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INDUSTRIAL POLICY IN CHILE

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Summary

Chile has experimented with practically every type of industrial policy in the book: from heavy import substitution, public ownership of domestic firms, directed credit, and heavy use of development banking; to a completely free-market approach. After the liberalization and privatization of the military regime's early days in the decade of the seventies, a more pragmatic approach was adopted in the eighties. After the return to democracy in 1990, an even greater role was given to the state, while remaining in what could be labeled a horizontal approach, emphasizing the resolution of economy-wide market failures but still eschewing sector selection. A large number of programs aimed at facilitating investment and technological upgrading especially by small and medium enterprises (SMEs) were instituted in the early 1990s, mainly by CORFO, a development agency set up during the heyday of import substitution in 1939. CORFO has also attempted to relax these firms' borrowing constraints through what amount to a series of development banking programs. During the current decade, Chile has moved to a more focused industrial policy, emphasizing the sectors in which the country has comparative advantages or those it could be expected to develop in a reasonable period of time. CORFO has given increasing emphasis to subsidizing the formation and operation of innovation-based consortia between private firms and universities and other activities related to innovation, increasingly in nine sectors singled out for special treatment by high-level National Council on Innovation for Competitiveness (NCIC) created in 2006.

This paper studies three horizontal policy instruments and two vertical ones. The horizontal instruments are (1) a guarantee program for borrowing by SMEs (FOGAPE), (2) a highly ingenious small subsidy to new exports that was operated from 1985 through 2003, and (3) the innovation subsidies provided by 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.

One conclusion of the study is that most of the programs instituted by the government are well oriented, with clearly defined goals and addressing real problems faced by Chilean entrepreneurs. However, there is a great proliferation of programs, each one of them insufficiently funded. The country could benefit from a prioritization of needs and a consolidation of programs.

Second, the instruments for making strategic bets on new sectors are particularly weak. In spite of a track record of success, they are endowed with resources that are too meager for them to have a major impact on the economy. In particular, FCh needs to refocus its activities on high-risk projects with long payoffs, something it cannot do with its small endowment.

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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. At this moment, a basically horizontal approach to industrial policy designed to correct what are perceived as important market failures is giving way to a renewed interest in vertical policies that concentrate government efforts in selected sectors. However, policy makers are groping to understand fully what this entails and which are the most effective instruments to bring about a diversification of Chile's productive and export profiles, which are still dominated to a very large degree by mining in general and by copper in particular.

This study reviews the productive development policies currently applied in Chile, evaluates their successes and failings, 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, on the one hand, horizontal or vertical in nature, and, on the other, 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, be they 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 on the rationale that they are needed to correct economy-wide market failures. Are they achieving their objectives and to what extent?
- (2) Vertical policy instruments have been advocated on the grounds that the market by itself 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 appropriate to 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 go on to examine in detail a selected number of 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 small and medium enterprises (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, or could develop, comparative advantage. Some of these industries are well established. In this case, the aim of policy is to bring them up to the technological frontier. Others are still promises, 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.

So far, however, the efforts to redirect policy towards a more vertical orientation have not yielded changes that can be felt at a macroeconomic level. The amounts spent promoting innovation or high technology investment have been relatively modest, although they have been growing.

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.

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.

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 for sustained change 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 the programs examined in this study. Given the fact that the premier development institution, CORFO, does have 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 to concentrate efforts on fewer programs. Good candidates are some that 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 infusions of resources that are beyond its capability at the moment. Other successful horizontal programs, such as FOGAPE, can be scaled up at very little cost to the state. The same can be said of CORFO' 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 constitute an effective development bank.

Part A. Broad Overview of Industrial Policy in Chile

I. 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 swathes of the industrial sector sprung up under government entrepreneurship: steel, petroleum extraction and processing, sugar, vertically integrated electricity generation and distribution, 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 with an ambitious industrialization policy, the execution of which it entrusted to a new development agency with broad attributions, including those of being a development bank (Corporación de Fomento de la Producción, CORFO), which it set up in 1939. 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.

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, labor 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

² BancoEstado is a state-owned commercial bank set up in the 1940s to grant credit to sectors favored by industrial policy, to small and medium enterprises that did not have adequate access to commercial banks, and to provide savings vehicles for consumers. Nowadays it is still 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 seventies, to be replaced by a liberalization without regulation that ended up in the crash of 1982. For a marvelous account of that episode, see Díaz-Alejandro (1985).

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 government, think tanks, or academics has tended to be met with a great deal of skepticism.

II. 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 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 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 (SMEs) have long been supported through a variety of programs of technical cooperation and special financial vehicles. These programs were and are being run 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. It 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 in fact 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

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).

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 everywhere 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 produce the human capital needed for this particular sector. Early in the military regime, Decreto Ley 701 gave wide 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 newly-turned out forestry engineers that were 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 has continued to be used until the present.

The second departure from neutrality has been the activities carried out by Fundación Chile (FCh). As noted above, FCh has been practically the only instrument for industrial policy in the large. It can be considered as 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 state 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 sell them off to the private sector (either national or international). In the late

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.

1970s it was responsible for adapting Norwegian technology of salmon cultivation to Chilean conditions (see Achurra, 1995).

III. Industrial policy from 1990 to the present

The types of instruments used

Nowadays, the government deploys a myriad of 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). Chilean policies are practically all of the HM variety. 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

[Insert table 1]

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, more on this below). It should be noted, however, that most of the clients of the program, and indeed the clusters identified in the 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

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 had been an active debate inside the administration between those favoring vertical policies (usually by adherents to 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).

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 (FCh), 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 is inspired in the European Union's Common Agricultural Policy. The system 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, all 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 the Common Market of the South, Mercosur (1996) and the United States (2003) require the country to eventually dismantle its system of farm protection, but over long phase-out periods.

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 understood 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 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. More on this below.

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 funds 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).

[Insert figure 1]

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 longer periods of time (Iniciativa Científica del Milenio for universities and Financiamiento Basal for consortia of universities and business firms).

The special role of CORFO

On the other hand, CORFO itself is a complex institution with a number of industrial policy functions (see table 2). As already noted, over the years, that role has changed very significantly, and several times. 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 started 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).

[Insert table 2]

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 watertight, 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.

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).

[Insert table 3]

One of the investment promotion programs and the Innova Chile program are discussed below in greater detail. 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 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 very 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 activities were completely revamped. The total amounts spent in 2007 ran to 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 and 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 about 13 different lending windows, most of which are aimed at providing long-term, investment-oriented loans to SMEs. There are two programs aimed at 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 stopped acting as a first tier bank in 1990. Before the change in its financial character, CORFO had a serious problem with delinquent loans, which it no longer does, as now all of its funding is provided in a second-tier-bank modality through credit lines that are auctioned to private financial institutions and BancoEstado on the basis of the interest rates that these institutions offer to charge borrowers.

¹¹ Formally, the earnings on CORFO 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 GIF portfolio at the end of 2006 was around US\$1.1 billion. While this may seem like a big number, when measured against needs for long-term finance 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 per cent), 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 into a *bona fide* development bank. It should be noted that all of its operations are managed with a very small staff (27 professionals, not all with banking experience). GIF does not have separate accounts from the rest of CORFO and is, right now, unable to operate as a true second-tier development bank. If its resources are increased to bring them up to what is required for its development banking tasks, it would be convenient to separate it from the technical cooperation activities of CORFO, as was done with the Innova Chile program, which has its own governing body.

It should be noted that Fomento and GIF – and, to a large extent, Innova Chile as well, respond to the approach to industrial policy that was prevalent during the 1990s, which stressed horizontal instruments designed to deal with perceived market failures. Fomento programs are all geared to improving the technological and managerial capabilities of SMEs and to 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.

More recently, this approach has been giving way to a more vertical approach, which has gained impetus from the publication of two influential white books on innovation for competitiveness.

IV. The two “white books” 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 most suited to the country's long-run growth. Nowhere is this revisionist approach more evident than in the two recent white books released by the National Council on Innovation for Competitiveness (Consejo Nacional de Innovación para la Competitividad, 2007 and 2008). The Consejo (CNIC) was set up by President Bachelet at the beginning of her mandate in May 2006.

The CNIC reports identify two objectives for government intervention: (1) the creation of platforms that are useful for several sectors (in other words, the 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 makes specific mention to 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 great tasks: on the one hand, the development of public goods that are specific to the sectors chosen, and, on the other, the strengthening of generic platforms that have a broader impact on the economy and which reduce, without entirely eliminating, the risk of placing bets on specific sectors (authors’ translation).”

The first report specifically rejects the notion that can be found 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, is to build on those successes by introducing advanced technology into production and by 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 or 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.

[Insert 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 lays a great deal of emphasis on improving the horizontal instruments that are now in use and developing new ones. The 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 embracing substantial changes in 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 councilors 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. In turn, the CNIC has a Council of Ministers, composed of the Ministers of Finance, Economy and Education, who 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. The CNIC proposes a long-term agenda that is independent of the electoral cycle, but the concrete decisions to implement the strategy are made by the Council of Ministers. The CNIC then oversees the implementation of those decisions.

Although this institutional setup is quite appropriate, it does require a strong political weight for the Minister of Economy, who presides over the CNIC. However, in Chile, historically the Ministry of Economy has been weak and has always deferred to the Ministry of Finance. It remains to be seen whether this will change in the future.

V. 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 per cent 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.

[insert table 4]

Table 4 also shows that GDP and export growth have slowed down very 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 sub par 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".

[insert table 5]

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 they overtake the limit of US\$ 1 million and never 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). On the other hand, of all the products discovered during the period, we classified those that exceeded 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. In the period from 1998 to 2003, export discoveries fall off dramatically. Agosin and Bravo-Ortega (2007) tested an empirical model showing that the real exchange rate had powerful lagged effects on export discoveries. It could thus be that the main reason

¹² See <http://www.cid.ucdavis.edu>.

for this pattern of export discoveries has 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 precisely by the previous period's currency appreciation.

[Insert figure 3]

Be that as it may, a very significant number of export discoveries (155, to be exact) did take place in the period 1991-2003. 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 is something that needs 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 is being advocated in recent years, might have led to more export discoveries and greater export successes. Thus, the more "vertical" approach that is implicit in the CNIC's white books is likely to be a promising 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.

[Insert table 5]

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 diagnostic behind the recommendations of the CNIC's white books, which stress a more vertical approach to industrial policy than what has been in evidence in the past.

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

Part B. Horizontal instruments

I. Borrowing guarantees for small businesses (FOGAPE)

MSEs usually do not 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 the sectors in which they may be located. Chilean policy makers have attempted to deal with this problem in a variety of ways. As noted earlier, SERCOTEC and CORFO have loan programs for small entrepreneurs, and SERCOTEC runs a subsidized loan preparation scheme for micro enterprises. However, the most important tool to address this problem is FOGAPE (Fondo de Garantía para Pequeños Empresarios). 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 (private or public) financial institutions to MSEs, small exporters, and organizations of small businesses.

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 for other countries, even the United States. In December 2004, almost 70 per cent of formal micro enterprises had a bank loan (Larraín, 2008). The figure for small enterprises was 93 per cent.¹⁴ At the end of 2007, it is estimated that the corresponding figures had risen to 93 and 100 per cent. In the United States, the Survey of Small Business Finances estimates that, in 2003, about 60 per cent 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 micro enterprises. 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 per cent, 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 per cent.

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.

¹⁴ In Chilean usage, micro enterprises have sales of up to UF 2,400 (about US\$ 80,000 in early November 2008), and small enterprises have 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 for the change in the cost of living index the month before.

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 organizations of small business people, 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. On the other hand, beneficiary firms must pay a user fee to the bank, which has a maximum of 2 per cent 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 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, purchases of equipment, 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 up to 2004 and has leveled off since then. At the end of 2007, total guarantees stood at US\$516 million. Remembering that 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.

[insert table 6]

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 amount 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 accounted for by 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 difficulties accessing credit, and this is the market failure that FOGAPE addresses. Smaller firms tend to face this problem more than established larger 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 is the case in lending to larger firms. This makes banks reluctant to lend to MSEs. 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 in bidding for slices 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 enough 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.

One can see FOGAPE 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 in changing 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 their first stages of 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 (Larrain, 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 the exporters that are 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 MSEs 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 stimulates 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 MSEs become an important business niche for banks. Larrain and Quiroz (2006) find evidence that FOGAPE has encouraged banks to go down a learning curve in the realm of micro and small enterprise financing. There are at present 17 financial institutions utilizing FOGAPE. However, FOGAPE use is heavily concentrated in five large banks, which raises some questions as to whether it has generated a generalized interest in this kind of financial operations.

In December 2007, total lending by Chilean financial institutions was of the order of US\$ 118 billion. As noted above, lending with FOGAPE guarantees totaled US\$ 516 million, or just 0.44 percent of total lending. In terms of the 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 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, benefits clearly outweigh 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 of them is that it is run by BancoEstado, who 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, FOGAIN (Fondo de Garantías para las Inversiones), 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.

II. The “Reintegro Simplificado”

The “reintegro simplificado” (RS) was, in effect a small subsidy on 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 (Ffrench-Davis and Sáez, 1994). In lieu of having to apply for a drawback of duties paid on imported inputs, small exports received up to a 10 percent export subsidy. 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 per cent 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 per cent and it was estimated that the average import content of non-traditional exports was 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 by 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 into account inflation. In 1987, it introduced two tiers to allow for the gradual loss of the subsidy. During 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 in products with a total value of exports of less than US\$ 10 million, 5 percent for exporters in products between US\$ 10 and US\$ 15 million, and 3 per cent for exporters in products 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 trade 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 did file a complaint, the subsidy would have disappeared. How to recreate it in a manner that is 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).

[Insert figure 4]

Figure 4 reveals some interesting facts. Subsidy amounts rose very quickly between 1991 and 1998, mainly because this was the period during which export discoveries exploded. They peak in 1998, as a consequence of the subsequent reduction in the 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 WTO, the amounts paid out fall off dramatically and become 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

$$RS_{i,t} = \left. \begin{array}{l} 0, \text{ for sectors/firms not receiving RS} \\ 1, \text{ for sectors/firms receiving RS} \end{array} \right\}$$

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, independent on whether a sector received the reintegro), and RS:

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

¹⁵ The uniform tariff was, by then, 6 percent. This explains the requirement of an important content of at least 50 percent.

The results of estimating this model are shown in table 8. One set of results uses the entire database, the other excluding 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, the exports from sectors that did receive RS grew more rapidly than sectors that did not. The effect is strongest during the 1991-1996 period, when, according to the different estimates that we use, 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.¹⁶

[Insert table 8]

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 estimate the growth of export value for each product-firm, and its matches, in the five five-year periods and test 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.

[Insert tables 9 and 10]

As can be seen in table 10, Model I yields the result that treated product-firms pairs, on average, increased their exports on average by 778 percent per five-year period. On the other hand, 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 3 times. However, the difference is significant only at the 5 percent level (one-tail test).

¹⁶ We also ran a similar exercise with volume data, obtained by deflating values by unit value indices for each category of products. The results were very similar.

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

III. Innova Chile, with special reference to the Business Innovation Programs

Innova Chile is CORFO's arm devoted to encourage innovation. It was set up as a special committee within the institution, with its own board, which has 21 members, seven each from the private sector, ministries, and CORFO itself. It runs six different types of 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 the support of the specific clusters identified in the NCIC's reports. CORFO innovation support can be classified in 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 Gerencia de Fomento 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 fully-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 per cent 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, now about 51 percent of all funds are awarded to priority clusters.¹⁷ 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 do evince 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 proven to have a 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 those involving consortia of firms and universities, involve applying technology to these sectors. Perhaps the only one that does not is in ICT area: the development of a router by YX Wireless, a firm that also benefited from the Innova gazelle firm project.

[Insert table 11]

It should be noted that Innova business innovation programs are not large. All together, the projects funded between 2000 and 2006 had a total cost of US\$ 16.5 million, hardly a large figure for a country that has placed its bets on innovation in the sectors in which it has a demonstrated comparative advantage.¹⁸

¹⁷ Interview with Claudio Maggi, Director of INNOVA.

¹⁸ The total sum mentioned refers only to those projects identified in CORFO (2007).

Part C. Vertical instruments

I. 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 devoted to 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 on 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 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. Most investments have been in the marine, forestry, and agribusiness sectors. These concentrate 88 percent of FCh's portfolio.

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 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. Most of its work is in the area of the natural resources that are abundant in Chile.

Initially, the emphasis of FCh operations was in sectors in which the country exhibited serious deficiencies, such as nutrition, food technology, and telecommunications; the most important objective was a social role, and its behavior was much like that of a government department. With time, it developed a market orientation. Its first endeavors were services and technical assistance in the production of vegetables and fruit. At the same time, FCh shrunk 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 charges for its services and on the resources of CORFO and CONICYT (Consejo Nacional de Investigación Científica y Tecnológica, 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 2000's it was the only institution practicing "industrial policy in the large", i.e. making strategic bets on new industries. One could also consider it a mechanism to explore the product space in search for 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).¹⁹ In fact, the decision to develop the production of cultivated salmon by FCh, culminating in the set up of Salmones Antártica in the location of Curaco 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 rose from nothing in 1980 to about US\$2.5 billion in 2008.²⁰

In a small and financially undeveloped country such as Chile, there is space for a public or semi-public venture capital firm.²¹ The private sector is just beginning to enter this segment of the capital market. There clearly is 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 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 indeed 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

¹⁹ 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.

²⁰ It should be noted that 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 haven't invested in protecting adequately the health of its products.

²¹ In fact, 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

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 have a clear cyclical behavior. Most of them are in tried and tested industries (construction, retailing, for example). At present, the major exit strategy for innovators is the direct sale of the business outside, many times to foreign investors. It is because of the difficulties involved in exiting successful ventures that since 1995 FCh has insisted in having partnerships 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 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.²² 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,²³ 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;
- a firm that issues bonds backed by forest development by small producers;

It also sells important services, such as quality certifications, environmental certifications (especially in forestry), and technology licensing (the salmon vaccines being a case in point). It also receives fees for bringing together firms and researchers for specific commercial ventures.

²² The story of the development of Chilean blueberry exports is told in Agosin and Bravo-Ortega (2007).

²³ Interview with Javier Duarte, head of enterprise development at FCh.

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 out ideas developed by its staff or in joint ventures with domestic and foreign universities. The first stage of operations consists in identifying an opportunity to add value to production by means of an innovation, which can consist of changes 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 setting up 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 in 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 through a variety of forms, 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; and (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.²⁴ 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 ten-year period. The project is still in the pipeline, but it is not being actively pursued at the present time.

²⁴ Interview with Marcelo Vásquez, Manager of New Business Projects and Marketing.

In addition, funding agencies such as CORFO and CONICYT normally do not provide funds in the scale and for the long 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 it funds for an endowment of US\$ 100 million, compared with its net worth today of about US\$ 50 million. In this way, the income from such an endowment would allow it to make strategic choices in developing products that require substantially larger resources than those available to it, and which have maturities that are much longer than those the Foundation can afford to undertake.²⁵

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 nineties. 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. This is the case of CENTEC, a firm producing furniture, which was sold in the mid nineties 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) went bankrupt because of management problems. But the social return has been very high. Something similar can be said about vacuum-packed meats.

FCh faces a fundamental trade off between, on the one hand, generating new products, services or processes that are privately profitable but which ensure its subsistence; and, on the other, 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 trade off have been already mentioned above. 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 in 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 ten-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 an a private-

²⁵ Interview with Eduardo Bitrán, President of the CNIC, and ex high executive in both CORFO and Fundación Chile.

sector orientation lead to lowered risk taking and emphasis on projects with shorter gestation periods.

These two trade-offs – 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 trade-off 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.

[Insert figure 5]

These observations and schematic form of presenting the activities of FCh do not mean 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.

II. FDI attraction in high technology

Beginning in 2000, CORFO launched its first program to attract foreign direct investment (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.²⁶ The program has three aspects. In the first place, an effort is made to promote the country as an attractive location for this type of investment. Chile does have 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 procedures, 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;

²⁶ The program is analyzed in Nelson (2007).

biotechnology and pharmaceutical products; and production of new materials. Since the publication of the white books of the National CNIC (discussed above), certain other sectors were 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 to which firms that invest a minimum of US\$ 500,000 may apply:

1. A subsidy to 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 beginning of operations;
3. A subsidy to the acquisition of land or buildings, not to exceed US\$ 2 million;
4. A subsidy to the rental cost of facilities for a maximum period of five years, which cannot exceed US\$ 1 million;²⁷
5. Subsidies to training programs, not to exceed US\$ 100,000;
6. Subsidies to 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 to the first year of employment of highly skilled workers in ICT ventures, with 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 annual approved budget has been of the order of US\$ 7 million, with a jump 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 Committee of Foreign Investments (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 may have been undertaken even without incentives.

[Insert figure 6]

²⁷ This subsidy is complementary to that on investments in land or buildings. Both together cannot exceed US\$ 2 million.

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, whose high-level 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 Government is constitutionally unable to grant tax incentives to individual firms.

The launching of the program coincided with the bust of the technology bubble in the United States and forced CORFO to re-evaluate its FDI attraction program. As a consequence, during the 2001-2004 period 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 and 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 was realized 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, particular in business competence in English. Through international bidding, CORFO has awarded a contract to train one thousand young people in business English, and is planning an additional such program for two thousand people in 2009. In terms of the classification of industrial policies that is being 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 did decide 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 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. CORFO officials aim at reaching by 2010 the total sum of US\$ 1 billion in exports since the inception of the program.²⁸ 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 of the order of US\$ 951 thousand, with feasibility studies being minimal (US\$25 thousand per firm). Since its inception in 2000, the program has generated 7,600 jobs.

[Insert table 12]

²⁸ Interview with Mario Castillo, the CORFO official in charge of running the program.

As of yet, there are no impact studies of the program, so that we are unable to say 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 precisely for its small budget. If so much has been done with so little, one can imagine that very significant results can be obtained with a more sizeable amount of 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 Euros 200 million, it had 25 offices around the world, compared to just four²⁹ in the case of the Chilean program, and a staff of 295 workers, compared with 7 in the case of the Chilean equivalent. The budget of the CORFO program (about US\$ 7 million per annum) surpassed that of its Costa Rican equivalent, CINDE, only in the three most recent years, 2006-2008 (see Nelson, 2007).

[Insert table 13]

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.

²⁹ In fact, the Chilean program had only one office manned by one person, in San José, 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, 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.

Part D. 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-term 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 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 exclusively on trade liberalization. Beginning in 1985, one of the policy tools deployed was the “reintegro 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. As already noted, one of the clusters that have indeed emerged over the past thirty years has been 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.

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 escalated 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 and that 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 ten 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.

Some of the conclusions of the study are as follows.

First, CORFO runs a myriad of 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 leaves 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 very 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 it from the need to justify its existence in the market place 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 raising substantially 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 notified as a subsidy to WTO. However, policy makers may be able to think of a subsidy to 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, also with a limit in terms of total product export value.³⁰

Sixth, it seems entirely sensible to insist on sectors that have already shown to have comparative advantage or to be able to develop on their own, which is the approach that is being pursued by policy makers in changing their emphasis from horizontal to vertical policies. The idea is to add technology and knowledge to the 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, 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 extremely 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 fluctuations. 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.

³⁰ We 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: “Reintegro simplificado” (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

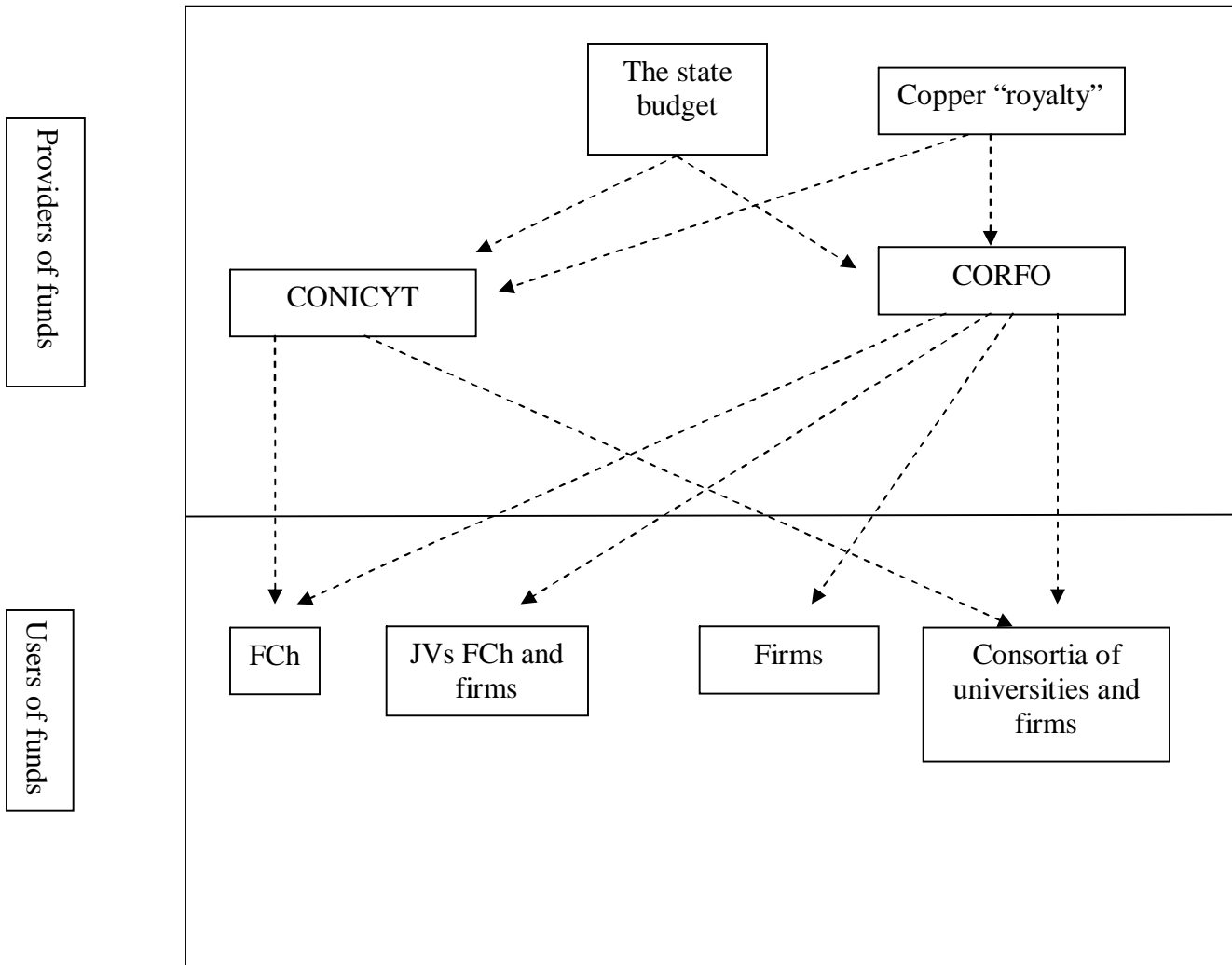


Table 2
A schematic view of CORFO programs

| 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.

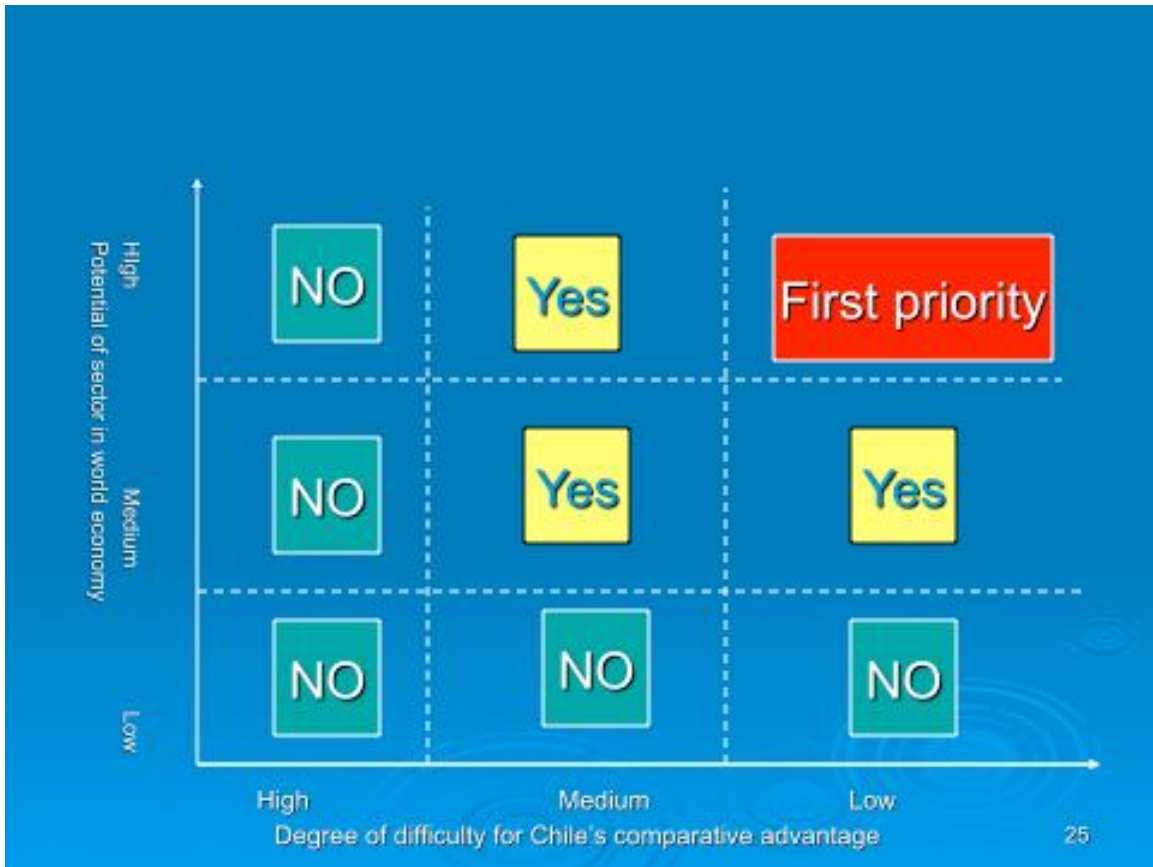
Table 3
CORFO subsidies and loans, 2006 and 2007
(million US\$)

| 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)

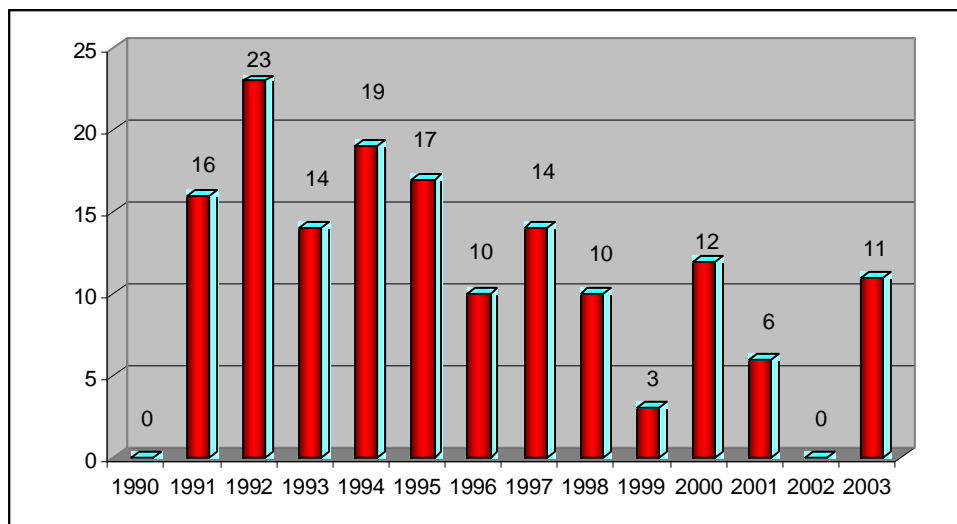
| | 1990 | 1997 | 2003 | 2007 |
|----------------------------|--------------|---------------|---------------|---------------|
| Copper | 45.0 | 36.2 | 31.6 | 51.5 |
| Other minerals | 9.7 | 7.6 | 5.6 | 6.0 |
| Fresh fruit | 10.0 | 9.2 | 10.6 | 5.6 |
| Wood, pulp, and paper | 10.6 | 11.9 | 12.7 | 8.9 |
| 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 |
| Polipropilene 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 mucilages and thickeners | 38.5 | 1991 |
| Data processing automatic machines | 33.5 | 1991 |
| Polipropilene in primary form | 32.9 | 2000 |
| Amonium nitrate | 32.2 | 2000 |
| Unalloyed iron bars | 32.0 | 1998 |
| Molybdate (of amonium 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 |
| Policarboxilic aromatic acids | 24.6 | 1994 |
| Seemless steel tubes | 23.1 | 1992 |
| Printed material for registry | 21.9 | 1991 |

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

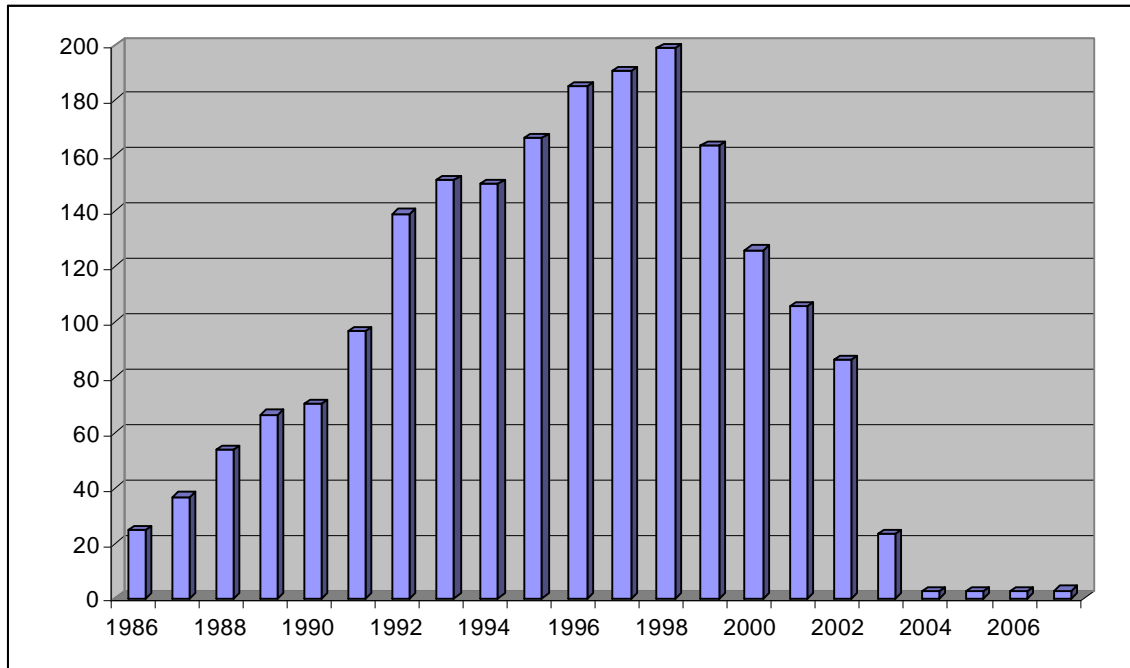
Note: An export "success" is defined as a product that exported less than US\$1 million in 1990, maintained exports above that figure after it crossed that threshold, and reached US\$20 million in 2007 or before.

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
Pseudo R2 = 0.2125

Log likelihood = -5086.1914

| 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)

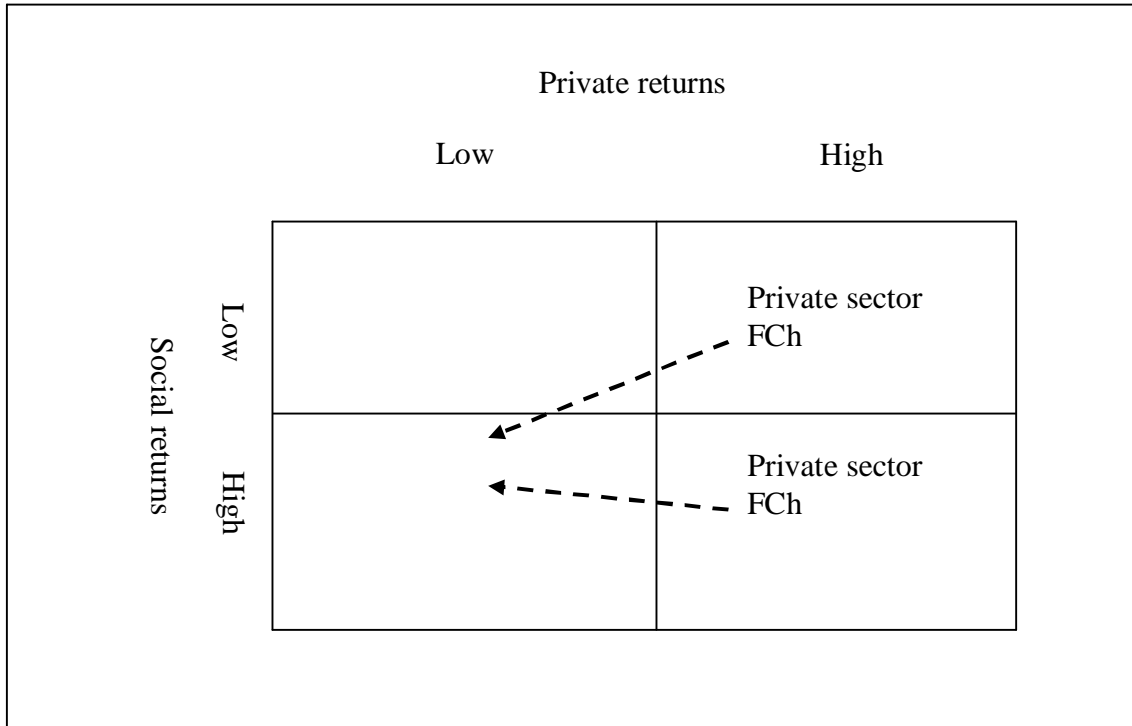
Analytical standard errors

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

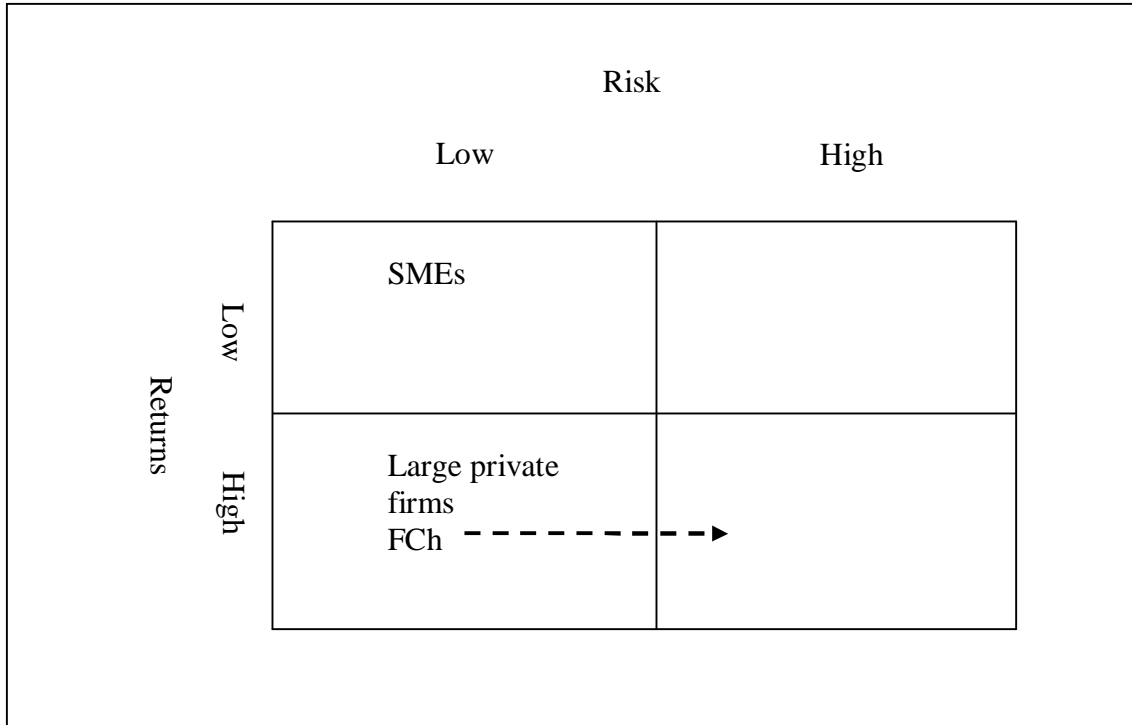
Note: the numbers of treated and controls refer to actual

Figure 5
Trade-offs facing Fundación Chile

A. Between private and social profitability



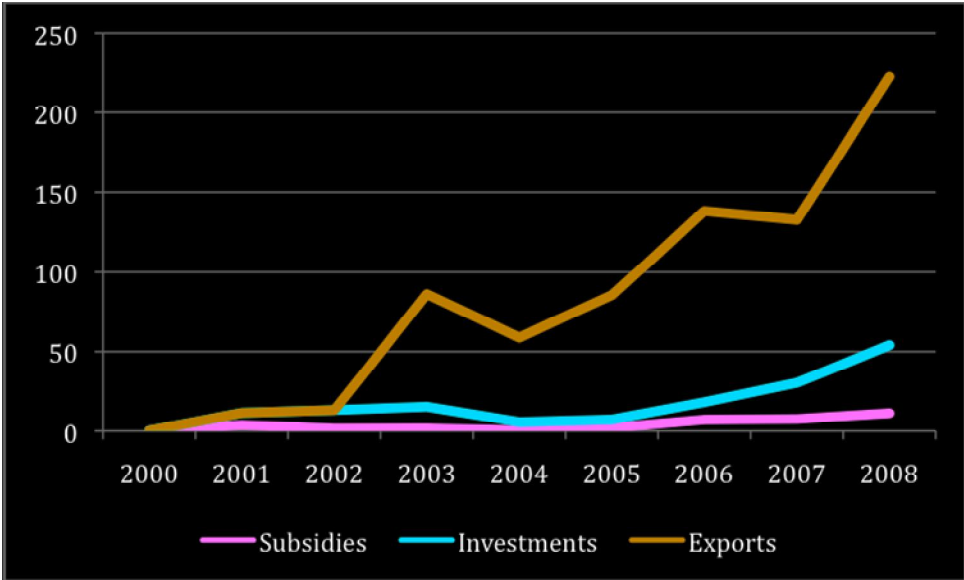
B. Between risk and return



| Table 11: Innova Chile business innovation projects A. Individual business innovation (figures in US\$) | | | | |
|--|--|----------------------------|--------------------|---------------|
| Project | Firm | Innova contribution | Cofinancing | 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 smolts 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 | Cofinancing | 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
(million US dollars)



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 program
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 | €59.6 million | US\$ 2.6 million |

Source: Belmar et al (2004).