policy instruments fall in the HM quadrant. With one exception, this description applies to all CORFO programs. We have classified *Innova Chile* programs to encourage innovation as basically of the HM type. Although the programs support innovation generally on a first-come, first-served basis, since 2006 a deliberate effort has been made to steer innovation subsidies to the nine clusters identified for special attention by the National Council on Innovation for Competitiveness (NCIC). It should be noted, however, that most of the clients of the program, and indeed the clusters identified in the

⁷ Interestingly, in an interview with Carlos Álvarez, the current Executive Vice President of CORFO, he stated that, since the first democratic government of President Aylwin (1990-94), there has been an active debate inside the administration between those favoring vertical policies (usually by adherents of the left-wing parties of the governing *Concertación* coalition) and those opposing them (the Christian Democrats and some more “liberal” members of the left-wing parties). While the “horizontalists” have won the day up to now, since the Lagos administration (2000-2006), the “verticalists” seem to be on the upswing. The new thinking is reflected in the CORFO program to attract FDI in information and communications technology, in some features of the CORFO INNOVA program, and in the proposals of the *Consejo Nacional de Innovación para la Competitividad* (see below).

white books of the NCIC, do not differ markedly from those that one would have expected to apply for innovation subsidies, given Chile's comparative advantages.

The one important policy instrument in the VP quadrant is the range of activities carried out by SAG, which has an important role in ensuring food safety at the borders, controlling the quality of food exports so that they comply with foreign phytosanitary requirements, and entering into sanitary and phytosanitary agreements with countries with which Chile has free trade agreements.

Below we discuss in detail two clearly vertical policy tools. One is *Fundación Chile*, and the second one is the program to attract FDI in information technology, instituted in 2000. FCh is difficult to classify into the two approaches through which vertical policies can be implemented. In fact, it should be in a category of its own: as noted above, it is an instrument for placing bets on new sectors or technologies, which later will be imitated by the private sector. On the other hand, the program to attract FDI in high technology is clearly of the VM type, since it is implemented through up-front subsidies. In fact, it represents a rare instance of VM policies in the Chilean arsenal.

There is another vertical market intervention, not so benign in this case, which is worth mentioning: the special protection offered to some agricultural goods through tariffs that are higher than Chile's so-called uniform tariff. Since the mid-1980s, the government has run a system of price bands for wheat, sugar, and vegetable oils and oilseeds. This system was inspired by the European Union's Common Agricultural Policy. It was originally intended to smooth the impact on domestic producers and consumers of the volatility of international prices. In practice, however, tariffs have always been above Chile's flat tariff for all other goods, transforming the price band system into a clearly protectionist measure. The farm lobby in Congress cuts across political parties. Deputies and senators from farm areas, across the political spectrum, have consistently voted to defend the interests of farmers to the detriment of consumers. The Free Trade Agreements signed by Chile with Mercosur (1996) and the United States (2003) require the country to eventually dismantle its system of farm protection, but over long phase-out periods.

2.3.2 The Institutional Framework

Over the past two decades, Chile has been in the process of building an institutional framework for industrial policy stressing the correction of market failures and heavily reliant on innovation. This latter term is not to be construed only as the commercial application of ideas that are at the frontier of knowledge, although this is certainly an aspect of the aim of policy. Innovation also encompasses what Hausmann and Rodrik (2003) call “self-discovery”, i.e., the introduction into the country’s production possibilities of a set of ideas that are being used elsewhere. As the economy has grown more sophisticated, innovation *strictu sensu* has become an explicit policy goal. It has also come to be recognized that innovation cannot be pursued in a vacuum and that efforts must be concentrated on specific sectors that are within reach, given the country’s existing or potential comparative advantages, and that have strong growth prospects in the international economy.

The system has been evolving along a scheme that has two major funders: the *Innova Chile* program run by CORFO, on the one hand, and the National Council on Innovation, Science and Technology (CONICYT, *Consejo Nacional de Investigación en Ciencia y Tecnología*). There are other sources of funding for innovation, but they are smaller in terms of resource volume and are more specialized sector-wise.⁸ The basic distinction between CORFO and CONYICIT is that the former specializes in subsidizing the demand for innovation by enterprises and the latter the supply of knowledge, mainly by universities and research institutes.⁹ These institutions channel resources that come from the state budget and from the so-called mining “royalty,” which is a 3 percent tax surcharge on mining profits earmarked for business innovation and allocated by the CNIC.¹⁰ The users of these funds are individual firms; *Fundación Chile*, either by itself or in joint ventures with private firms; and consortia of universities and private firms, usually business associations (see Figure 1).

⁸ These are *Fondo de Innovación Agraria* (FIA), *Iniciativa Científica Milenio*, and *Fondo de Innovación Pesquera* (FIP).

⁹ The boundary between supply and demand is not airtight, since both CONYICIT and CORFO provide funds for consortia between firms and universities.

¹⁰ *Sensu strictu*, the annual amounts that go into the *Fondo de Innovación para la Competitividad* (FIC), whose allocation is recommended by the Council, is determined by a formula which ensures that the FIC will have a smooth flow of resources from year to year and will not be dependent on the price of copper.

Up to now, most of the financing available for R&D has been of a relatively short- to medium-term nature, usually no longer than three years. In addition, the amounts of the grants have rarely exceeded one million dollars. This has been true of CORFO innovation projects as well as those financed by CONICYT. This may be changing with two new lines of financing for universities and for consortia of universities and enterprises, whereby financing is made available from CONICYT on a much larger scale and for longer periods of time (*Iniciativa Científica del Milenio* for universities and *Financiamiento Basal* for consortia of universities and business firms).

2.3.3 *The Special Role of CORFO*

CORFO is a complex institution with a number of industrial policy functions (see Table 2). Over the years, that role has evolved considerably. Since 1990 it has been conceived mostly as a second-tier institution, either in its subsidy or its lending operations. Most of its programs are of a horizontal nature, although a few of the new programs begun during this decade have veered toward a vertical approach. It has four distinct roles, each one corresponding to a separate department, or *Gerencia*: (i) the provision of subsidized services to SMEs (*Gerencia de Fomento*); (ii) investment promotion, of which the attraction of FDI in information-technology-related services is the most interesting from the point of view of this study; (iii) a variety of innovation subsidies, now managed through a special committee (*Innova Chile*); and (iv) several financial programs that basically provide long-term capital to SMEs (*Gerencia de Intermediación Financiera*, GIF).

CORFO has its own resources. During the Allende administration, CORFO acted as a holding company for nationalized enterprises. As they were sold off during the military government, CORFO began making investments in the financial system. The income it obtains from these investments essentially funds the operations of GIF.¹¹ CORFO's operations account for almost 0.3 percent of GDP. The most important ones in terms of resources are those of GIF (see Table 3).

The *Gerencia de Fomento* runs programs whose aim is to promote the association of small firms to enhance the provision of services with economies of scale, upgrading

¹¹ Formally, the earnings on CORFO's assets go into the state budget, which then returns it to the institution for the purpose of making long-term credit available to SMEs through GIF.

the quality of production in order to participate in supply chains with larger firms, or adopting new technologies. They operate on the basis of the matching grant principle, with CORFO's contribution constituting normally up to 50 percent of the costs, with a maximum amount per firm and per program. The *Gerencia de Fomento* runs a large number of programs, including PROFO (*Proyectos Asociativos de Fomento*), PDP (*Programa de Desarrollo de Proveedores*), FAT (*Fondo de Asistencia Técnica*), FOCAL (*Fomento a la Calidad*), and many others (e.g., encouragement of movie and audiovisual production and various subsidies to feasibility studies in energy efficiency, environmental protection, irrigation, and artisan fisheries). Most of these programs have been operating since the early 1990s, when CORFO's activities were completely revamped. The total amount spent in 2007 was about US\$46 million. The resources for these programs are managed at the regional level by intermediaries, normally business associations. As a purely funding agency, CORFO does not deal with beneficiaries. Rather, it allocates resources to each regional office for each program according to the demand for them until the budgeted amounts are used up.

The GIF is much larger in terms of resources. It manages 13 different lending windows, most of which are aimed at providing long-term, investment-oriented loans to SMEs. Two of the programs provide long-term financing of university studies in Chile at the undergraduate and graduate level. All of these windows represent horizontal policy instruments aimed at relieving financial constraints perceived to be holding up investment by SMEs or investment in education. No effort is made to steer investment into particular sectors or university students into specific careers.

As noted above, CORFO ceased to be a first-tier bank in 1990. Before the change in its financial character, CORFO had a serious problem with delinquent loans. This problem no longer exists as all of CORFO's funding is now provided in a second-tier-bank modality through credit lines auctioned to private financial institutions and *BancoEstado* on the basis of the interest rates that these institutions offer to charge borrowers.

At the end of 2006, the GIF portfolio was around US\$1.1 billion. While this may seem like a large number, when measured against needs for long-term financing by SMEs, it is too small. In terms of the size of the domestic credit market, the GIF portfolio

accounts for 1.1 percent of the total portfolio of the Chilean financial system, much smaller than Mexico's NAFIN (9.7 percent), Colombia's BANCOLDEX (5.3 percent), or even El Salvador's BMI (3.5 percent).

Given the small scale of its financial operations relative to the size of Chile's financial sector and the need for long-term resources by firms that do not have access to them, it may be a good idea to scale up GIF and convert it to a *bona fide* development bank. All of GIF's operations are managed by a small staff of 27 professionals, not all with banking experience. GIF does not have separate accounts from the rest of CORFO and is currently unable to operate as a true second-tier development bank. If its resources were increased to a level that would enable it to function as a development bank, it would be advisable to separate CORFO's development banking function from its technical cooperation activities, as was done with the *Innova Chile* program, which has its own governing body.

Fomento and GIF—and, to a large extent, *Innova Chile* as well, fall within the approach to industrial policy that was prevalent during the 1990s, which stressed horizontal instruments designed to deal with perceived market failures. *Fomento's* programs are all geared to improving the technological and managerial capabilities of SMEs and assisting them to reap economies of scale, regardless of the sector in which they operate. GIF deals with the paucity of long-term financing faced by this segment of the enterprise universe.

In recent years, this approach has been giving way to a more vertical approach, which has gained impetus from the publication of two influential white papers on innovation for competitiveness.

2.4 The Two “White Papers” of the National Council on Innovation for Competitiveness

While the new policies have yet to yield significant results, it is clear that policy makers have already moved away from the notion that horizontal policies are the best suited to the country's long-term growth. Nowhere is this revisionist approach more evident than in the two recent white papers released by the National Council on Innovation for Competitiveness (2007 and 2008). The Council (CNIC) was set up by President Bachelet at the beginning of her mandate in May 2006.

The CNIC reports identify two objectives of government intervention: (1) the creation of platforms that are useful for several sectors (horizontal policies that solve specific market failures, e.g., the development of a venture capital segment of the capital markets); and (2) strategic bets on specific industries. The CNIC has embraced selectivity on much the same basis as the Hausmann-Rodrik (2006) argument (“doomed to choose”): resources are scarce and results can be obtained only when a critical mass of resources has been invested in a particular sector. Moreover, the provision of any kind of infrastructure involves some sector selectivity, because public goods have a sector bias. It is also argued that the fruits of investments of this sort mature with long lags. In fact, the CNIC specifically mentions the provision of public goods as the preferred instrument of public policy to implement the vertical dimension of its proposal.

Thus, the second report states that the public sector has two major tasks. On the one hand, it must develop public goods that are specific to the sector. On the other hand, it must strengthen the generic platforms that have a broader impact on the economy. The latter reduces, without entirely eliminating, the risk of placing bets on particular sectors.

The first report specifically rejects the notion laid out in recent work by Hausmann and his coauthors (see in particular Hausmann, Hwang, and Rodrik, 2005) that what you export matters, and that countries need to move away from natural resources in order to achieve fast growth. It rejects the notion of a natural resource curse and puts more emphasis on the “how” than on the “what.” The clusters selected for promotion are those in which Chile has already demonstrated a comparative advantage, and the effort, according to the CNIC’s reports, should aim at building on those successes by introducing advanced technology into production and moving upstream or downstream. For example, in the case of mining, it sees Chile moving toward engineering services in mining, or chemicals for mining, or mining machinery, rather than abandoning the sector. Natural resources are seen as springboards to development, rather than as a curse. Implicitly, it takes as models not Korea or China but Australia, New Zealand, and Finland.

Armed with the results of a study awarded to Boston Consulting Group through competitive bidding, the first report of the CNIC recommends that productive development policies focus on selected clusters that (1) show good prospects in world

markets and (2) are close to Chile's competitive strengths. The criteria for selection are shown schematically in Figure 2.

The clusters mentioned in the report are the following:

1. Strategic bets:
 - a. copper mining
 - b. aquaculture
 - c. fruit production
 - d. beef, pork and poultry
 - e. offshoring services
 - f. tourism
 - g. processed foods

2. Broad-based "platform" sectors:
 - a. financial services
 - b. transport and logistics
 - c. construction

The report places a great deal of emphasis on improving the horizontal instruments currently in use and developing new ones. Greater attention to the vertical dimension of industrial policies would be achieved through the correction of market failures that prevent the full development of the chosen clusters rather than through generic, industry-specific subsidies. As noted, the provision of sector-specific infrastructure is also contemplated as a key policy instrument.

The report advocates the use of instruments that are already in the arsenal of policy makers rather than introducing substantial changes to the instruments that are currently in use. For example, the attraction of FDI in high technology will continue, but it has already been oriented to the needs of the clusters identified in the reports of the CNIC.

The CNIC also proposes that, in order to minimize rent-seeking and capture by bureaucratic interests, the entity be made permanent and that its members be nominated by the President and ratified by the Senate, much in the same manner as the procedure for choosing members of the Central Bank's Board. In order to minimize intertemporal

inconsistency, the term of office of the council members would not coincide with that of the President. In addition, the proposal adopts a checks-and-balances approach to policy making and recommends that membership in the CNIC be assigned to academics, business leaders, and high government officials. The Ministers of Finance, Economy and Education would sit on the CNIC, with a right to voice but not vote, much as the Minister of Finance may attend the meetings of the Central Bank's Board but cannot vote.

2.5 Growth and Export Discovery in Chile in 1990-2007

This introduction to the detailed discussion of major PDPs in use at present would be incomplete without a broad-brush description of Chilean growth and export performance in recent years. Growth accelerated beginning with the recovery from the financial crisis of 1983-84. From 1985 through 1997, growth averaged over 7 percent per annum. Although the rate of investment (at 2000 prices) was not spectacular, the growth rate was the fastest in Chile's history (see Table 3). Growth was clearly export-led, as exports grew more rapidly than GDP.

Table 4 also shows that GDP and export growth have slowed significantly since 1997. In spite of the boom in copper prices and the large investments in the sector by foreign companies, the country has been experiencing modest growth, even after the recession of 1998-2003. The slow growth of exports and the slowdown in the emergence of new exports could well have much to do with this subpar growth performance.

Table 5 shows the evolution of exports by main product category. Copper and other minerals loom ever larger in the export basket, mainly because of the sharp increase in prices since 2003. In 2007, they accounted for 58 percent of all exports. If exports are valued at 2003 prices, however, the share of copper and other minerals fell from 47 percent in 1990 to 35 percent in 2007. In volume, non-mineral exports did very well during 1990-2007. The big winners were wine (with a growth rate of over 20 percent per annum); salmon and trout; wood, pulp and paper, and wood products, and a catchall category of "other manufactures," which includes a large number of products. The success of salmon exports can be directly ascribed to one of the instruments we will be studying (*Fundación Chile*). Wine exporters have been the beneficiaries of several CORFO programs, to be discussed below. The important group of "other manufactures"

hides a very wide variety of products exported in small quantities. Some of them benefited from the *reintegro simplificado*.

We also carried out an exercise of “export discovery” in the sense used in Agosin and Bravo-Ortega (2007). We used a database kept by the Central Bank, which identifies 447 products exported by Chile in the period 1990-2007. A product is classified as an “export discovery” the year it overtakes the limit of US\$1 million and thereafter does not fall below that level in the sample period (up to 2003, since we wanted to exclude the possibility of a product exceeding the limit for less than five years). Of all the products discovered during the period, we classified those exceeding US\$20 million in 2007 as “successes.”

As can be seen in Figure 3, export discoveries tend to bunch in the period 1991-1997, exactly the same result found in Agosin and Bravo-Ortega (2007) with the Feenstra database,¹² which covers all products at the four-digit SITC level in the 1962-2000 period. Between 1998 and 2003, export discoveries fell off dramatically. Agosin and Bravo-Ortega (2007) tested an empirical model showing that the real exchange rate had powerful lagged effects on export discoveries. The main reason for this pattern of export discoveries may have much to do with the lagged impact of real exchange rate changes. The earlier period followed a dramatic real depreciation of the peso in the 1980s, which was slowly unwound during 1991-1997. The subsequent period might have been influenced by the previous period’s currency appreciation.

Be that as it may, a significant number of export discoveries (155, to be exact) took place in between 1991 and 2003. Several of these wound up as export successes. In fact, by 2007, 15 food products and 23 manufactures discovered in 1991-2003 were being exported in values exceeding US\$20 million (see Table 5). What is interesting about these products is that they are almost all related to Chile’s comparative advantage base in food and minerals. Whether policy had a role in these developments remains to be determined. Perhaps a more active support of activities of clusters related to the country’s comparative advantage and incorporating modern technology, such as has been advocated in recent years, might have led to more export discoveries and greater export successes. Thus, the more “vertical” approach implicit in the CNIC’s white papers is likely to be a

¹² See <http://www.cid.ucdavis.edu>.

promising point of departure, provided that the instruments with which the goals are pursued are appropriate to the task and that the resources allocated to them are sufficient.

In spite of these export successes, Chilean exports continue to be heavily concentrated in unprocessed copper. A more rapid diversification in the recent past might have led to a higher rate of growth.¹³ This seems to be the implicit assessment behind the recommendations of the CNIC's white papers, which stress a more vertical approach to industrial policy than what has been in evidence in the past.

3. Horizontal Instruments

3.1 Borrowing Guarantees for Small Businesses (FOGAPE)

Micro and small enterprises (MSEs) do not usually have adequate access to credit, mainly because they are unable to post collateral and/or do not have a track record of timely repayment. Most small firms must rely on internally generated resources (plus financing from family and friends) for both investment and working capital. In addition, when they do obtain financing from the formal banking system, it is likely to be considerably more expensive than for medium or large firms, or even for consumers.

The availability of credit (or lack thereof) has long been identified as a constraint to investment by small firms generally, regardless of sector. Chilean policymakers have attempted to deal with this problem in a variety of ways. As noted earlier, SERCOTEC and CORFO have loan programs for small businesses, and SERCOTEC runs a subsidized loan preparation scheme for microenterprises. However, the most important tool to address this problem is The Small Business Guarantee Fund (*Fondo de Garantía para Pequeños Empresarios—FOGAPE*). Launched in 2000, FOGAPE is funded and run as a separate entity by *BancoEstado*. It seeks to guarantee a certain percentage of the credit granted by public or private financial institutions to MSEs, small exporters, and small business associations.

In Chile, perhaps due to the existence of FOGAPE, the share of micro and small firms having access to credit is extremely high and considerably higher than in other countries, even the United States. In December 2004, almost 70 percent of formal micro enterprises had a bank loan (Larraín, 2008). The figure for small enterprises was 93

¹³ For an argument along these lines, see Agosin (1999) and Agosin (2009).

percent.¹⁴ At the end of 2007, it is estimated that the corresponding figures had risen to 93 and 100 percent. In the United States, the Survey of Small Business Finances estimates that, in 2003, about 60 percent of all small and micro enterprises had a bank loan. The figures for Chile are likely to be overstated, because they do not take into account the vast universe of informal microenterprises. Nonetheless, they do suggest that formal micro and small enterprises have been gaining significant access to bank financing.

Where the record is not as impressive is with regard to interest rates. In September 2008, while very small loans (of up to UF 200) paid an annual rate of interest of 37.7 percent, medium loans of between UF 200 and 5,000 were charged 22.2 percent, and the cost of credit for large loans in excess of UF 5,000 was only 11.2 percent.

There is also qualitative and quantitative evidence that small enterprises face difficulties in their access to investment resources, credit being available mainly for working capital. Not only are interest rates high, but longer-term credit tends to be unavailable. As noted above, this is the problem that CORFO/GIF seeks to tackle.

FOGAPE guarantees a certain percentage of the capital amount of lending operations from banks to MSEs (including leasing and factoring), small exporters (with export value of up to US\$16.7 million), and eligible associations of small business owners who cannot post adequate collateral. *BancoEstado* auctions guarantee rights among private banks, which must use them during the time limit established in the auction (currently, seven months).

The administrator receives the commissions paid by the banks, with which it finances defaults. Commissions are assigned according to the risk classification of each bank, and it must be paid in advance. Beneficiary firms must pay a user fee to the bank, which has a maximum of 2 percent of the guaranteed capital. Clients must submit evidence of ability to pay and must not have defaulted on loans before the application for a FOGAPE guarantee. The guarantees can be used to secure credit for working capital (purchase of inputs, suppliers' payments, sowing and cultivation costs, expenses for consultancies and training), investment projects (purchases of machinery, expenses

¹⁴ In Chilean usage, microenterprises had sales of up to UF 2,400 (about US\$80,000 in early November 2008), and small enterprises had sales between UF 2,400 and 25,000 (about US\$800,000). The UF (*Unidad de Fomento*) is a unit in constant purchasing power. It is corrected each day to reflect the change in the cost of living index the month before.

related to plant building, acquisitions of commercial property), and capital contributions to a business firm. Small business associations may use the guarantees for infrastructure investment, equipment purchases, and irrigation and drainage projects.

Until 2004, the number of existing clients (stock) grew very rapidly and has now stagnated at about 42,500 (see Table 6). The volume of guaranteed credits also rose until 2004 and has leveled off since then. At the end of 2007, total guarantees stood at US\$516 million. As guarantees are a fraction of the loans granted, new guarantees granted each year follow more or less the same pattern and amounted to US\$376 million at the end of 2007. The stock of outstanding guarantees (new guarantees minus those freed by loan repayments) stood at US\$549 million at the end of 2007.

The reason that guarantees seem to have stagnated in 2004 is that the fund's capital allowed for a leverage of 10 times, which was used up by the end of 2004. The fund's capital was supplemented by 15 percent in early 2008, with an additional number of guarantees made possible by an increase in leverage to 11 times. The fund was thus able to auction an additional US\$110 million in 2008.

About one-third of FOGAPE's financing goes to the commercial sector. This is followed by various kinds of services (26 percent), the remainder being allocated to agriculture, transport, manufacturing, and construction. Over 63 percent of loans with FOGAPE guarantees have maturities of over a year, which contrasts with about 58 percent for all lending to small and medium enterprises.

As noted above, FOGAPE is run by *BancoEstado*, which invests in the local capital markets the funds provided by the government, about US\$60 million at the exchange rate prevailing in early November 2008. Since its inception in 2000, FOGAPE has had a small profit every year. The auctions are based on the lowest guarantee portion of loans received from financial institutions. Bidders are ranked from the lowest to highest guarantee percentages. The resources requested by the banks are added up until the funds are exhausted.

FOGAPE is clearly a horizontal policy instrument. Its funds are not provided directly by the government, which acts as a second-tier institution. The only case in which there is an explicit choice of recipients is that small exporters receive a certain allocation of funds separately from other businesses (5 percent of the total).

Many MSEs with projects that have a positive private and social return have difficulty accessing credit, and this is the market failure that FOGAPE addresses. Smaller firms tend to face this problem more than larger established firms, owing to informational asymmetries and adverse selection. Guarantees seek to get around the problem of lack of collateral and the informational opacity of small firms. Guarantees allow banks to manage problems of adverse selection when granting a loan and the problems of moral hazard once the loan has been granted. Likewise, guarantees can reduce transaction costs, since a financial institution is able to evaluate the guarantee at a lower cost than it would take it to appraise a firm's business proposal.

In addition, FOGAPE addresses a regulatory failure. Basel II provisioning norms require banks to set aside a higher percentage of reserves against bad loans the higher the risk of each loan class. Lending to SMEs is particularly risky and, therefore, provisioning against losses is higher than for larger firms. This makes banks reluctant to lend to SMEs. The guarantee program frees bank resources to be lent to larger firms and lowers the overall level of reserves that banks must maintain. This makes them keen to bid for portions of the guarantee program. This, in essence, is the approach taken in the study of Benavente, Galetovic, and Sanhueza (2006).

Thus, FOGAPE can be seen as an intervention model whose essence is the encouragement of lending to clients perceived by banks and regulators as riskier and who lack sufficient collateral to lower that risk. The fact that lending is a repeated game also helps to lower the moral hazard of lending to this segment of the business population.

FOGAPE can be seen as having two major effects. One is to offer financing to firms that had no access to it. The second one is to help firms change the source of their financing, from more expensive informal sources to formal institutions. Likewise, FOGAPE may have an impact on interest rates. Since FOGAPE reduces the risk of lending, and banks set interest rates according to the riskiness of their clients, it is highly likely that the existence of FOGAPE results in lower interest costs for its users.

An instrument such as FOGAPE can be considered an exercise in risk-pooling where the government assumes the contingent liabilities of defaults. In a sense, this kind of arrangement overcomes a coordination problem: small firms on their own are unable to

engage in the risk pooling required, and individual banks are unwilling to do so by themselves. This is why there is a need for state intervention.

The costs to the state of an institution such as FOGAPE are negligible. Since most MSEs are credit constrained and need FOGAPE to access credit markets in the initial stages of their relationship with the formal banking system, default rates are likely to be very low. This is indeed the case. It is estimated that risky loans were about 5.7 percent of the total in 2007. However, actual losses amounted to only 1.2 percent (Larraín, 2008). In addition, the fixed cost of administration of the fund is very low (0.15 percent).

Is FOGAPE reaching its target borrowers? A recent study by Larraín and Quiroz (2006) shows that less than 3 percent of FOGAPE guarantees is used by medium and large firms. These are likely to be exporters singled out for special treatment by the fund.

Are FOGAPE resources sufficient? A program such as FOGAPE ought to generate demonstration effects such that the number of SMEs gaining access to credit is much larger than those benefiting from the program. In the long run, the objective is to make the program unnecessary because the market failure has in fact disappeared. It is hoped that, through the fund, banks gain experience dealing with clientele such as its beneficiaries, which will stimulate them to broaden their portfolio of such loans.

One of the requirements for such a favorable outcome is for the program to have a critical mass that will generate durable impacts on capital markets. This would be the case if SMEs become an important business niche for banks. Larraín and Quiroz (2006) found evidence that FOGAPE has encouraged banks to enter the realm of micro and small enterprise financing. There are presently 17 financial institutions utilizing FOGAPE. However, the use of FOGAPE is heavily concentrated in five large banks, which raises some question as to whether it has generated a generalized interest in this kind of financial operation.

In December 2007, total lending by Chilean financial institutions was on the order of US\$118 billion. Lending with FOGAPE guarantees totaled US\$516 million, or just 0.44 percent of total lending. In terms of number of firms, the stock of FOGAPE clients was 42,499, a little over 3 percent of all firms in Chile. There is a large universe of firms outside the purview of the banking system that could benefit from a larger FOGAPE. FOGAPE's costs are minimal and are mostly contingent in nature. Since the default rate

is extremely low (in line with experience with micro credit worldwide), even contingent costs can be considered negligible. Therefore, the benefits clearly outweigh the costs, and there is a good case for vastly enlarging the program, which can be considered a great success.

There are a number of problems with FOGAPE. One is that it is run by *BancoEstado*, which is also a bidder for funds. This may raise some concerns about moral hazard and preferential allocation of guarantees to *BancoEstado* programs. Second, CORFO runs a similar program, the Investment Guarantee Fund (*Fondo de Garantías para las Inversiones*—FOGAIN), for firms that do not qualify for FOGAPE. It may be a good idea to transfer the management of FOGAPE to CORFO and to unify both programs.

3.2 The Reintegro Simplificado

The *reintegro simplificado* (RS) was, in effect, a small subsidy for new exports. It was instituted in the mid-1980s and eliminated in 2003, in order to comply with the Subsidies Code of the Uruguay Round of trade negotiations (French-Davis and Sáez, 1994). In lieu of having to apply for a drawback of duties paid on imported inputs, small exports received an export subsidy of up to a 10 percent. This percentage declined when the entire tariff line (defined at the eight-digit SITC level) surpassed a certain threshold and disappeared altogether at a higher value of exports. In modern terms, the mechanism can be viewed as a clever way of subsidizing self-discovery (Hausmann and Rodrik, 2003) and letting the market select the sectors to be promoted. The amounts involved were small, and the feature of its automatic discontinuance discouraged rent-seeking. The fact that the continuation of the subsidy depended not on individual firm exports but on those of all firms exporting the product ensured that it was in effect a subsidy to infant exports.

The RS was established at the end of 1985 in order to allow exporters of non-traditional exports to receive a payment of 10 percent of the value of exports in lieu of having to file for a drawback of import duties paid on imported input. The reason given for the value of the benefit was that the uniform tariff at the time was 20 percent and the average import content of non-traditional exports was estimated at 50 percent. In point of fact, it is highly likely that the 10 percent payment contained a significant subsidy

element. The non-traditional character of an export was determined by the Ministry of Economy using a simple rule: the entire tariff line should not exceed US\$7.5 million.

The threshold value of exports that determined the loss of the benefit was raised annually by the Ministry to take inflation into account. In 1987, it introduced two tiers to allow for the gradual loss of the subsidy. In 1988, the sales of inputs to exporters qualifying for the RS were added to the list of beneficiaries. Beginning in 1991, three rates began to be used for the RS: 10 percent for exporters on products with a total value of exports of less than US\$10 million, 5 percent for exporters on products valued between US\$10 and US\$15 million, and 3 percent for exporters in products valued between US\$15 and US\$18 million.

As a follow-up to the Uruguay Round's Code on Subsidies and Countervailing Duties, in the mid-1990s, even though no complaints had been received from trading partners, the democratic government declared its existence as a subsidy to the World Trade Organization and promised to dismantle it, which it finally did in 2003, when export subsidies were due to disappear altogether. It is doubtful that any trading partner would have complained: the maximum subsidy for any given product was US\$1 million for all exporters, and, if successful, by the time any partner filed a complaint, the subsidy would have disappeared. How to recreate it in a manner consistent with WTO may be an important task for a revamped industrial policy.

As a result of this decision, in 1998 the higher percentages of subsidy were reduced annually until they reached a uniform level of 3 percent in 2003. In addition, that year, in order to continue qualifying for the RS, firms were required to have an imported content of at least 50 percent,¹⁵ whereas before the requirement had been exactly the opposite: a national content of at least 50 percent. This made application for the RS unattractive, and the amounts paid by the Treasury on account of the RS fell off dramatically (Figure 4).

Figure 4 reveals some interesting facts. Subsidy amounts rose very quickly between 1991 and 1998, mainly because this was the period in which export discoveries exploded. They peaked in 1998, as a consequence of the subsequent reduction in the

¹⁵ By then, the uniform tariff was 6 percent. This explains the requirement of an imported content of at least 50 percent.

subsidy rates and because export discoveries also declined sharply. In 2003, as the benefit was reengineered to meet the requirements of the Subsidies Code of the WTO, the amounts paid out fell off dramatically and have been essentially nil since 2004.

We attempted to evaluate the extent to which the RS had a positive effect on exports. We carried out two exercises, one with data at the sector level, the second one with firm-level data. At the sector level, with eight-digit level data, the growth in export volume over five five-year intervals was estimated for 1991-1996, 1992-1997, 1993-1998, 1994-1999, and 1995-2000. This is the dependent variable in the exercise. The following equations were estimated with five different panels:

$$\ln X_{i,t+1} = \alpha_i + \beta_{t+1} + \gamma RS_{i,t} + u_{i,t+1} \quad (1)$$

$$\ln X_{i,t} = \alpha_i + \beta_t + \gamma' RS_{i,t} + u_{i,t} \quad (2)$$

where

$X_{i,t}$ = value of exports of product i in period t

α_i = fixed effects affecting exports of product i

β_t = fixed effect affecting all exports in period t

$$RS_{i,t} = \begin{cases} 0, & \text{for sectors/firms not receiving RS} \\ 1, & \text{for sectors/firms receiving RS} \end{cases}$$

Taking differences, the sector fixed effects wash out and we are left with an expression in which percentage export increases for each five-year period depend only on a constant (the average increase in exports at the eight-digit SITC level, regardless of whether a sector received the *reintegro*), and RS:

$$\ln X_{i,t+1} - \ln X_{i,t} = (\beta_{t+1} - \beta_t) + (\gamma - \gamma') RS_{i,t} + u_i'' \quad (2a)$$

The results of estimating this model are shown in Table 8. One set of results uses the entire database; the other excludes exports of less than US\$1,000 in value in the base year. Our preferred estimates are those that exclude very small exports, since small initial values bias growth rates upward. Indeed, exports from sectors that did receive RS grew more rapidly than from sectors that did not. The effect is strongest during the 1991-1996

period when, according to the different estimates that we used, exports from RS-supported sectors grew by 89 to 60 percent more than other exports. This effect falls off gradually, becoming not significantly different from zero in 1994-1999 for exports of more than US\$1,000 in value.

The second exercise carried out utilized a quasi-experimental “matching” methodology which finds for each “treated” firm-product combination (i.e., benefiting from RS) another similar one that was not treated (did not receive RS). We estimated the growth of export value for each product-firm, and its matches, in the five five-year periods and tested whether the treated product-firm combinations increased their exports more than the untreated ones. Two logit models for estimating the probability of receiving RS were used. In Model I, the probability is dependent only on the value of exports and the year of the export. In Model II, the probability is dependent on the value of exports, the year of the export, and the sector to which the exported product belongs. The matching product-firm chosen is the closest to the treated product-firm in terms of probability of being treated, value of exports, base year, and, in Model II, sector of provenance. Exports of less than US\$1,000 in the initial year were excluded. The estimations of the two models and the results obtained from the matching exercises using each one are shown in Tables 9 and 10.

As can be seen in Table 10, Model I yields the result that treated product-firms increased their exports on average by 778 percent per five-year period. The control group of untreated product-firms increased their exports by 279 percent. The average treatment effect on treated product-firms was 499 percent. In other words, treated product-firms had export growth which was 2.8 times higher than untreated product-firms. The difference in export growth between treated and untreated product-firms is highly significant.

Model II results are similar, although less significant. The mean export growth of treated product-firms was 873 percent, compared with 284 for untreated product-firms, slightly more than three times higher. However, the difference is significant only at the 5 percent level (one-tail test).

The results suggest that the RS encouraged new exports to grow and that an effort should have been made to retain the system, suitably modified if necessary to satisfy the requirements of the WTO.

3.3 Innova Chile, with Special Reference to the Business Innovation Programs

Innova Chile is CORFO's arm devoted to encouraging innovation. It was set up as a special committee within the institution, with its own 21-member board, seven each from the private sector, ministries, and CORFO itself. It runs six programs, the most important of which is the business innovation program. Most of CORFO's innovation programs are of a horizontal nature. However, the business innovation program has been deliberately steered toward support of the specific clusters identified in the NCIC's reports. CORFO's innovation support can be classified in the following categories of programs:

- i) Public goods of a pre-competitive nature. This program offers grants to business associations, centers, and foundations for the development of norms, technological infrastructure, and specialized information needed by all market participants. Grantees have included FCh; technological institutes associated with line ministries in agriculture, forestry, or mining; and business associations.
- ii) Technological assistance to SMEs, consisting of grants for the adoption of new technologies. It is likely that this program will be merged with the horizontal programs in the GIF discussed above.
- iii) Support for nodes, which are very light administrative offices that seek to connect the technological needs of firms with suppliers, either within the country or abroad.
- iv) Support of gazelle firms (firms that have the potential for explosive growth). These grants are made through the intermediation of business incubators. They support start-ups and provide seed capital for business plans and their escalation into full-fledged businesses.
- v) Support for business incubators and networks of angel investors.
- vi) Business innovation. This group of program brought together several programs already in existence. There are two types of programs under this heading:
 - a. Support for innovation by individual firms.
 - b. Grants for the development of new technologies given to consortia of firms (usually through business associations) and university

technology institutes. The awardees must set themselves up as corporations. The results are shared by all firms participating in the program through the payment of royalties. These awards are handled on a continuous basis through a specialized window.

- vii) A very recent program has been the institution of a tax incentive for R&D. Firms that enter into a contract with approved research centers may deduct up to 35 percent of the cost of the contract from their tax liability the following year. In addition, they are allowed to expense immediately the remaining 65 percent.

Here we will concentrate on the business innovation programs. The funds are not generally intended to be awarded to specific sectors, and applicants are handled on a first-come, first-served basis on a continuous basis until the annual resources of the program are exhausted (*ventanilla continua*). However, in the last couple of years, calls for proposals have been issued for projects related to mining, processed foods, fruit, tourism, aquaculture diversification, meats, wines, and genetic improvement, in line with the clusters identified by the CNIC. According to *Innova Chile* executives, about 51 percent of all funds are now awarded to priority clusters.¹⁶ It is not clear whether that 51 percent corresponds to funds awarded through the calls for proposals or generally to projects that are within the priority clusters. In other words, the calls for proposals for specific cluster projects indicate that vertical policies are being applied, since they refer to specific activities and sectors chosen *a priori* by the authorities. On the other hand, it would not be surprising that a general program to support innovation from any sector (and thus horizontal in nature) did in fact elicit proposals from priority clusters, since these are, after all, sectors in which Chile already has a proven comparative advantage.

The fact is that most of the projects funded by *Innova* are in sectors in which Chile has a comparative advantage (mining and food). This is borne out in Table 12, which lists projects approved in the period 2000-2007 (CORFO, 2007). All projects, either at the individual firm level or that of consortia of firms and universities, involve applying technology to these sectors. Perhaps the only one that does not is in ICT area:

¹⁶ Interview with Claudio Maggi, Director of *Innova*.

the development of a router by YX Wireless, a firm that also benefited from the *Innova* gazelle firm project.

It should be noted that *Innova* business innovation programs are not large. Altogether, the projects funded between 2000 and 2006 amounted to US\$16.5 million, hardly a large sum for a country that has placed its bets on innovation in the sectors in which it has a demonstrated comparative advantage.¹⁷

4. Vertical Instruments

4.1 Fundación Chile

Fundación Chile (FCh) is a private, non-profit organization created in 1976 by the government of Chile and IT&T Corporation as part of the settlement for the Allende government's expropriation of the Chilean Telephone Corporation (owned by IT&T) for the purpose of conducting research and technology transfer. Each party contributed US\$25 million. In October 2006, BHP Billiton (the majority owner of the Escondida copper mine, the largest in the world) joined as a co-founder partner contributing an additional US\$10 million, which was matched by the Chilean government. BHP Billiton joined FCh's board of directors.

In spite of the fact that FCh is a private organization, the government has a large influence in the naming of its board of directors and president, which makes it in practice a mixed institution. It can be considered a vertical policy instrument, since its decisions lead to the development and adaptation to Chilean conditions of foreign technologies with a view to their commercial application. FCh has concentrated in six sectors, mostly related to the natural resources that are abundant in Chile: (1) agribusiness, (2) marine resources, (3) forestry, (4) environment and chemical metrology, (5) human capital, and (6) information and communication technologies. Eighty-eight percent of FCh's investments have been in the marine, forestry, and agribusiness sectors.

According to its own mission statement, the objective of FCh is to "introduce innovations and develop human capital in the key clusters of the Chilean economy, through technology management and in alliance with global and national networks." To accomplish this aim, it promotes commercial projects that utilize technologies that may

¹⁷ The total sum mentioned refers only to those projects identified in CORFO (2007).

exist in other parts of the world but are not in use in Chile, it undertakes technological research in its own labs, and it acts as a broker between different actors that need to come together to undertake commercial projects.

Initially, the emphasis of FCh's operations was in sectors in which the country exhibited serious deficiencies, such as nutrition, food technology, and telecommunications. Its most important objective was playing a social role, and it behaved much like a government department. Over time, FCh developed a market orientation. Its first activities were services and technical assistance in the production of vegetables and fruit. At the same time, FCh reduced its activities in telecommunications to devote itself almost exclusively to natural resource-related sectors. Its first projects were financed with the institution's own capital resources. Over time, it has come to depend increasingly on fees for its services and on the resources of CORFO and CONICYT (Chile's equivalent of the National Science Foundation in the United States), for which it competes with private firms.

One could define FCh as a semi-public entrepreneur, in new sectors where entrepreneurial activity may be suboptimal, and also as a kind of venture capitalist. Until the early 2000s it was the only institution practicing "industrial policy in the large", i.e. making strategic bets on new industries. It could also be considered a mechanism to explore the product space in search of new export discoveries, in the manner described by Hausmann, Hwang, and Rodrik (2005) or Hausmann and Klinger (2006). It is interesting to note that cultivated salmon is unlikely to have been found in Chile's "open forest" in 1980, not being obviously related to copper mining or the burgeoning exports in that period (forestry-related products or fruit).¹⁸ In fact, the decision to develop the production of cultivated salmon by FCh, culminating in the set up of *Salmones Antártica* in Curaco

¹⁸ The "open forest" is a measure developed by Hausmann, Hwang, and Rodrik (HHR, 2005) that attempts to measure the number of products in and the "value" of exports that, in the world, are found in the export baskets of countries that have a similar export profile as the country in question but which are not exported by that country. It attempts to measure the number of products the country might be expected to be able to export with its current export package and the potential value of such exports, "value" being measured for each product by the weighted average per capita income of the countries that do export it (labeled EXPY by HHR). In a sense, if the number of products in and value of the open forest are low, it means the country in question is in a sparse area of the world product space and needs to make a big effort to discover new export products. At the other end, a high number and value for the open forest imply that there are many other products, and that the products are of high value, in the "neighborhood" of the country's export package. Therefore, with the country's current capabilities and sector-specific public goods, it can be expected to be able to continue to diversify its exports with relative ease.

de Vélez (Chiloé island) may be considered a sort of strategic gamble on opening up a new area of the Chilean economy. The firm was later sold to Nippon Suisan, one of the largest food producers of Japan. It paid off handsomely. Not only did FCh make a tidy profit on its investment, but its decision led to a boom in salmon and other fish exports, which surged from nothing in 1980 to about US\$2.5 billion in 2008.¹⁹

In a small and financially undeveloped country such as Chile, there is space for a public or semi-public venture capital firm.²⁰ The private sector is just beginning to enter this segment of the capital market. There is clearly a need to fund projects that are riskier than those in already established sectors, and the private sector is unlikely to do so on a socially optimal scale, simply because the amounts of resources required are large and the appetite for risk on the part of national entrepreneurs and financial institutions is limited. Foreign venture capitalists are unlikely to enter this market except in very specific projects, simply owing to lack of information.

One of the roles of CORFO/GIF and *Innova Chile* is to stimulate the emergence of angel and venture capital industries, so far with limited success. FCh acts as a cross between angel and venture capitalist, undertaking projects that are normally at a stage that is too incipient for venture capitalists. The basic problem with both financial market segments is the absence of a mechanism to cash in on success: the exit strategy would require an active market for initial public offerings. Although there are IPOs in Chile, they tend to be few in number each year and exhibit clear cyclical behavior. Most of them are in tried and tested industries (e.g., construction, retailing). At present, the main exit strategy for innovators is the direct sale of the business outside, often to foreign investors. Because of the difficulties involved in exiting successful ventures, since 1995 FCh has insisted on partnering with private investors from the beginning of any new venture, with a commitment by the latter to purchase FCh's stake after a certain time or otherwise winding up the venture.

Salmon cultivation remains FCh's most spectacular success. But there have been others. One of them was the introduction in Chile of the cultivation of berries, through its

¹⁹ In the last couple of years the industry has been undergoing serious environmental and salmon health problems, due mainly to the shortsighted vision of the firms in the industry, which have not invested in adequately protecting the health of its products.

²⁰ FCh undertakes projects that are normally at a stage that is too incipient for venture capitalists.

joint venture with a private firm in creating the first enterprise devoted to cultivating and exporting blueberries. While the firm later did not do well (after FCh exited the business), its demonstration effect was very important, and today Chile exports over US\$150 million.²¹ In 1982, FCh pioneered the export of boxed and vacuum-packed meats. Today, vacuum-packed and boxed frozen private pork and beef exports are a thriving export business of about US\$500 million.

Whereas emulation by private firms is still viewed as a problem by FCh executives,²² it is in fact part of its success. Since many of its technological incursions are not patentable because they constitute the adaptation of existing technologies to Chilean conditions, in some endeavors it has had a large number of emulators. This is the case of salmon, blueberries, and vacuum-packed meats.

Besides salmon and blueberries, other ventures with variable rates of success, some of which have not yet matured, include:

- the cultivation of oysters, which are consumed domestically; oyster eggs are exported to some markets;
- the development of salmon feed;
- the development of a number of salmon vaccines;
- the first successful cultivations of abalone for Asian markets;
- the cultivation of turbot for export;
- the cultivation of asparagus for export;
- the cultivation of marine algae for human consumption and as food additives, and for use in pharmacology and beauty products;
- quality improvements in rice production that led to significant exports; and
- a firm that issues bonds backed by forest development by small producers.

It sells important services, such as quality certifications, environmental certifications (especially in forestry), and technology licensing (the salmon vaccines

²¹ The story of the development of Chilean blueberry exports is told in Agosin and Bravo-Ortega (2007).

²² Interview with Javier Duarte, head of enterprise development at FCh.

being a case in point). It also receives fees for bringing together firms and researchers for specific commercial ventures.

FCh has several interesting products under development. In the marine resources area, it is experimenting with several other species, including sea bass. In bioenergy, a process to convert wood pellets into energy has led to the creation of a firm, EcoPellets, with a view to entering the European and Japanese bioenergy markets.

An important new venture in which FCh does not have an equity stake but acts as an intermediary between various investors and innovators is the so-called Atacama Solar Platform. This endeavor seeks to produce electricity with new solar panel technologies. If successful, it could have benefits that are larger than those of the cultivated salmon industry. It is expected that it has the potential for supplying a significant percentage of Chile's energy needs, and the technology itself, which is at a developmental stage, could provide new exports.

FCh runs its own labs in which it tests ideas developed by its staff or in joint ventures with domestic and foreign universities. The first stage of operations consists of identifying an opportunity to add value to production by means of an innovation, such as a change in the nature of an existing product, the provision of a service, or the change in production technology or business model. While not disdaining carrying out original research, the main aim of its research is to apply to the Chilean environment technologies that are in commercial operation elsewhere in the world. The emblematic example is again salmon cultivation, which was developed in Norway and Scotland. Chilean production grew rapidly since the establishment of the first commercial operation by FCh, and now Chile is the main producer of cultivated salmon in the world.

The process by which an idea is discovered, developed, and converted into a business opportunity is as follows. The first stage consists of identifying a product, technology, or service that is profitable abroad and is not in use in the national economy. In the second stage, attempts are made to acquire the technology through a license (if needed) and to adapt it to the national environment through research and development. When the R&D effort indicates that the commercial application of the product or process is feasible, it is scaled up to commercial application in a variety of ways, depending on the product or technology: (i) the creation of a company, with strategic partners; (ii) sale

and licensing of technology; (iii) supply of technological services by the various sector areas and business units of FCh; or (iv) certification and implementation of standards, for which FCh charges fees.

FCh has had more than a few projects that have not panned out. One of them is the cultivation of the southern hake. According to interviews with an executive of the Foundation, for this particular venture to have become a commercial success on the scale of salmon would have required a much larger volume of resources than those that have been made available to the project.²³ FCh is loath to spend more than US\$3 million on a project, and the southern hake project requires, in his estimation, about US\$20 million over a 10-year period. The project is still in the pipeline, but it is not being actively pursued at the present time.

In addition, funding agencies such as CORFO and CONICYT normally do not provide funds on the scale and for the periods of time that are required for success in developing a new technology or adapting a foreign technology for commercial application. In fact, an influential observer believes that FCh needs the government to allocate funds to build an endowment of US\$100 million, compared with its net worth today of about US\$50 million. The income from such an endowment would allow it to make strategic choices in developing products that require substantially greater resources than those available to it, and which have maturities much longer than those the Foundation can afford to undertake.²⁴

Other projects, such as farmed turbot or abalone, have not lived up to expectations. It may be too early to judge, but the gestation period of these products has been unusually long, the firms that produce them having been set up in the late 1990s. In fact, serious liquidity problems at the end of 2008 led them to merge.

Other ventures have been commercially successful for FCh but not socially profitable. One such case is CENTEC, a furniture manufacturer, which was sold in the mid-1990s to private interests, did not do well, and had no followers. To this day, Chile does not export important volumes of furniture. Finally, FCh had a low private return in blueberries, and the private entrepreneur who bought the company (Berries La Unión)

²³ Interview with Marcelo Vásquez, Manager of New Business Projects and Marketing.

²⁴ Interview with Eduardo Bitrán, President of the CNIC, and former senior executive in both CORFO and *Fundación Chile*.

went bankrupt because of management problems. But the social return has been very high. A similar statement can be made about vacuum-packed meats.

FCh faces a fundamental tradeoff between generating new products, services or processes that are privately profitable but which ensure its subsistence, and investing in ventures that are highly risky, privately less profitable, or profitable only over an extended period of time, but have a high social rate of return. Some examples of this tradeoff have already been mentioned. In addition, R&D in sectors that are already successful may be more privately profitable than investing in sectors which are new to the national economy and in which risks are high.

It would be socially optimal to remove FCh from the need to have to raise all or most of its resources through market-based endeavors, such as sales of services or quick success in setting up a commercially viable firm. Of course, success must be measured by eventual profits and income. But given the nature and social purpose of FCh and the fact that it has a development goal, the need to meet the test of the market over the short or medium run makes it less functional to its objectives than what it could be. This means that its economic results should be measured at long intervals, say, five- to 10-year periods, and that social returns ought to be factored into the evaluation.

If it is to become more of an angel/venture capital entity, its capital resources are probably too small. This route would require it to invest in many ventures with long gestation periods and with uncertain results. Small amounts of capital and a private-sector orientation lead to lower risk taking and emphasis on projects with shorter gestation periods.

These two tradeoffs—between private and social returns, on the one hand, and between risk and return, on the other—can be seen in Figure 5. In terms of Figure 5A, FCh tends to position itself in the High-private-returns quadrants, and the socially desirable outcome is to have it move increasingly to the Low-private-return, High-social-returns quadrant. In terms of Figure 5B, which shows the tradeoff between risk and return, FCh appears to be excessively concentrated in the Low-risk, High-return quadrant, while it may be socially desirable for it to move more into the High-risk, High-return quadrant.

These observations and schematic form of presenting the activities of FCh are not meant to imply that it does not undertake low-private-return, high-social-return, or high-risk ventures. Examples of risky ventures with higher social than private returns have been given above. The contention is that FCh is in an ideal position to undertake more of these socially desirable activities. In a country with a low degree of absorption of foreign technologies and with a negligible venture capital market, FCh could become much more important than it has been. Its capability for doing so has been proven by its track record. Both of these objectives can be accomplished by endowing it with a greater capital base, which can come only from the government. What the authorities need to do is to clarify the role the institution is meant to play in the productive transformation of the country. If it is to become a true development institution, it will have to stress less short-term private profitability and more long-term social returns.

4.2 FDI Attraction in High Technology

Beginning in 2000, CORFO launched its first program to attract FDI, which involved explicit up-front subsidies. This program has a sector orientation (information and communications technologies, ICT), and, in this sense, it is clearly vertical.²⁵ The program has three aspects. First, an effort is made to promote the country as an attractive location for this type of investment. Chile has locational advantages for many types of FDI, but particularly for FDI in this group of industries. Its business environment is stable and rules-based, the country has an advanced telecommunications infrastructure, it has good engineering human resources, and it is in the same time zone as the eastern United States.

Second, the program offers services to potential investors (assisting them with bureaucratic transactions, obtaining permits, etc.) and grants a number of subsidies to firms investing in the country. It was decided that firms in the following areas would qualify: software production; production of hardware; services using intensively ICT, such as call centers and business process offshoring; production and diffusion of multimedia contents; biotechnology and pharmaceutical products; and production of new materials. Since the publication of CNIC's white papers, certain other sectors were

²⁵ The program is analyzed in Nelson (2007).

added: firms specializing in technology for mining and agribusiness, firms investing in global or technological services, firms that can assist in closing identifiable technology gaps, and those producing unconventional renewable energy.

There are seven subsidies for which firms that invest a minimum of US\$500,000 may apply:

1. A subsidy for feasibility studies of up to US\$30,000;
2. A subsidy of up to US\$30,000 for the formulation of a work plan leading to the initiation of operations;
3. A subsidy for the acquisition of land or buildings, not to exceed US\$2 million;
4. A subsidy for the rental cost of facilities for a maximum period of five years, not to exceed US\$1 million;²⁶
5. Subsidies for training programs, not to exceed US\$100,000;
6. Subsidies for the first year of employment of workers in call centers or client-oriented services, not to exceed 25 percent of the wages of such workers or a maximum of US\$5,000 per worker;
7. Subsidies for the first year of employment of highly skilled workers in ICT ventures, up to a maximum of 50 percent of the wages of such workers or US\$25,000 per worker.

In an economic sense, these subsidies are paying for two different sets of costs: the cost of setting up business in an unknown environment, and the cost of providing sector-specific and firm-specific training to workers. The first type of subsidy involves overcoming a friction that has unknown costs to the firm. The economic argument for the second type involves internalizing an externality. To the extent that the skills acquired can be deployed in other firms, the subsidy is covering the externality of such learning.

Prospective investors may apply for these subsidies at any time, and they are granted until the annual budgeted amount is exhausted. The program began with very limited resources (a budget of about US\$700,000 per annum), but in 2006-2007 the

²⁶ This subsidy is complementary to the subsidy on investments in land or buildings. Both together cannot exceed US\$2 million.

annual approved budget has been on the order of US\$7 million, jumping to US\$11.2 million in 2008 (see Figure 6). Applications are reviewed by a committee consisting of the Minister of Economy, CORFO's Executive Vice President, CORFO's General Manager, a representative of the Ministry of Finance, the Executive Vice President of the Foreign Investments Committee (who approves foreign investment applications), and two private sector executives or well-known professionals. The committee agrees to a package of incentives on a case-by-case basis, taking into account the possibility that the investment might have been made even without incentives.

Originally, the program was conceived as an incentive mainly to ICT firms. It was developed as a direct consequence of Chile's failure to land an Intel semiconductor plant. Intel's senior executives had Chile on their short list but eventually decided to install the plant in Costa Rica, where the firm was offered an interesting package of incentives, whereas it had been unable to secure any in Chile. At the time (1994), Chile had no program to attract FDI, and the authorities insisted on complete neutrality and national treatment for foreign investors. It should be noted that the Constitution prohibits the government from granting tax incentives to individual firms.

The launching of the program coincided with the bursting of the technology bubble in the United States, forcing CORFO to re-evaluate its FDI attraction program. Consequently, between 2001 and 2004, the program was reoriented to firms that wished to establish back office and call center operations in Chile. In 2005-2007, the emphasis shifted back to information technology. However, business services, software development, and shared information technology services for multinational companies have constituted the bulk of the investments that have arrived. Recently, with the arrival of Tata Consulting Services, it became clear that Chile could be attractive to Indian companies wishing to develop software for Spanish-speaking countries and for export to the United States.

The emphasis on FDI in high-technology industries has led to efforts to improve human capital, particularly in business competence in English. Through international bidding, CORFO has awarded a contract to train 1,000 young people in business English, and is planning an additional such program for 2,000 people in 2009. In terms of the classification of industrial policies used in this study, this program would qualify as the

provision of a public good to specific industries that require it, and would be located in the VP quadrant. It thus constitutes an indispensable supplement to the VM policies emphasized by the High Technology program.

The results so far have been quite promising. Seventy firms have benefited from subsidies, of which 37 received subsidies that went beyond feasibility studies (in other words, they decided to set up in Chile). A list of the 31 most important companies with Chilean subsidiaries that have been attracted by the program is shown in Table 12. As a consequence of the program, the recorded exports of services of the promoted firms have risen to slightly over US\$168 million. Total service exports may in fact be larger, since a good portion of these exports is intrafirm, and, at any rate, service exports are poorly recorded. By 2010, CORFO officials hope to reach the goal of US\$ 1 billion in exports since the program's inception.²⁷ In the nine years since it has been in operation, the program has approved about US\$35 in subsidies. The average subsidy per firm has been on the order of US\$951,000, with feasibility studies being minimal (US\$25,000 per firm). Since its inception in 2000, the program has generated 7,600 jobs.

To date, no impact studies of the program have been conducted. Thus, it is not possible to determine whether the program has been a success from the point of view of a social cost-benefit analysis. Nonetheless, the results seem fairly impressive so far, and the resources expended have been rather modest. If one had to fault the program for something, it would be for its small budget. If so much has been done with so little, one can imagine that very significant results could be obtained with more resources.

A study carried out in 2004 shows how small the Chilean effort is in comparison with others, such as Ireland's (see Belmar et al., 2004). As shown in Table 13, in 2003, the Irish counterpart to this program, the Irish Development Agency, had a budget of EUR 200 million. It had 25 offices around the world, compared to just four in the case of the Chilean program, and a staff of 295 workers, compared with seven in the case of the Chilean equivalent.²⁸ The budget of the CORFO program (about US\$7 million per

²⁷ Interview with Mario Castillo, the CORFO official in charge of running the program.

²⁸ In fact, the Chilean program had only one office manned by one person, in San Jose, California. The other "offices" were shared with other institutions of the Chilean government and were manned on a part-time basis. The San Jose office turned out to be failure and was unable to attract any investments from Silicon Valley. Nelson (2007) is of the opinion that New York would have been a better site for that office,

annum) surpassed that of its Costa Rican equivalent, CINDE, only in the three most recent years, 2006-2008 (see Nelson, 2007).

These comparisons suggest that a bigger and better funded effort would yield greater catches and might just succeed in making Chile a center for business process outsourcing, call centers, and software.

5. Conclusions and Policy Recommendations

In spite of significant output and export diversification since the 1980s, Chilean exports remain heavily dependent on unprocessed copper. Transforming Chile into a modern economy centered on the application of knowledge to production is still a task to be accomplished. Rather than resulting from a deliberate strategy implemented with coherent industrial policies, the ups and downs in the fortunes of non-copper exports have been more the effect of medium-term real exchange rate fluctuations and, occasionally, of isolated policy initiatives. It should be noted that medium- to long-term real exchange rate swings in Chile are among the widest in the world. In fact, long real exchange volatility has increased since the country opted for a flexible exchange rate regime in 1999, and which it largely has stuck to even during periods of balance of payments bonanzas and crises.

The surge of new exports beginning in the mid-1980s was encouraged by the severe real exchange rate depreciation stemming from the financial and debt crisis of 1982-83. A contributing factor was a more pragmatic policy stance from economic authorities whose approach to industrial policy up to then had been centered on trade liberalization. Beginning in 1985, one of the policy tools deployed was the *reintegró simplificado* (RS). As we show in this study, the RS appears to have had a very positive effect on export growth, through the push it gave to new export products. One of the clusters that emerged over the past 30 years is wood, wood products, and pulp and paper. These sectors have benefited from one of the few exceptions to the non-interventionist ethos prevailing since the military coup of 1973.

since most of the firms that eventually invested in Chile had subsidiaries or home offices in New York. Their Chilean investments were more heavy users than generators of ITC.

Another exception has been the industrial activism of *Fundación Chile*, which was responsible for a few great export successes, notably farmed salmon, a product in which Chile has become a leading world exporter.

The fast growth in new exports and export discoveries that took place during 1985-1997 petered out afterwards, mainly owing to the lagged effects of the gradual but inexorable real exchange rate appreciation during the surge in capital inflows (1990-1997). Contagion from the Asian financial crisis led to another bout of currency depreciation, and to another positive shock for new exports. As copper prices rose in 2004-2008, the real exchange rate took another dive, and the growth of new exports slackened.

There is a growing awareness of the need to have a more activist industrial policy because the market, left to its own devices, will not bring about the upgrading of the production structure and rapid long-term growth. This awareness has led to the deployment of more vertical policy instruments. The orientation of innovation policy toward 10 favored clusters has been one of these changes. But these efforts are more in the nature of “industrial policy in the small”: attempts to foster productivity enhancement and innovation in existing export sectors. Strategic bets have been weak and have been relegated to what FCh could do with its capital resource base and, since 2000, to a still very insufficient effort to attract foreign direct investment in information technology and in IT-intensive sectors.

The use of a large number of horizontal policy instruments, especially through CORFO, has continued. The emphasis has been on relieving financing constraints for SMEs through credit guarantees and special long-term investment credit programs in CORFO; technical cooperation programs of various kinds; the promotion of associative endeavors by small firms; and subsidies for innovation, both at the firm level and between groups of firms and business associations and universities.

Following are some of the conclusions of the study:

First, CORFO runs myriad programs oriented toward SMEs. While some programs have been evaluated, it is not clear that they make a coherent whole, or that the money is being well spent.

Second, the financing activities of CORFO, as well as FOGAPE, are indeed filling a gap in the financial system and are valuable to SMEs. If current lending procedures continue to be used, FOGAPE resources can be increased at little cost to the government, since the program even generates a small profit. CORFO provides longer-term financing basically to the same clientele. The scale of such operations is too small, and CORFO is not properly organized as a development bank. It may be useful to transform the *Gerencia de Intermediación Financiera* into a bona fide development bank and to increase the resources it has for on-lending to the segment of the business world it serves.

Third, the scales of operations of both the program to attract FDI to high-technology sectors and the business innovation arm of *Innova Chile* are too small to have a visible impact on the economy. The FDI incentive program has already proved its usefulness. *Innova Chile* is too new to have yielded important results so far. Both of them are inadequately funded. In addition, the resources supplied by *Innova* are probably too short-term to be genuinely useful in promoting business innovation, which has gestation periods that go well beyond the three years that are typical of *Innova*-funded projects.

Fourth, there is a need to redefine the role of *Fundación Chile*, removing the need to justify its existence in the marketplace from year to year. Its usefulness is in discovering new industries that can be competitive in the long run, as it did with salmon and blueberries. Its search and research activities ought to be geared to the long run, with a full understanding that most of its ventures will result in failure. It is enough that very few become new exports on the scale of salmon for its existence to be fully justified. In other words, it should move toward developing ideas that are too risky for the private sector to be willing to undertake, and toward activities that have higher social than private returns. This can be accomplished only by substantially increasing FCh's endowment, thereby freeing it from having to earn its keep year-in, year-out.

Fifth, the RS was a good idea that should not have been abandoned. It was a small, low-cost subsidy that had automatic sunset provisions; in other words, a subsidy to market-oriented self-discovery. It is not realistic to think that it can be reinstated in the same way, since it has already been reported as a subsidy to the WTO. However, policy makers may be able to think of subsidizing new activities in general, regardless of

whether they are for the domestic market or for export. Another modality would be to subsidize exports of firms introducing new products to the export basket, but to base the subsidy not on the firm's exports but on those of other firms exporting the same product, setting a limit in terms of total product export value.²⁹

Sixth, it seems entirely sensible to insist on sectors that have already been shown to have comparative advantage or to be able to develop one on their own, which is the approach that is being pursued by policymakers in changing their emphasis from horizontal to vertical policies. The idea is to add technology and knowledge to those sectors where Chile already has an international market presence or which have shown promise, and to find new products and niches within these clusters. But this should not preclude the big strategic bet, which has paid off so handsomely in the past. Business services offshoring, software, biotechnology, and new food exports should be on policy makers' lists. FCh is an ideal institution for this sort of "industrial policy in the large". More determined efforts to create an angel/venture capital industry also ought to work in this direction, given the country's resources.

Finally, industrial policy doesn't work in a vacuum. The wide medium- to long-term fluctuations of the real exchange rate are deleterious to the emergence of new activities. Chilean policy makers would do well to re-examine their commitment to a rigid floating rule and develop a policy regime that ensures less real exchange rate fluctuation. Of course, the diversification of the production and export structure would contribute to less real exchange volatility, in what would be a virtuous circle between less volatility and a more modern economy.

²⁹ I owe this idea to Ernesto Stein.

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**Table 1.
Policy Intervention Matrix**

	Horizontal (H)	Vertical (V)
Public Input (P)		Food safety: SAG
Market intervention (M)	<p>SME technical assistance: SERCOTEC</p> <p>SME credit: FOGAPE, SERCOTEC loan preparation program, credit lines from BancoEstado</p> <p>SME long-term finance: CORFO GIF windows</p> <p>Economies of scale and SME upgrading: CORFO Fomento programs: PROFO, FAT, FOCAL, PDP</p> <p>Export subsidies: <i>Reintegro simplificado</i> (discontinued 2003)</p> <p>Training: SENCE</p> <p>Generic export promotion: ProChile</p> <p>R&D subsidies: CORFO Innova Chile^a</p>	<p>Public entrepreneurship: Fundación Chile</p> <p>Sector-specific education: Chile-California program (mostly fruit, discontinued 1978)</p> <p>Higher education: Fellowship program for foreign studies in engineering (announced 2008)</p> <p>Information technology: CORFO FDI subsidies</p> <p>Agricultural protection: Higher tariffs for four groups of products with price bands</p> <p>Forestry: DL 701</p>

^a Together with other programs, since the unveiling of the white books of the CNIC, this program is veering toward support for ten specific clusters. Therefore, from a generic promotion of innovation, the CORFO R&D programs are becoming more vertical in nature.

Figure 1.
Stylized View of Innovation-Based Industrial Policy Emerging in Chile

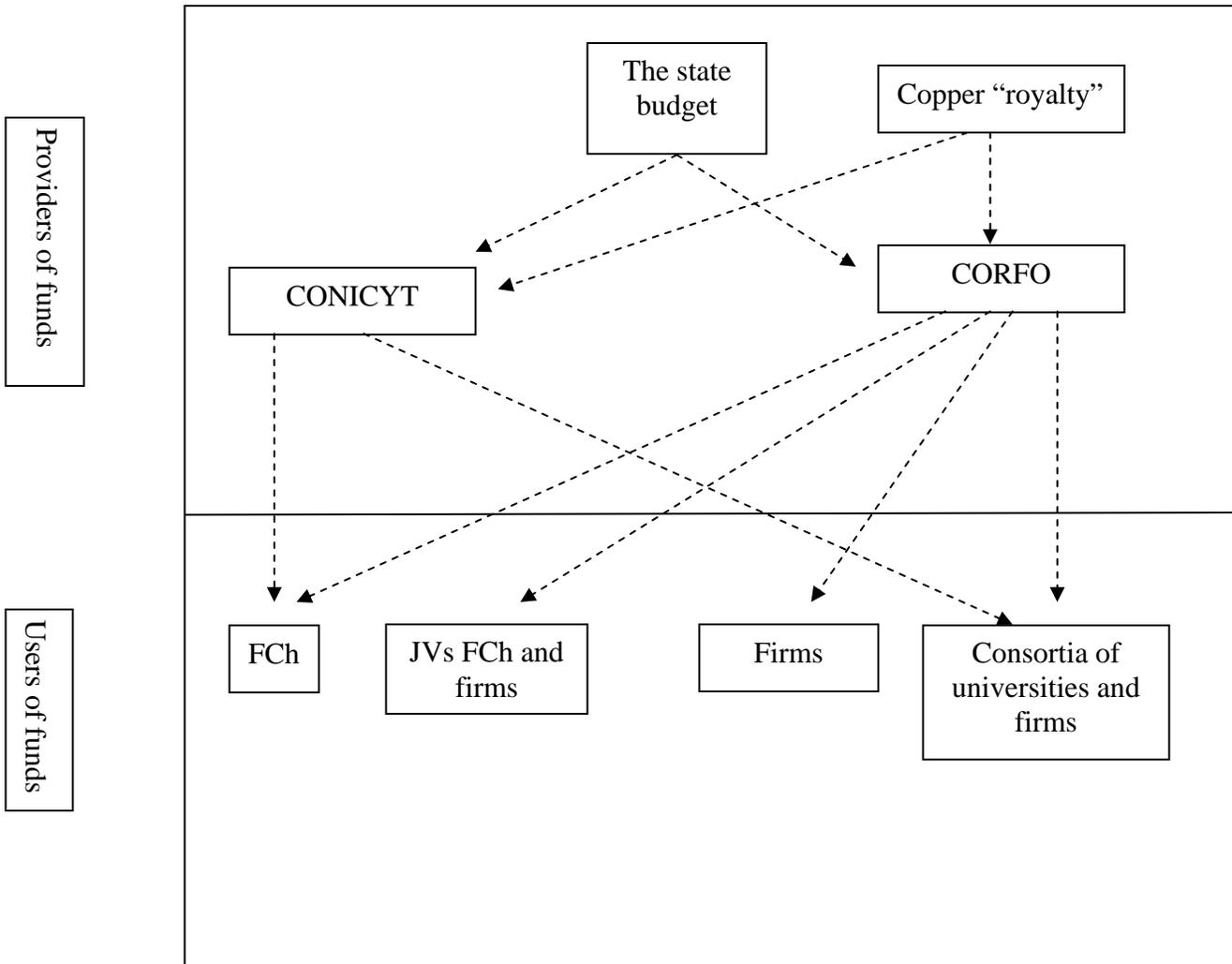


Table 2.
A Schematic View of CORFO Programs

Department	Main programs
Fomento (SME support)	PROFO (associations of small firms) FAT (technical assistance) FOCAL (quality improvement) PDP (supplier development)
Investment promotion	Todo Chile (for national investors) High technology FDI attraction
Gerencia de Intermediación Financiera (GIF)	13 credit lines, mostly long-term, for SMEs and for university students
Innova	Public goods and precompetitive investment Business innovation (individual and consortia) Technological diffusion (aimed at SMEs) Entrepreneurship Support for technological nodes

Source: CORFO.

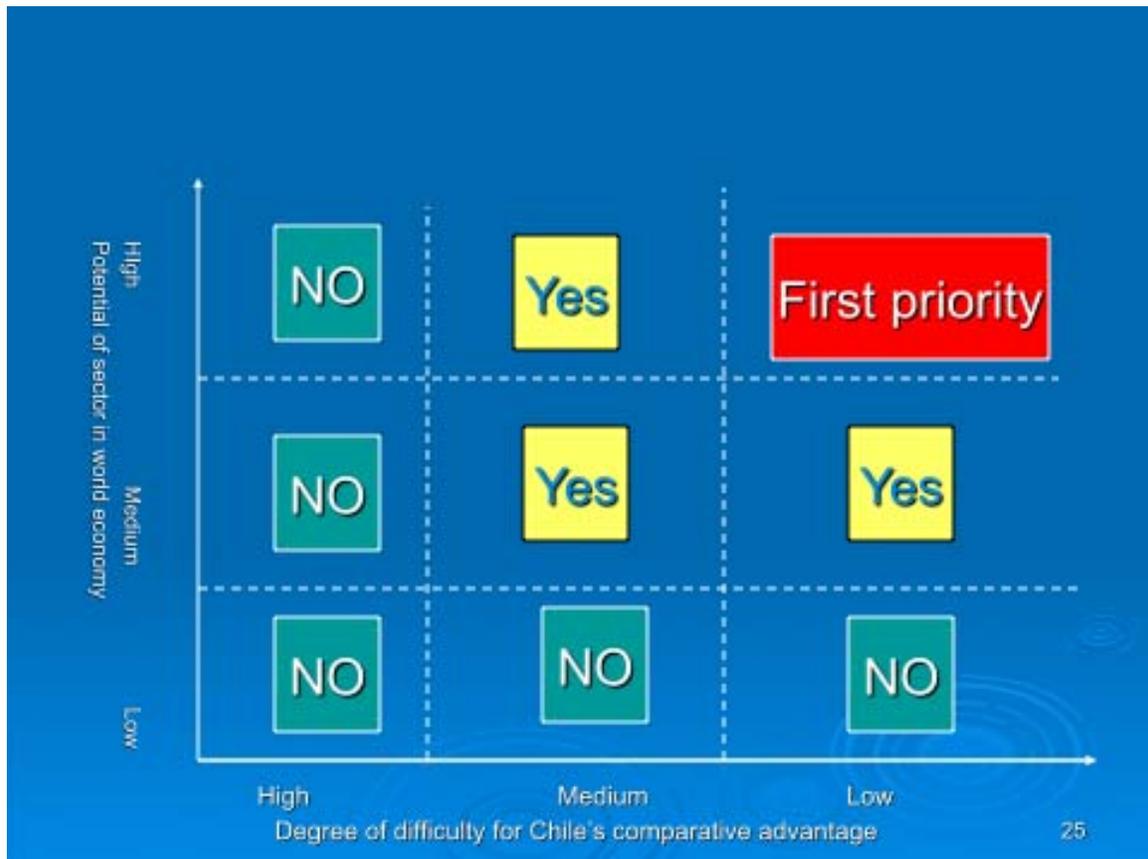
Table 3.
CORFO Subsidies and Loans, 2006 and 2007
(millions of US\$ and percentage of GDP)

Departments (Gerencias)	2006		2007	
	In million US\$	%GDP	In million US\$	%GDP
GIF	208.4	0.14	347.8	0.21
Fomento	40.2	0.03	45.9	0.03
Investment and development	7.1	0.00	12.1	0.01
Innova Chile	59.4	0.04	73.4	0.04
Total	315.1	0.22	479.2	0.29

Source: CORFO.

Note: GIF figures are loans; for other departments, the figures are expenditures on subsidies.

Figure 2.
Criteria Used by CNIC to Select Sectors and Clusters for Support



Source: Based on the authors' reading of Consejo Nacional de Innovación para la Competitividad (2007 and 2008).

Table 4.
Growth and Investment Indicators
(average percentage annual growth for GDP and exports;
percentage share of GDP for investment)

	1990 - 1997	1997-2003	2003-2007
GDP growth	7.1	2.3	4.2
Growth of exports (goods and services)	9.3	4.7	5.8
Gross fixed investment rate	21.3	21.7	24.3

Source: Central Bank of Chile, *Boletín Mensual de Estadística*, and World Bank, *World Development Indicators*.

Table 5.
A. Export Values, by Major Category of Products, 1990-2007
(percentage)

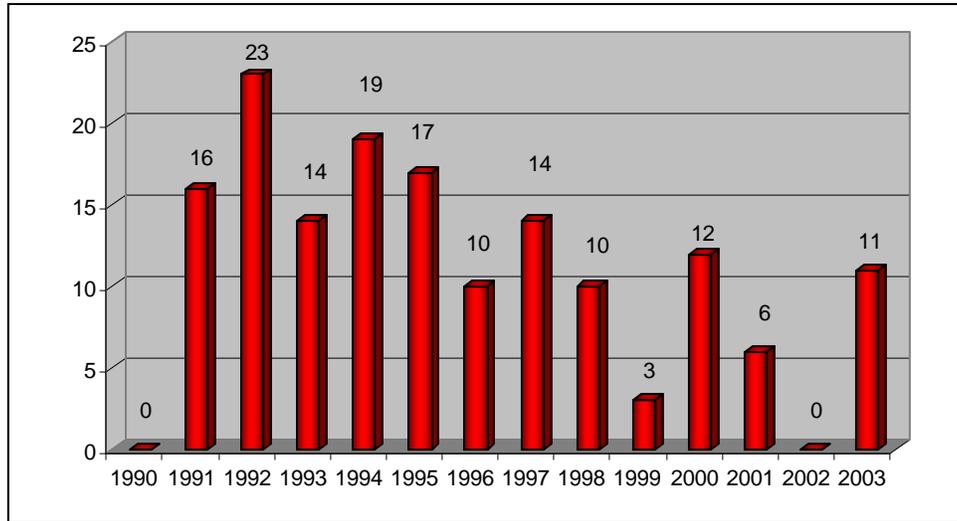
	1990	1997	2003	2007
Copper	45.0	36.2	31.6	51.5
Other minerals	9.7	7.6	5.6	6.0
Fresh fruit	10.0	9.2	10.6	5.6
Wood, pulp, and paper	10.6	11.9	12.7	8.9
Salmon and trout	1.5	4.9	6.8	4.9
Wine	0.7	3.0	4.0	2.6
Other food and agriculture	15.4	15.9	14.3	8.4
Other manufactures	7.2	11.3	14.3	12.2
Total	100.0	100.0	100.0	100.0
Total, US\$ million	7,648	13,940	16,867	48,878

B. Export Volumes (2003 prices), by Major Category of Product, 1990-2007
(percentage)

	1990	1997	2003	2007	Annual growth, 1990-2007
Copper	35.2	30.3	31.6	24.2	6.3
Other minerals	11.4	8.3	5.6	11.0	8.4
Fresh fruit	11.7	10.1	10.6	10.2	7.7
Wood, pulp and paper	12.5	13.0	12.7	15.7	10.1
Salmon and trout	1.8	5.4	6.8	4.3	14.3
Wine	0.8	3.3	4.0	4.7	20.6
Other food	18.1	17.4	14.3	13.4	6.3
Other manufactures	8.5	12.3	14.3	16.3	12.9
Total	100.0	100.0	100.0	100.0	8.6

Source: Central Bank of Chile.

Figure 3.
Export Discoveries, 1990-2003
(number of products)



Source: Authors' calculations, based on Central Bank of Chile, "glosas de exportación" database.

Table 6.
Export Successes, 1990-2007
(exports in US\$ million)

A. Food products	Exports, 2007	Year discovered
Frozen salmon fillets	666.1	1991
Blueberries	158.0	1993
Mussels	78.9	1995
Cereal products	62.3	1994
Cheese	61.6	1994
Condensed milk	55.7	1992
Other meats and edible leftovers	49.2	1996
Frozen or dried sea urchins	48.7	1992
Turkey meat and leftovers	44.3	1994
Lemons	43.9	1992
Smoked salmon	37.2	1993
Smoked trout	37.1	1993
Tea, coffee, or herb concentrates	27.3	1992
Tangerines	27.2	1996
Meat sausages and preparations	25.4	1991
Scallops	21.9	1994
B. Manufactures	Exports, 2007	Year discovered
Multilayered paper	206.0	1996
Ashes and residues	137.1	1997
Pick-up trucks	135.2	1991
Covered copper cables	66.6	1992
Polyethylene sheets, films and plates	52.6	1995
Liquified butane gas	48.9	2000
Polypropilene sheets, films and plates	48.7	1995
Petroleum ethers	45.5	1998
Potassium sulphate	45.3	1998
Iron and steel constructions and pieces	42.8	1992
Other vegetable mucilage and thickeners	38.5	1991
Data processing automatic machines	33.5	1991
Polypropilene in primary form	32.9	2000
Ammonium nitrate	32.2	2000
Unalloyed iron bars	32.0	1998
Molybdate (of ammonium or sodium)	31.5	1994
Aluminum scrap	29.4	1996
Combinations of refrigerators and freezers	27.0	1996
Sacks (bags)	25.4	1995
Drawers and cabinets for cold storage	25.4	1993
Polycarboxilic aromatic acids	24.6	1994
Seamless steel tubes	23.1	1992
Printed material for registry	21.9	1991

Source: Authors' calculations, based on Central Bank, *glosas de exportación* database.

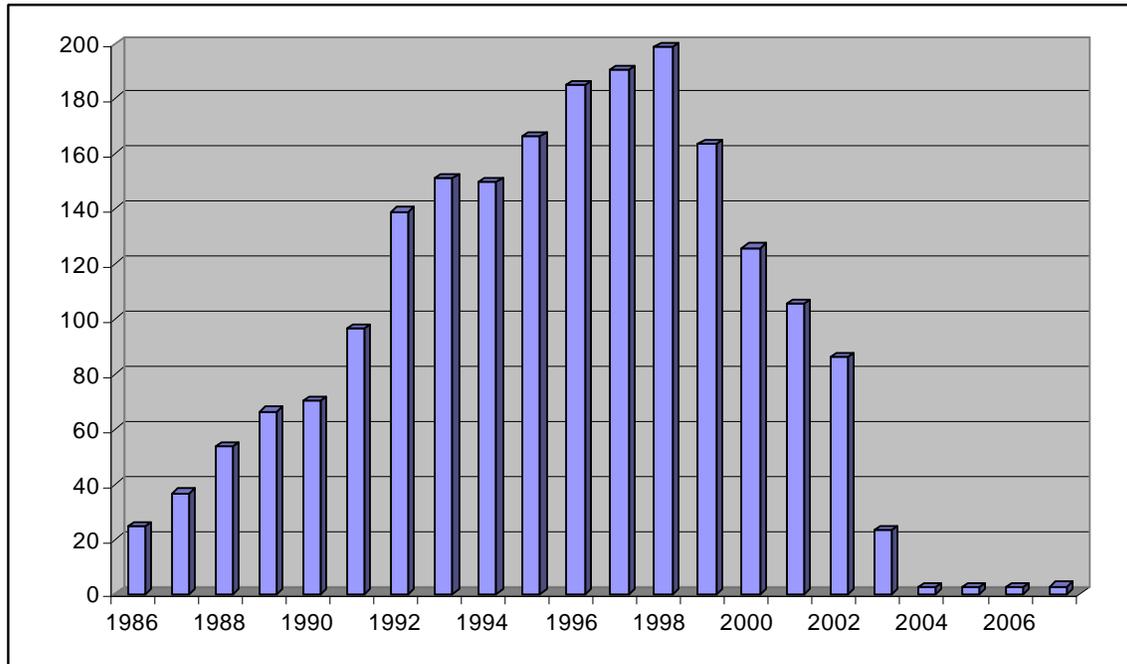
Note: An export "success" is defined as a product that exported less than US\$1 million in 1990, maintained exports above that figure after it crossed that threshold, and reached US\$20 million in 2007 or before.

Table 7.
FOGAPE Activity Volumes, 2000-2007
 (money figures in US\$ million)

	Current clients	Stock of guaranteed credits	New guarantees	Stock of guarantees
2000	13,000	141.5	91.0	87.9
2001	22,000	156.8	123.9	150.3
2002	35,000	228.6	177.7	219.8
2003	39,100	356.2	254.6	324.1
2004	41,900	463.5	326.2	421.4
2005	42,997	524.0	352.7	498.8
2007	43,113	420.4	274.1	436.3
2008	42,499	516.2	376.3	546.9

Source: FOGAPE.

Figure 4.
Amounts Paid by the Treasury on Account of the RS, 1986-2007
 (US\$ million)



Source: Tesorería General de la República.

Table 8.
Two-period panel model for export volume growth

Year	All exports			Exports<US \$1,000 Excluded		
	Constant (Std. Err.)	RS (Std. Err.)	Number of Obs.	Constant (Std. Err.)	RS (Std. Err.)	Number of Obs.
1991-1996	10,930 (0,054)	0,885 (0,088)	2078	11,746 (0,053)	0,597 (0,084)	1802
1992-1997	11,284 (0,057)	0,645 (0,096)	2127	11,331 (0,055)	0,355 (0,090)	1882
1993-1998	11,278 (0,055)	0,444 (0,092)	2185	12,100 (0,054)	0,237 (0,089)	1916
1994-1999	11,388 (0,054)	0,273 (0,090)	2245	12,245 (0,053)	-0,044 (0,086)	1957
1995-2000	11,716 (0,059)	0,202 (0,125)	1955	12,502 (0,057)	-0,105 (0,117)	1730

Coefficients in red are not significant at 5% level.
Standard errors are robust.

Table 9.
Logit Model I and Results of Matching Test

Logistic regression

Number of obs =10764

LR chi2(6) =1063.63

Prob > chi2 =0.0000

Log likelihood = -6637.6519

Pseudo R2 =0.0742

RS	Coef.	Std. Err.	z	P> z	[95% Conf.Interval]	
Exports	-0.0000003	0.00000	-20.78000	0.00000	0.00000	0.00000
year_1996	-0.2022963	0.08688	-2.33000	0.02000	-0.37258	-0.03202
year_1997	-0.1294326	0.08652	-1.50000	0.13500	-0.29900	0.04014
year_1998	-0.1711493	0.08563	-2.00000	0.04600	-0.33897	-0.00333
year_1999	-0.1934761	0.08530	-2.27000	0.02300	-0.36066	-0.02629
year_2000	-0.4441412	0.08585	-5.17000	0.00000	-0.61241	-0.27588
Constant	0.9717648	0.07120	13.65000	0.00000	0.83221	1.11132

Note: 50 failures and 0 successes completely determined.

Average outcome of the matched treated

Variable	Obs	Mean	Std. Dev.	Min	Max
Variation	6629	777.8478	6169.857	-99.94	230794.9

Average outcome of the matched controls

Variable	Obs	Weight	Mean	Std. Dev.	Min	Max
Variation	2341	6629	278.923	1969.88	-99.9853	55960.11

ATT estimation with Nearest Neighbor Matching method

(random draw version)

Analytical standard errors

n.treat.	n.contr.	ATT	Std. Err.	t
6629	2341	498.925	103.698	4.811

Note: the numbers of treated and controls refer to actual nearest neighbour matches

Table 10.
Logit Model II and Results of Matching Test

Logistic regression

Number of obs =9419

LR chi2(11) =2744.61

Prob > chi2 =0.0000

Log likelihood = -5086.1914

Pseudo R2 =0.2125

RS	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Exports	-0.0000002	0.00000	-17.580	0.00000	-0.0000003	-0.0000002
year_1996	0.4378241	0.10434	4.200	0.00000	0.2333270	0.6423212
year_1997	0.4508145	0.10395	4.340	0.00000	0.2470755	0.6545535
year_1998	0.4096669	0.10285	3.980	0.00000	0.2080759	0.6112578
year_1999	0.4456946	0.10220	4.360	0.00000	0.2453843	0.6460050
year_2000	0.3630384	0.10201	3.560	0.00000	0.1631115	0.5629654
SITC 0	-2.6845420	0.24216	-11.090	0.00000	-3.1591580	-2.2099260
SITC 1	-1.3513730	0.24940	-5.420	0.00000	-1.8401960	-0.8625488
SITC 2	-1.3066220	0.24796	-5.270	0.00000	-1.7926200	-0.8206228
SITC 3	1.8165300	0.33018	5.500	0.00000	1.1693830	2.4636770
SITC 4	-1.6518540	0.25192	-6.560	0.00000	-2.1456050	-1.1581030
Constant	2.0578140	0.24936	8.250	0.00000	1.5690720	2.5465560

Note: 35 failures and 0 successes completely determined.

Average outcome of the matched treated

Variable	Obs	Mean	Std. Dev.	Min	Max
Variation	5284	872.7423	6836.59	-99.9402	230794.9

Average outcome of the matched controls

Variable	Obs	Weight	Mean	Std. Dev.	Min	Max
Variation	1804	6629.00008	284.163	1783.518	-99.98528	55960.11

ATT estimation with Nearest Neighbor Matching method

(random draw version)

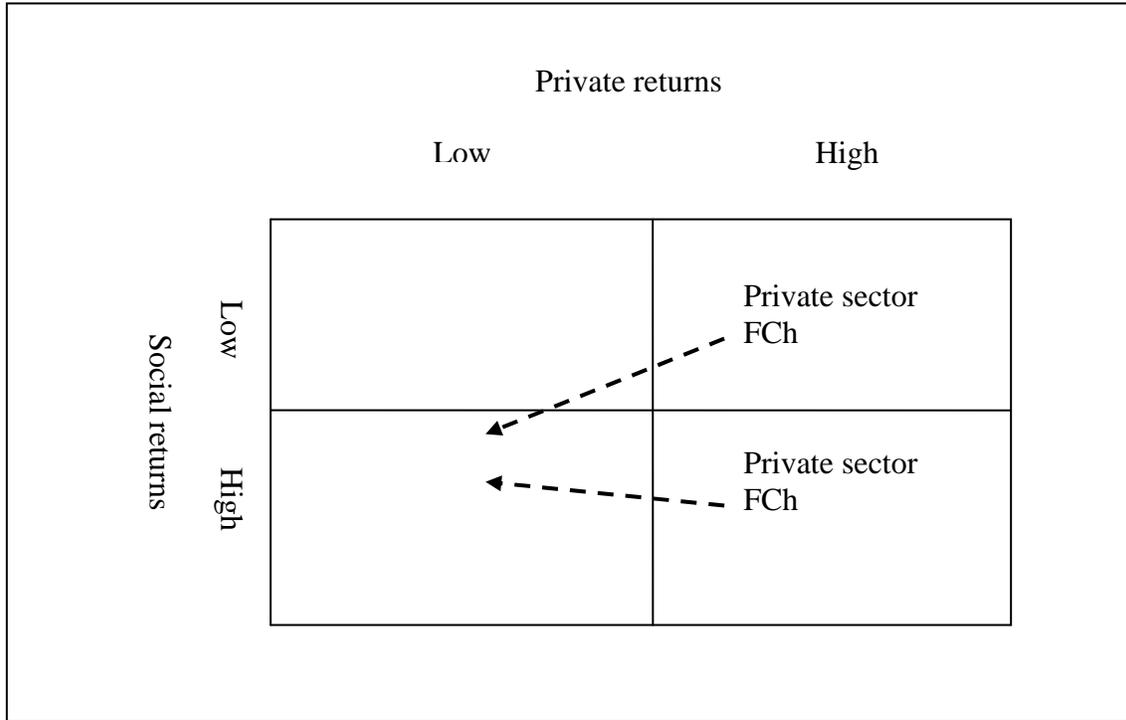
Analytical standard errors

n. treat.	n. contr.	ATT	Std. Err.	t
6629	1804	588.579	328.422	1.792

Note: the numbers of treated and controls refer to actual

Figure 5.
Trade-offs Facing Fundación Chile

A. Between Private and Social Profitability



B. Between Risk and Return

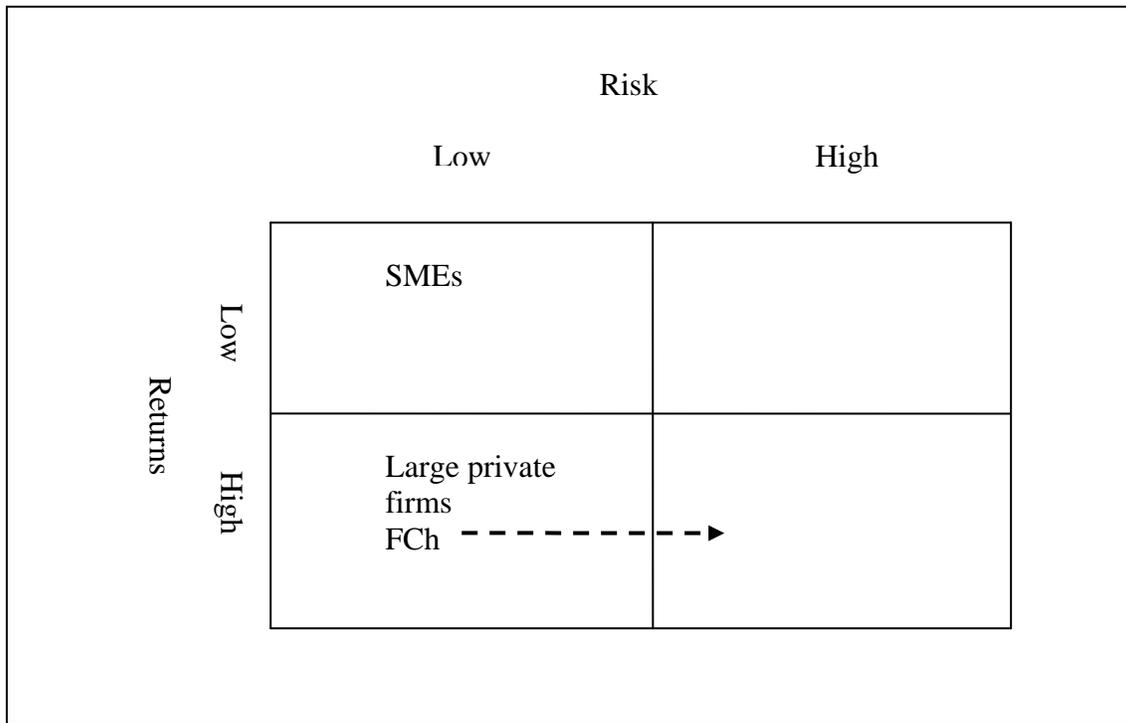
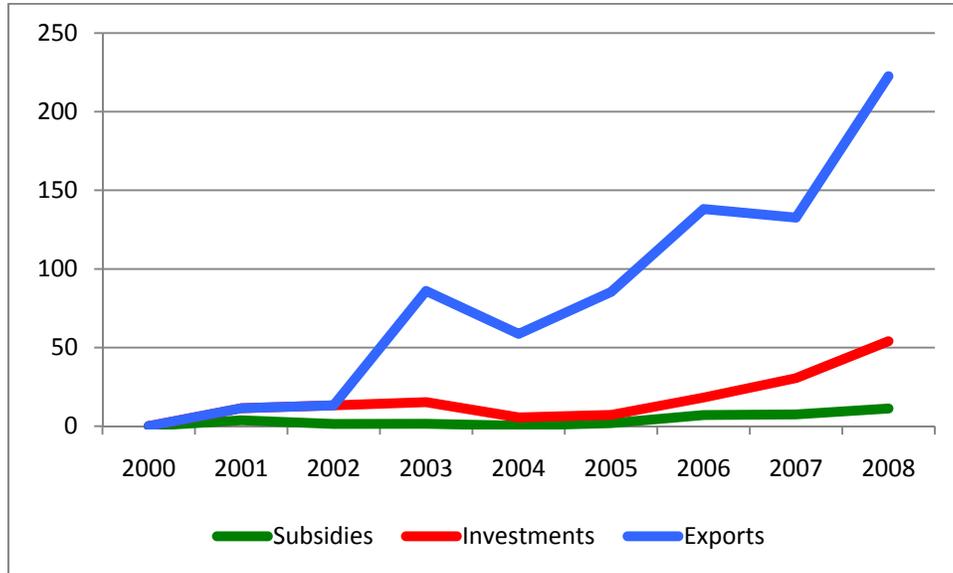


Table 11. Innova Chile Business Innovation Projects A. Individual Business Innovation (figures in US\$)				
Project	Firm	Innova contribution	Co-financing	Sector
Building prefabricated homes	Empresa Constructora Rucantú S.A.	42,000	73,432	Construction
Developing plastic wood panels	Wenco S.A	102,308	224,866	Manufacturing
Bird watching tourism in Maullín river	Gallardo Mödinger y Cía. Ltda.	33,000	63,112	Tourism
Using the Chilean abalone for immunological ends	Biosonda S.A.	134,006	197,052	Health
Using biogas as an alternative source of vapor	Pisco Capel (cooperative)	140,402	159,830	Agribusiness
Obtaining emu oil through biotechnology	Emuchile S.A.	62,476	76,476	Manufacturing
Wagyu beef breeding	Sociedad Martinez y Calvo Ltda.	90,000	147,760	Agribusiness
A salmon vaccine	Centrovét	400,000	543,334	Aquaculture
Using biotechnology in copper mining (biolixiviación)	Sociedad Punta del Cobre S.A (Pucobre)	80,000	151,410	Mining
Developing new fish products	Comercial y Pesquera South Wind Ltda.	52,750	67,738	Manufacturing
Industrial door production	Refricentro	64,600	38,882	Manufacturing
Controlling wear and tear in mining equipment	Cauchos industriales S.A. (Cainsa)	110,000	184,014	Mining
Prefabricated housing and its components	Cintac S.A	89,298	239,648	Construction
Transporting salmon smelts in isothermic tanks	Maestranza Tenglo	80,000	110,634	Aquaculture
Controlling wear and tear in mining equipment	HighService	100,000	204,204	Mining
Application of sodium silicate in mining and construction	Austral Chemicals Chile S.A	236,000	204,634	Mining
Development of GSM SPRS/EDGE router	Yx Wireless S.A.	130,000	326,937	ICT
Technology for custard apple exports	Vital Berry Marketing S.A.	58,000	75,838	Agribusiness
B. Innovation consortia				
Project	Consortia	Innova contribution	Co-financing	Sector
Robotic solutions in mining	Codelco and foreign mining and technology firms	2,280,000	9,127,054	Mining
Wine sector development I	Wines of Chile and three Chilean universities	3,060,000	1,538,000	Agribusiness
Forestry genomics	Several universities and national forestry companies	5,038,000	3,256,753	Forestry
Genetic improvement of blueberries	University of Talca and two exporting firms	669,752	682,946	Agribusiness
Wine sector development II	Vinnova S.A. (Wines of Chile and two universities)	3,400,000	2,220,030	Agribusiness

Source: CORFO.

Figure 6.
Subsidies to Firms Benefiting from CORFO's High Technology Program,
Investments and Exports by Beneficiaries, 2000-2008
(US\$ million)



Source: CORFO High Technology program.

Table 12.
Firms Attracted by CORFO's High Technology Program
(investment in US\$ million)

Firm	Year of arrival	Investment	Number of employees	Area	Subsidy
Delta Airlines	2000	3	200	Client/technical services	Yes
Unysis	2000	n.a.	200	Client/technical services	No
Packard Bell	2000	n.a.	130	Assembly and repairs	No
Altec (Banco Santander)	2001	23	589	IT center and software	Yes
BHP Billiton	2001	n.a.	76	Shared services center	No
Air France	2001	1.3	70	Client/technical services	Yes
Citigroup	2002	n.a.	120	IT center; software	Yes
BBVA	2002	80	180	IT center; software	Yes
Tata Consulting Services	2002	30	1,500	IT center; software	n.a.
Unilever	2002	11	200	IT center; software	Yes
Int. Center of Excellence	2002	n.a.	70	Client/technical services	No
Shell	2003	n.a.	60	Client/technical services	Yes
CellStar	2003	1.1	53	Assembly and repair	Yes
Software AG	2005	n.a.	50	IT center and software	No
Reuters	2005	n.a.	25	Client/technical services	No
Intersystems	2006	5	5	IT center; software	Yes
Synopsys	2006	3.2	100 (projected)	IT center; software	Yes
JP Morgan	2006	0.65	50	IT center; software	Yes
Lafarge	2006	0.8	10	Shared services center	Yes
MSD	2006	n.a.	21	Shared services center	No
Sitel	2006	n.a.	1,000	Call center; BPO provider	No
Transcom	2006	n.a.	550	Call center; BPO provider	Yes
Unisono	2006	n.a.	641	Call center; BPO provider	Yes
Teleperformance	2006	n.a.	1,450	Call center; BPO provider	Yes
Konecta	2006	n.a.	1,400	Call center; BPO provider	Yes
Atento	2006	n.a.	7,600	Call center; BPO provider	No
Emergia	2006	n.a.	900	Call center; BPO provider	Yes
Yahoo	2006	n.a.	10	Knowledge center	Yes
Evalueserve	2006	1	102	Knowledge center	Yes
Experian	2007	n.a.	300	IT center and software	Yes
Oracle	2007	3	200 proj.	Shared services center	Yes

Source: CORFO.

Table 13.
Comparison Between Irish and Chilean FDI Attraction Programs
in High Technology, 2003

	Ireland	Chile
General data		
Years of operation	55	3
Budget (2002)	€197 million	US\$1.5 million
Firms established	1,094	9
Cumulative employment	132,246	1,097
Professional staff	295	7
Exports	€65.2 billion	US\$23 million
Foreign offices	15	3
Domestic offices	10	1
Efficacy indicators		
Firms per year	19.9	3
Employment per firm	120.9	121.9
Professionals per firm	3.7	1.3
Exports per firms	€9.6 million	US\$2.6 million

Source: Belmar et al. (2004).