

The role of CORFO in Chile's Development; Achievements and Challenges

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I. Introduction

CORFO (Corporación de Fomento de la Producción or Production Development Corporation) was created in 1939. In the initial period, it was an overarching and powerful institution that participated in the funding of over 30% of Chilean investment in equipment and machinery and 25% of public investment (Durán and Fermandois, 2011). Through many instruments, it played a key role in the process of Chilean economic development, including the creation of many key enterprises and playing an essential role in running these.

In later years, its relative scale diminished significantly, both in terms of the role it plays in promoting development, and the share that its operations have in relation to total credit to the private sector. In 2015, the financial support deployed by CORFO (through grants, credits and guarantees, see Table I) amounted to USD 2,863 million, which represents only 1% of Chile's GDP. As discussed below, guarantees granted by CORFO play now a much larger role than loans made by CORFO to banks, that on-lend to the private sector. It is noteworthy CORFO's credit to the private sector is not just relatively far smaller than it was in earlier periods in Chile, but is also

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significantly smaller in scale, compared to the size of the Chilean economy (as proportion of GDP), and to total domestic credit to the private sector, than national development banks in other countries, such as KfW in Germany, with a ratio of loan portfolio to GDP of 14.5% and to domestic private sector loans of 15.2%; BNDES in Brazil with 11.7% and 16.6% respectively or CDB in China with 12.2% and 9% respectively.

An important question to ask is whether the relatively small scale of resources, which CORFO provides at present, is sufficient at a time when Chile has to urgently make a major structural transformation of its economy, for 'smart' and higher productivity diversification, so as to achieve more dynamic, inclusive and sustainable growth. This urgent challenge is made clearer at a time when the rather sharp fall in the copper price in recent years has contributed to a major slowdown of Chile's economic growth, which shows the vulnerability of a model based on exports, mainly of primary commodities. There are more long-term structural challenges for future growth based on natural resources, which also make structural transformation urgent. These are linked to the physical and environmental limits in Chile for further natural resource development; they relate for example to scarcity of water (to produce one glass of wine requires an input of 100 litres of water!), limits of land to expand forestry, for wood, as well as paper and cellulose, and resource limits to production of salmon. Furthermore, very slow productivity growth in Chile makes it urgent to accelerate investment to enhance productivity growth and thus increase competitiveness of the Chilean economy.

Whilst the fairly deep Chilean banking and capital markets may have been relatively efficient in financing, at a relatively low cost, established enterprises and sectors, they may not be able or willing to take on the risks that financing new enterprises in new sectors, especially at sufficient maturities, that the current and future circumstances of Chile demand. Thus, funding ‘*mission-oriented investments*’ (Mazzucato & Penna, 2015), that could catalyse transformational impacts in the economy are essential and require the action of public financial institutions, such as CORFO, capable of channelling sufficient resources to strategic sectors with large positive externalities, such as renewable energy (see below). Such channelling of public resources would help catalyse additional private resources, which would co-finance such investments. Thinking of the new industrial revolution worldwide, Chile needs more and better investment in high-speed connectivity, such as a network of fibre optic; it also requires digitalization of agriculture to improve productivity. It may require large and lumpy finance for major projects, that are socially profitable; an example is a potential major investment in Chile’s smelting copper capacity, which could help the country move up the value chain in copper exports. Often such activities are not profitable in the short term, as there are major economic or environmental externalities; also large-scale investment, even if profitable in long term, may be difficult to fund purely with private finance.

An institution like CORFO could help provide and catalyse the necessary funding for such initiatives. In this sense, it seems important to both expand the scale of CORFO, and make sure the instruments it uses are appropriate for the current stage of Chilean development.

Fiscal resources are currently fairly constrained and seen to be constrained in Chile, (like in many other Latin American countries), as growth slowed down, and tighter fiscal policy is adopted. At the same time, there was a great emphasis in Chile on prioritizing the use of the limited fiscal resources to meet social needs (especially in education), with long-term development benefits. This, however, limits the scale of CORFO, which currently relies mainly on fiscal resources, for funding, as there are (or are perceived to be), relatively less fiscal resources for financing structural transformation, such as support for R&D, financing innovation in new companies and new sectors.

R&D is particularly key for natural resource-based economies, which reportedly need to invest more in relation to GDP than other economies to be successful; furthermore, R&D spending is fairly low in Chile, so support by institutions like CORFO in collaboration with other public and private institutions is very relevant.

It would seem therefore desirable to use CORFO for helping fund and catalyse further private funding towards such key activities. Given Chile's deep domestic capital markets, favourable access to international capital markets, as well as the fact it has investment grade credit rating, an interesting funding alternative for CORFO is to be authorized by the Finance Ministry to raise funds on the local capital markets. This is in many cases the most regular source of funding for other national development banks, such as KfW in Germany, the Business Development Corporation (BDC) in Canada and many others. Indeed, according to Martinez Luna and Vicente (2012), 89% of national development banks borrow from other financial institutions or issue

debt on local capital markets, so, it would seem appropriate for CORFO to do so as well.

This would mean public resources could be significantly leveraged, as the enlarged activities would be financed from the private capital market, and any public contribution would be related to relatively small increases of CORFO's capital, to comply with Basle capital requirements; the latter would be the only part which would go into calculations of the fiscal deficit, as for example KfW is reported to do. Therefore, there would be very limited impact on the fiscal deficit, and a potentially very large expansion of additional resources available for CORFO to increase its credits and guarantees with resources raised on the capital markets.

Reportedly, such a suggestion was made in the late 2000s by the then Vice-president of CORFO, for CORFO to issue bonds for USD 500 million to fund new credit lines for SMEs (interview material). However, the Finance Ministry preferred to increase the fiscal contribution to CORFO. As the precedent for such a proposal exists, and as CORFO is authorized to raise funding in this way once the Finance Ministry approves it, this should make it easy for CORFO to raise funds on capital markets.

Besides raising funds in national and international capital markets, CORFO could further increase its scale by additional funding from other development banks. It already does so successfully with institutions like CAF, Inter-American Development bank and KfW, and could do more; this could be further expanded to include institutions like the Chinese Development Bank, especially given the strong trade and investment links that Chile has with China, and with institutions like the European Investment Bank.

As detailed below, CORFO has been innovative in deploying a number of activities (such as supporting entrepreneurship, through innovative programs like Start-Up Chile), and supporting a variety of sectors. However, within the range of instruments it has used, it has given a decreasing role to credit, and an increased role to grants and, especially, guarantees. Though this may be a fairly common trend in some Latin American development banks, (e.g. NAFINSA in Mexico), it is different to the instruments used by highly successful banks like German KfW, which continue to use credits, mainly channelled through financial intermediaries, as a major instrument, especially for new sectors (such as renewable energy) and for SMEs; this is the case even though German capital and banking markets are more developed than the Chilean one.

Another key challenge that CORFO should support more is helping promote Chilean exports in new sectors, as well as help Chilean companies invest abroad , to encourage Chile´s long-term international competitiveness (going beyond sectors where Chilean firms have already successfully expanded abroad, such as retail and paper). This is an important new function of public development banks, which institutions like the Chinese Development Bank and BNDES have carried out.

Particularly, in this new phase of Chilean development, where economic diversification into new sectors is needed urgently, and where therefore initial risks and uncertainty may be far higher than in the past, it seems particularly urgent for CORFO to deploy a full battery of instruments, including especially credits, to support more innovative enterprises and sectors, as well as more generally SMEs, that

generate a high proportion of employment in the Chilean economy especially for loans of longer maturities, which private banks are less likely to grant. This will allow such companies to obtain sufficient credit, at sufficiently long maturities and at reasonable cost. Naturally, such an expansion of credit should be combined with continued use of currently deployed instruments, such as guarantees, grants and contributions to risk capital. The above-mentioned expansion of the scale of CORFO resources would thus facilitate not just an increase of the level of activity of the institution, but allow a more complete mix of instruments required to finance private enterprises, and support structural diversification.

In what follows, we first analyse briefly the history of CORFO, linking it to the needs of Chile's development model. Then, we outline the objectives that CORFO, is pursuing. Later, we describe the main features of CORFO today, as well as emphasizing its counter-cyclical role. Then, we describe and analyse the main programs and activities, which CORFO pursues currently. This is not easy, as CORFO developed a large number of instruments and activities; as we argue below, there may be a case for streamlining some of these instruments, making access to them simpler to users, as well as possibly putting greater focus on fewer priority sectors. We then analyse in some detail the role of CORFO in the development of solar energy in Chile, and in developing Start Up Chile. Finally, we conclude and draw policy implications.

II. Brief history of CORFO

CORFO has since 1939 till the present played very varied roles, being seen overall by Governments of different persuasions as an efficient instrument to serve their development objectives and strategies (Muñoz Goma, 2009).

CORFO was launched in 1939, which turned it into one of the first national development banks in Latin America, after México's Nafin in 1934. At the time, the needs of import substitution industrialisation (ISI) blended with the catastrophic consequences of the Chillán earthquake, set the stage for CORFO's creation. In the initial period, it was a large and influential institution that used to participate in the funding of over 30% of the investments in equipment and machinery and 18% of the gross capital formation. (Durán and Fermandois, opcit). Furthermore, CORFO created and played an important role in many of the key public enterprises, central to Chile's development. These included in the initial years the enterprise for electricity distribution (ENDESA), steel (CAP), sugar beet processing (IANSAs), oil (ENAP) and national airline (LAN). In the 1960s, it continued creating key enterprises, like telecommunications (ENTEL) and public TV (TVN) (Rivas, 2012). CORFO also supported the transition to a more export-oriented model, for example through financial backing to the forestry sector, that helped develop the paper and cellulose industry (personal experience).

In the Popular Unity government, CORFO played an important role in nationalizing enterprises, whereas during the military Government, it did the reverse, playing a key role in privatizing many companies. Also during the military government, CORFO

was forbidden from owning or creating State enterprises; it is interesting other national development banks, like KfW, still today own shares in public enterprises. During the 1982/3 debt and banking crisis, (that hit the Chilean economy especially hard), as well as more recently during the 2008/9 financial crisis, CORFO played an important counter-cyclical role, by increasing significantly its credit to private enterprises and guarantees for such credit to banks.

When democracy returned, CORFO was in a very weak financial position, with USD 1.6 billion of liabilities linked to the privatization process and over USD 700 million of impaired loans. There were then voices that raised the possibility of dissolving CORFO, but the view prevailed that CORFO should continue to play a key role in supporting private investment, for achieving productive development. CORFO managed to improve its financial position, and focus on its new tasks. Furthermore, its credibility was enhanced both by a series of independent evaluations of impact, as well as clear guidelines and challenges posed to CORFO by the Ministry of Economy (Rivas, 2012).

Following suggestions made by the World Bank, CORFO switched from giving credit directly to becoming a second tier institution providing credit and, increasingly, guarantees, through financial intermediaries. The shift towards reducing the role of credit, whilst increasing the role of guarantees and targeted grants accelerated since the Pinera Government.

Currently, CORFO implements long-term strategic goals determined by the National Council for Innovation and Competitiveness (CNIC), which advises the Executive

and Legislative branches of Government (Ministry of Economy, 2015). Several Ministers sit on the Board of CORFO. Thus CORFO is closely linked to the development aims of the Government, whilst having a close dialogue with the private sector.

III. Development Strategy in Chile and the role of CORFO

The legacy of privatization during the military regime and of unpaid debts to the institution relegated CORFO mostly to tasks related to financial management in the early 1990s. The inherited difficult financial situation required efforts directed towards a solution. Thus, CORFO's historical role was pushed into the background of its activities for a time.

With the return of democracy, a debate regarding the appropriateness of CORFO's continuation started. Within the political and academic sphere, questioning of the very idea of economic intervention through industrial policies had become quite widespread. However, the prevailing stance suggested that even within a market economy, there are important market imperfections and failures, which can undermine productivity and overall growth. These market failures and imperfections together with some (then weak) concern about need for structural diversification of the Chilean economy, justified policy interventions, looking to correct market imperfections.

The most decisive step towards confirmation of the need of a policy agenda for productive development was designing new instruments of CORFO, as well as their impact evaluation, the latter especially important in relation to their justification in relation to the Finance Ministry.

Subsequently, with the creation of The National Council of Innovation and Competitiveness, more ambitious progress was made in terms of the need of directing

efforts at the sectorial level. A study by the *Boston Consulting Group* proposed eleven sectors as priority: Aquaculture, Functional Foods, Fruit Farming, Mining, Pig and Poultry Farming, Global Services, Special Interest Tourism, Logistics and Transportation, Wideband and Financial Services. Five clusters were chosen by a committee of ministers to propose a policy design to boost each industry.

In recent times, CORFO and the Ministry of Economy launched the Strategic Program of Smart Specialization (SPSS), Transform Program: *'The Transform Program aims to improve competitiveness of our economy through the development of eleven strategic sectors'*. This phrase commits to the implementation of productive development policies. This path has already started with the previous proposal of The National Council of Innovation and Competitiveness.

'Chile needs to change in productive structure – production and export of goods based not only in natural resources – and to advance towards a more sophisticated economy, specialized, diverse and innovative, which allows to create a new national productive baseline'. Productive sectors chosen for the SPSS are High-Grade Mining, Tourism, Healthy Foods, Building Industry, Fishing and Aquaculture, Solar Industry, Logistics for Exports, Smart Industries, Creative Economy, Advanced Manufacture and Technologies and Health Services.

During 2014, the Productivity, Innovation and Growth Agenda was launched, which aims to overcome obstacles regarding increasing productivity of the economy. A Fund for Strategic Investments (FSI) was created to finance initiatives aiming to

improve productivity and productive diversification. Amongst the funded projects are the SPSS from the Transform Program (Comisión Nacional de Productividad, 2014). Priority sectors for the FSI are Fishing and Sustainable Aquaculture, Sustainable Tourism, Solar Industry, Logistics, Sustainable Building Industry, Advanced Manufactory, Smart Industry, Creative Industry, Services and Health Technologies, High-Grade Mining and Healthy Foods.

The previous paragraphs show clearly which sectors Chile is looking to promote; in this way, the Chilean productive development strategy is set. However, different government entities play a role in the productive transformation of the country, often with their own policy agenda, and are not fully coordinated, nor with the private sector. It is important to coordinate better and in a strategic way at the institutional level to develop and implement a productive development strategy.

IV. CORFO and its institutional relationship with the Government

CORFO depends from the Ministry of Economy, and is led by a governing board chaired by the Minister. The Vice-president of the Board, also the Executive Vice-President of CORFO is appointed by the President of the Republic. Moreover, this Board includes the Ministers of Foreign Affairs, Finance, Social Development and Agriculture.

Until 2006, the relationship between CORFO and the government was focused on the composition of the board and the reach of the instruments and programs, involving the participation of other ministries. The creation of the National Innovation and Competitiveness Council established a new institutional design for supporting the proposed national strategy (Rivas, 2012). Within this strategy, CORFO has a defined role, and thus, it is possible to identify more clearly the relationships with other government institutions.

The National Council of Innovation and Competitiveness objective, apart from establishing the long-term strategic guidelines for the policy, is to propose ideas for the use of the Innovation and Competitiveness Fund (ICF), funded by income from the royalty paid by the mining sector. ICF works as a financial implementation entity for CORFO and CONICYT, the latter, as a branch of the Ministry of Education, specializes in tasks related to science, technology and production of human capital.

There is also the Committee of Ministers for Innovation, whose executive secretariat is headed by the Ministry of Economy. The Innovation Department of the Ministry of Economy is in charge of the coordination of the several public entities related to the programs defined by the Innovation Policy.

The national system of innovation has established the strategic definition given by the National Council of Innovation and Competitiveness and the Committee of Ministers for Innovation.

Besides the focus of the just detailed innovation strategy, there is the *Productivity Agenda for Innovation and Growth*, with a more short and medium-term scope of action. The relationship between CORFO and the Agenda occurs through the Strategic Inversion Fund, which finances CORFO programs aligned with the objectives proposed for the Agenda.

Even so, CORFO is committed to policies and instruments that go beyond the national system of innovation. A big percentage of their programs are own-initiatives funded mainly by the allocated public budget.

The national system of innovation establishes networks that only respond to one part of the productive development policy of the country. It is necessary to expand the institutional organization towards all spheres of action of public policies working on productive transformation, search for innovation and promotion of competitiveness, with the aim of coordinating efficiently all of the efforts and available resources in order to maximize the impact on the economy.

V. CORFO today

In 2015 CORFO had total assets worth USD 6,272 million, which represent 2.6% of Chile's GDP. When analysing its composition, we can note that in 2015, the financial support deployed by CORFO (through grants, credits and guarantees, see Table I) amounted to USD 2,863 million, which represents only 1.2% of Chile's GDP. This makes CORFO significantly smaller, in scale, than national development banks in other countries, such as KfW, CDB and BNDES.

Table I:

Financial Support (million USD)	2010	2011	2012	2013	2014	2015	2016
Subsidies	194.54	181.89	194.68	199.61	304.96	332.94	332.17
Guarantees	1,219.59	2,277.88	2,541.56	3,414.83	2,729.42	2,360.37	2,457.36
Loans	508.34	192.97	166.41	104.08	80.13	61.07	74.35
TOTAL	1,922.47	2,652.74	2,902.65	3,718.52	3,114.50	2,754.38	2,863.88

* million USD

As pointed out, CORFO's main financial support to the private sector has in recent years not been pursued through loans, which only amounted to USD 74 million in 2016, but through loan guarantees to financial institutions. By 2016 the guarantee stock level was USD 2,467 million. Indeed, CORFO's guarantees in terms of GDP, is one of the highest for any equivalent granted by a public institution in Latin America. Given the importance of guarantees in CORFO's current activities, we focus more below on this instrument.

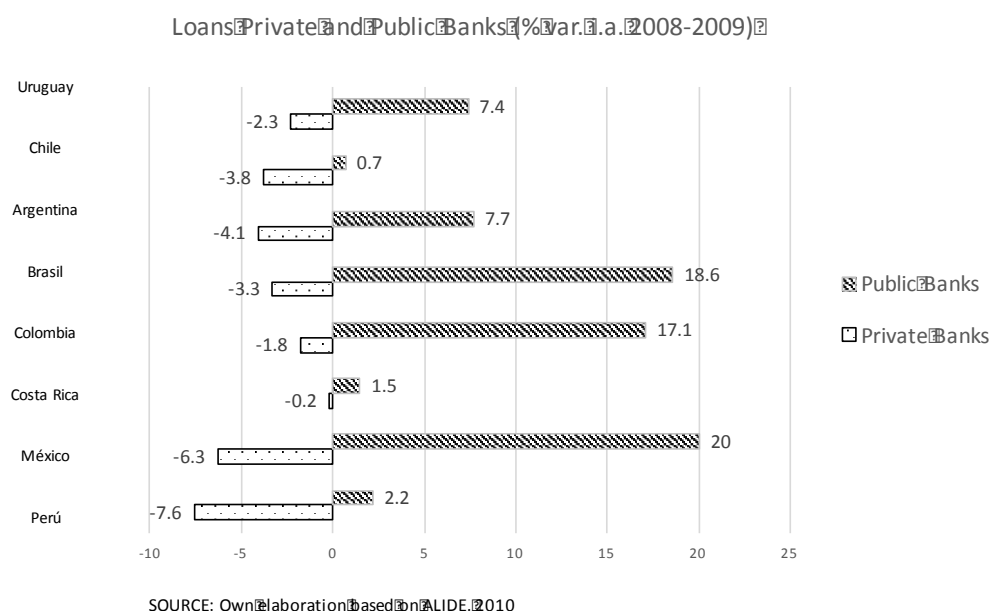
It seems useful to point out here, that there is a perception among many observers and users of CORFO's resources, that CORFO seems to have too many priority sectors and too many instruments. As one observer commented, '*for every problem, there is a separate instrument*' (Interview material). Reportedly, also users find procedures for application for resources in some programs unclear and cumbersome, sometimes even discouraging them from applying, or requiring major transaction costs for such applications. There are exceptions, and some programs -including guarantees- are reported by users to operate in a fairly agile way. Streamlining of priority sectors and of instruments, and simplification and transparency of procedures for application, may be a valuable and high priority task to increase CORFO effectiveness.

VI. CORFO's Countercyclical Role

The role that governments should have in the financial system has been much debated. Some authors were negative about the role of public development banks as growth catalysers, basing their critique on their political favouritism and corruption, as well as efficient private financial markets arguments (La Porta, 2002; Sapienza, 2004). During the 1980s and 1990s public banks received severe critiques from neo-classical economists who argued that what they called 'financial repression' was inefficient. Thus, in regions such as Latin America, where 65% of the banks used to be publicly owned during the 1970s, went through massive privatizations in the 1990s, and by mid 1990s only 40% remained state-owned (Micco & Bank, 2005). Nonetheless, in the aftermath of the 2008-2009 financial crisis, the previous trend was reversed in many emerging and developed economies (Culpeper, 2012). In European economies, both national development banks were either expanded or even created, as well as the regional development bank, the European Investment Bank, being given a far bigger role since the 2008/9 crisis (Griffith-Jones and Cozzi, 2016).

In many Latin American economies, public banks' operations surged due to the counter-cyclical lending they deployed after the crisis, while private banks' lending shrunk (Figure I). Empirical evidence has been collected by authors such as Bertay, Demirgüç-Kunt, & Huizinga (2015:327), who studied more than 1,600 banks in both emerging and developed economies and found that '*...state banks can play a useful role in stabilizing credit over the business cycle as well as during periods of financial instability.*' Furthermore, Schlarek et al, in this volume, provide empirical evidence for how counter-cyclical public development banks have been.

FIGURE I:



In the case of Chile, Banco del Estado, the public bank that lends directly to small businesses, increased its loans sharply, while private loans plummeted. Ribeiro de Mendonça, Ana Rosa & Sibin (2008) show how Banco del Estado increased its corporate loans by 32% in 2009, while others shrunk more than 7%. At the time, Banco del Estado also encouraged the construction sector by reducing mortgages interest rates. This was part of a more general anti-cyclical policy encouraged by the national government, which, in the wake of the international financial crisis, increased its fiscal expenditure by 15% in a clear counter-cyclical move.

Chile's previous adoption of the so-called Cyclically Adjusted Balance (CAB) rule, compels the government to follow spending targets that enable the deployment of general counter-cyclical fiscal policies, which is very positive. However, authors such

as French-Davis (2010) argue that it was only during the 2008/9 global financial crisis that the fiscal rule operated in a really counter-cyclical manner, which should become the general case. Instead, he regards the general Chilean rule as more ‘cyclically-neutral’ and not sufficiently counter-cyclical, though superior to the pro-cyclical nature of private finance, both domestically and internationally.

It is important to stress, in the context of this paper, that CORFO, whose funding sources are to an important extent provided by the Chilean Finance Ministry, also expanded its programs counter-cyclically. This is clearly illustrated when examining CORFO’s annual budgets, which almost doubled from 2008 to 2009. CORFO provided liquidity to the financial market by injecting additional USD 850 million in 2008, which intended to leverage USD 1,800 million. Out of this figure, most of the money was targeted to long-term investments (USD 500 million), but short-term lending had also been supported. Ensuring solid payment chains across the different sectors is of the upmost importance in crisis settings. Thus, CORFO tendered USD 300 million to support working capital through the banking system and using factoring mechanisms, that could target the usually unattended smaller firms.

Apart from providing liquidity to the financial system, CORFO also made more flexible most of its guarantee schemes’ requirements and increased its limits to expand its reach (ALIDE, 2009). Overall, between 2007 and 2011, Hermann (2014) shows that CORFO increased seven times the guarantees for SMEs. This partly reflected the shift of preference for the guarantee instrument, but also had an important counter-cyclical aim.

Along with the general countercyclical stimulus implemented by national governments in Latin America, national development banks had a crucial role to support the economy, when private lending fell (ALIDE, 2009 ; Griffith-Jones et al in this volume). It is also important to notice that the counter-cyclical role of national development banks is complemented by the important counter-cyclical role that regional and multilateral development banks play; this was very clearly the case of CAF and IADB lending to Latin American countries, in the wake of the 2008/9 crisis.

VII. Areas of Activity

In terms of areas of activity, CORFO has three focal areas: productive diversification, support to innovation and entrepreneurship and foreign and national investment promotion (CORFO, 2016).

a. Structural Transformation and economic diversification

The Total Factor Productivity (TFP) growth rate in Chile dropped from an average of 2.4% in the 1990s to 0.5% in the 2000s, situation that becomes even gloomier when considering Manufacturing TFP. In addition, the export sophistication index significantly decreased during the last years (Bitran, 2016). These figures illustrate that Chile needs to develop dynamic competitive advantages and achieve structural transformation, by greater and ‘smarter’ diversification. The need for such a strategy received increased support, in the last few years, especially by the Bachelet Government; the urgency of both increasing productivity and diversifying the Chilean economy has been made clear by the sharp fall in copper prices and the apparent end of the ‘commodities super-cycle’.

CORFO is seen by the Chilean Government, as a valuable policy instrument, that should play a key role in the coordination of private companies, catalysing appropriate finance to them and identifying market gaps, as well as opportunities. Furthermore, far higher priority than in the past is given to the task of diversification of the Chilean economy, and especially of exports. In this context, the Chilean government launched in 2014 the program ‘*Chile Transforms*’, where CORFO is

responsible for 37 '*Strategic Schemes of Intelligent Specialization*' and grants support, including subsidies to 10 sectors, selected as engines for development: advanced manufacturing and mining, solar energy (see Green Policy section below), food, tourism, fishery and aquaculture, intelligent industries, construction, logistics and creative economy.

The main goal of this tool is to try to diversify Chile's productive structure, moving from an economy exclusively based on natural resources, to a more complex, knowledge intensive and competitive one. For example, in 2013 CORFO launched a financial program called '*Engineering 2030*' to help diversify Chile's economy and scale up to a more knowledge intensive economy. The scheme consists of subsidies to Chilean universities that aspire to transform their educational program in engineering, focusing on key areas (health and sustainability) that could trigger international competitiveness across several productive sectors. (Interview material). With the same developmental purpose, complementary subsidy lines are given to the '*Strategic Nodes*', which aim to engage entrepreneurs and SMEs among themselves, to foster collaboration in areas of mutual interest. The type of nodes covered are related to public and private coordination failures and include market information, quality control or improving standards for suppliers; the project is presented by an intermediary consultant that deploys the program. An important difficulty of using nodes is the risk of capture by consultants, which can be minimized by filtering demands by companies requiring these services. (Interview material).

Also, initiatives such as PROFO (Programa de Proyectos Asociativos de Fomento), aim to enhance firms' associativity and grouping for common tasks to gain

competitiveness in both internal and external markets. This program was inspired by similar initiatives in Spain and Italy of supporting clusters; its success is illustrated by the example of small wine makers, who used to sell to larger producers, but decided to associate amongst themselves, to improve market access by constituting their own brand (Rivas, 2012). In a similar way, the PDP scheme (Programa de Desarrollo de Proveedores) provides subsidies to stimulate local value chains and co-finances the development and improved quality of local providers. Overall, the financial support to encourage competitiveness, through these different programs amounted to USD 60.2 million to 24,963 beneficiaries through 1,473 projects, in 2015.

b. Innovation and Entrepreneurship

Leapfrogging into higher value-added activities in Chile entails taking full advantage of previous productive capabilities and enhancing them through creation and diffusion of new technological opportunities. However, the reverse trend seems to have been taking place in Chile during the last decades, when the percentage of innovative firms plummeted from 37.9% in 2004 to 16.6% in 2014 and expenditure in R&D lagged behind many countries, at only 0.39% of GDP (Bitran, op cit). To tackle this obstacle, and in consideration of the constraints that uncertain innovative projects and start-ups with no track record face, an important part of CORFO's programs rightly focus on this area, where externalities and high risk investment play such an important role.

According to a report by the Chilean Ministry of Economy, Chile is positioned among the top 20 entrepreneurship ecosystems in the world and first in Latin America, creating more than 200 new dynamic firms per year (Ministry of Economy, 2015).

The main CORFO programs to support entrepreneurs are *'Seed Capital'*, which had applications from over 5,200 firms and granted to 118 of them for over USD 4 million in 2015; *'Start Up Chile'*, further detailed below, and the *'Scheme for Regional Entrepreneurship and Innovation'* with more than 250 applicants and over USD 2,5 million granted to 80 projects. The budget for financial support to innovation exceeded USD 60 million in 2015, which entailed a 98% increase with respect to the average in 2010-2013. These programs include interesting instruments, such as tax exemptions for R&D, given to private companies. A significant 80% of the 680 approved projects were from SMEs. Also, CORFO stimulates the creation of technology centres and technology transfer programs, that in 2015 had received support for over USD 33 million. The above-mentioned schemes are in large proportion given as subsidies, granted through public tenders. Subsidies disbursed by CORFO in 2016 totalled over USD 330 million (Table I).

Part of the explanation given for a structure of instruments that gives priority to guarantees and grants, is that, overall, there is much funding available in Chilean private markets, allegedly for relatively long maturities at relatively low costs for established companies. Loans by CORFO to commercial banks for on-lending are allegedly seen to be less necessary than in other Latin American countries. This seems, however, not to be the case for innovative enterprises and start-ups, due to uncertainty, typical of new activities and enterprises, which often do not have tangible guarantees; nor is it clear long maturity loans are available in the case of SME's projects .

The fact that such high priority is being given to sectorial diversification, which implies going into new sectors where uncertainty and externalities are higher, as well as the need for Chilean companies to invest abroad in new sectors, implies private banking and capital markets on their own may not be up to the task, especially in providing long-term finance to new sectors, as well as to new enterprises, and start-ups.

Acknowledging this funding gap, CORFO, since 1999, offers long-term resources to expand the role of Risk Capital Funds which aim to catalyse innovative firms, both during early and growth stages. Up to 2016, the historical investments amounted to USD 630 million in 43 funds and 194 beneficiaries, which, in its vast majority were SMEs in the Information, Technology and Communications (ICT) sector. (Interview material).

Furthermore, there are gaps in the Chilean non-banking financial intermediaries, such as for cooperative financial institutions, leasing and factoring companies; CORFO is developing initiatives for supporting those latter institutions development. Often the issue with the funding that these institutions are able to provide relate not so much to amounts granted, but to the conditions (of cost and especially maturity). Furthermore, these financial institutions need both financial support and technical assistance, which CORFO is providing in its new initiative, funded by KfW. Also, the banking system is fairly concentrated in Chile, which can lead to excessive spreads on borrowing, and very high return on equity of banks.(Interview material). CORFO and other institutions are designing measures to deal with these market gaps and imperfections.

c. Foreign and National Investment Promotion

CORFO works in cooperation with the Council of Foreign Investments, to attract foreign capital to the Chilean market. Also, CORFO encourages local investments by granting loan guarantees, by financing Reciprocal Guarantee Institutions (IGR) and operating through financial institutions.

The guarantee mechanism consists of ten different programs, being the main three: FOGAIN, by far the largest scheme, which represented 93% of CORFO's guarantees transactions in 2016, and covers long-term investments and working capital. Other interesting programs are COBEX, which covers export operations and PROINVESTMENT, a new program that represents only 3% of the guarantee portfolio and encourages long-term investments of larger firms. Apart from that, CORFO also provides financial support to Chilean Institutions of Mutual Guarantee, namely IGRs.

The IGR system was born in Europe and diffused in some Latin American countries since the 1990s. In Chile, the IGR fund was established in 2007 and its norms have been designed by CORFO, which can leverage up to ten times private investments. However, its size has always been modest, covering only 2% of the issued guarantees from 2010 till 2016.

CORFO's main area of intervention is now guarantees. However, this focus has only been stressed since March 2010, when FOGAIN and IGR's systems had been reformulated by CORFO. In its origins, public guarantees were mainly issued by

FOGAPE (Fondo de Garantía para el Pequeño Empresario), a government fund launched in 1982. Up until 2011, FOGAPE was still the main protagonist in the public guarantees landscape, much ahead of the IGR system and CORFO. For instance, in 2010 its number of transactions amounted to 76,171, while IGRs' only were 1,522 and CORFO's were 4,484. However, by 2013 FOGAPE's activity dropped by 36% while CORFO's surged by almost 2,000%, to more than 93,000 guarantees. It is noticeable, though, that apart from taking the lead in the guarantee system, CORFO's intervention enabled a general increase to a wider range of beneficiaries. This is because, unlike FOGAPE, which only supported small and micro enterprises, CORFO reached medium firms (Hermann, 2014).

It is noteworthy that, at the same time, in 2011, the credit lines managed by CORFO sharply fell, dropping 62% in only one year. In the period, between 2010 and 2014, value of loans fell even more dramatically by 84%, with some fairly minor recovery in 2016 (Table1). In 2011 and in following years, many medium and long-term credit lines for SMEs ceased to exist, which partly explains the sharp fall in the level of loans (Interview material). This structural shift in CORFO away from loans that occurred during President Piñera's government, is attributed by some observers to the belief that public financial institutions should not crowd out private banking, but, instead, cover the private banking sector risks, by guaranteeing its loans.

VIII. Relevant programs of CORFO today

a. Impact of guarantee programs

An interesting question is why guarantees, rather than credits have been far more used by CORFO in recent years, trend that seemed to become particularly marked during President Piñera's 2010-2014 government, despite it being continued in later years. Though guarantees are clearly a valuable instrument, especially for providing access to companies without sufficient physical assets to offer as collateral (eg those who have mainly intangible assets, like an innovative idea), and can allow for additional leverage of CORFO's capital, guarantees need to often be complemented by other instruments, such as credits and subsidies.

The emphasis on guarantees seems to be based on the idea that banking and capital markets are deeply developed in Chile, which is true. However, this line would also argue guarantees are sufficient to encourage additional private finance to previously excluded SMEs and credit by institutions like CORFO may 'crowd out' private finance. This is certainly not true for financing in sectors where there is much uncertainty, where economic, social and environmental externalities are not privately internalized and where there is need for patient capital (e.g. new strategic sectors that demand high initial investments, innovative companies, etc.), in sectors or activities in which private finance is unwilling to take the risks, especially on its own.

Furthermore, the problem with guarantees is that -though profits from the loans will go to the private financiers, the risks or at least those portions covered by the guarantees-, will be assumed by the public sector. This asymmetry may be

problematic, as it may result in large contingent liabilities for CORFO. In this sense, it is important that enough provisions are made up front; CORFO seems to have been prudent in this aspect by restricting the scale of its leverage well below the limits established in its regulations. It is a source of some concern that CORFO's guarantee programs, which have been scaled up so much, have only partly been evaluated; however, as discussed immediately below, the evaluation of FOGAIN, which represents the largest guarantee mechanism, has shown positive results, especially in terms of broadening financial inclusion.

Indeed, the FOGAIN scheme was evaluated in 2013 by qualitative interviews, where 84% respondents declared to have received a positive impact from using the scheme, being 40% in terms of productivity, 16% in terms of increased sales, 13% of profit and 5% of employees. Furthermore, the scheme enabled the financial inclusion of previously excluded companies, which amount to 15% of the total.

The impact of guarantee granting is allegedly large, as the funds are allowed to extend collateral for up to eight times its value, implying high leverage. The lack of adequate collateral is one of the most severe limitations to finance long-term projects in Chile. In many cases, traditional banks demand real assets that duplicate the loan's value, in order to cover any potential unpaid interests or associated expenses. Thus, many firms, especially SMEs, that intend to pursue investments to increase their productive capabilities or efficiency, cannot access such funding, unless they are provided with guarantees, where CORFO plays a key role. Though the guarantee instruments have been successful in helping leverage additional credit, reportedly they have been less successful in lowering its cost. (Interview material).

b. Start-Up Chile

The National Innovation Policy, designed by the Innovation Department of the Ministry of Economy, had as main aim the promotion of entrepreneurship and innovation for the achievement of the objectives from the productive development strategy. The plan granted great importance to the establishment of an ‘innovation and entrepreneurship ecosystem’, creating the *Start-up* program, a competition for global entrepreneurs, offering rewards to entrepreneurial initiatives with high potential in Chile.

Participants in the program have to develop their projects with minimal financial resources (bootstrap), within a six-month deadline. The grants reached up to USD 40,000 USD for *Seed Capital* and a year work visa. The pilot plan was carried out by Innova Chile with 22 start-up projects, successfully finished during the testing phase. Then the program was officially implemented.

Since mid-2011, more than 10 generations with around a hundred projects have gone through *Start-Up*. Throughout the years, modifications have been made in terms of benefits and requirements. Currently, *Start-Up* offers a 90% of the total program cost funding (with a maximum of USD 40,000 USD) per project. Beneficiaries should contribute with a 10% of the expenses. There is an additional prize of USD 20,000 for carrying out the projects in regions outside the capital and for Chilean repatriated students with postgraduate degrees obtained in the best 150 universities from all over

the world. Finally, successfully completed projects can apply for a second stage of funding, reaching up to USD 120,000.

Within the institutional framework of the national system of innovation, the impact evaluation of the instruments and programs is a key element. In 2015, the Ministry of Economy hired an outside consultant to evaluate *Start-Up*. The main objective was to evaluate specific results from the program, as well as evaluating the aggregate impact on the economy.

For the evaluation, four objectives of the program were identified: i) World class entrepreneurs develop companies in Chile with global potential, (attraction/retention) ii) Local entrepreneurs develop knowledge, skills and networks iii) Other participants of the Chilean entrepreneur ecosystem improve access to information and become more open to innovate and become more entrepreneurial, and iv) International community related to innovation and entrepreneurship improves their perception regarding the Chilean ecosystem. (Verde, 2016)

The first nine generations of beneficiaries were evaluated, involving 785 projects. The methodology included surveys of project leaders and interviews of participants from the national entrepreneurship ecosystem, considering intermediate and final variables. Results show that the program did have a positive impact for raising capital and in the amount of capital raised. However, the program did not have a statistically meaningful impact for the projects in term of: continuity of the start-up, sales (total value and growth), profits, exports, level of employment, later support from business

incubators and accelerators and number of subsequent entrepreneurships from the project leader.

Finally, the evaluation makes a series of suggestions, including to define as the main purpose, that entrepreneurs of world level have to develop in Chile, Start Ups with high global potential, (recommendation, which has started to be implemented), as well as prioritizing criteria related to the potential of entrepreneurship and its permanence in the country, and incorporation of specialization alternatives for the program, by market or technology.

The evaluation carried out by *Verde* clearly has value regarding the understanding of Start-Up impact on the economy. However, even when having evaluation reports on the impact of the project is key in order to test effectiveness of instruments, it is necessary to interpret the results within the context of the limitations of the methodology used, in order to determine the limits of the value of the evaluation.

The high reputation of the Start-Up Chile project is clear, with many acknowledgments in national and international press and publications by important international organizations, such as the OECD Development Center (OECD, 2016), which concluded that Start-Up programs reveal a different, more dynamic side to the Latin American region, and to Chile, specifically. According to OECD (2016) '*Start Up Chile media impact has helped make Chile a talking point around the world and inspired young people to become entrepreneurs*'. Besides, Start Up Chile has been an example for the creation of similar initiatives to establish favorable environments for startups in other countries of the region (www.startupchile.org). Engineering projects,

3D educational projects, applications to facilitate communication with suppliers, and others which offer digital books to children represent the range of entrepreneurs that have successfully gone through the program.

At the end of 2015, the family of start-ups in Chile included 1 unicorn (Start up of at least USD 1 billion), 4 centaurs (with a valuation of between USD 100 million and USD 1 billion), and 31 little ponies (with a valuation of between USD 10 and USD 100 million). This is one of the most positive situations in the Latin American region, and is even comparable in scale to Singapore, one of the vanguard countries in terms of entrepreneurship, which has 2 unicorns, 12 centaurs and 27 little ponies (OECD, op cit).

General perceptions inside the Chilean innovation ecosystem are positive, particularly due to the way in which the program is conceived, with the identification and project selection, and the international positioning of Chile within the startup field ((Rivas, 2012). To consider the overall impact of the program, from a broader economic point of view (value generation, quality employment, productive diversification and sophistication) is complex, but there have been positive individual results from the projects, and the perceptions about the program portray a favorable picture regarding the impact in Chile. Specific problems, such as excessive concentration in the capital, are seemingly being corrected, with special emphasis on encouraging Start Ups in different regions.

One of the benefits of the CORFO Start Up program, which has its own dedicated Division in CORFO, is that it has encouraged that the policy mix to support these

companies has been modernized, improved and broadened in Chile. For example, relevant regulations have been simplified, by a new law, which allows people to start a new business in a single day. Furthermore, available financing has been broadened to support the different phases of the projects. CORFO, the rest of the Government, the private sector and Universities seem to be collaborating effectively to support creation of Start Ups, that will hopefully contribute to greater technological sophistication and diversification of the Chilean economy.

IX. Green industrial policy: the case of solar power in Chile.

Designing an effective strategy for development is still a matter for debate. Many mainstream scholars allege that the State should not build capabilities and steer resources to specific sectors because they tend to ‘pick losers’, creating inefficiencies. More heterodox economists, such as Chang (2002), show that now developed countries that had applied highly interventionist policies to leap in development are now ‘*kicking away the ladder*’ to prevent emerging countries from climbing a few rungs. Some authors may claim that boosting a global green growth strategy to reduce carbon emissions could hamper developing countries’ possibilities to follow the Global North countries’ growth path. However, there is growing consensus, that green-growth could act as a job creating, inclusive, developmental strategy, if correctly encouraged.

According to Carlota Perez (in Mazzucato & Jacobs, 2016), the next techno-economic paradigm could take a green direction, due to green projects’ innovative potential, ability to transform linked industries and renovate societal consumption habits. Thus, developing countries seeking to take advantage of this new ‘*window of opportunity*’ in development (Perez, 2010), should build capabilities around these technologies. Latin American countries, such as Chile, highly endowed with natural resources, could use them as a platform for development. Renewable Energy Technologies (RET), such as solar energy, on which we focus, have the potential to catalyse inclusive growth and sustainable development for various reasons.

Firstly, in Chile, diversifying the energy matrix through the incorporation of Renewable Energy Sources (RES) was necessary to gain more self-sufficiency and stability in energy provision. During the 1990s Chile's energy generation was based on large hydroelectric projects, insufficient when demand increased and droughts turned more frequent. The country imported gas from Argentina and invested in combined-cycle power stations. However, since the mid-2000s, Argentina stopped providing gas at a convenient price and Chile suffered provision shortages (Nasirov & Silva, 2014). In 2008, Chile, seeking to diversify the energy matrix, launched its Renewable Energy Policy (NCRE). The law established a 10% target for 2024. However, the NCRE policy was so successful that, in 2012, Chile had already met a 7% target. In 2013, a new target of 20% was set for 2025. Stabilizing the energy supply by developing RES had a huge impact on individual and industrial consumers, who accessed energy without interruptions and at lower price. The incorporation of NCREs to Chile's last electricity tender in 2015, reduced the price by 40%, from USD 47 MWh to USD 29 MWh.

Secondly, a mission-oriented policy to develop the solar power industry (for which Chile has great comparative natural advantages) is helping catalyse sustainable and inclusive growth. It incentivizes local producers to develop innovative business models that introduce new technologies and use local natural resources. It fosters dynamic comparative advantages that could position Chile as an internationally competitive producer. Besides this potential for exporting renewables to neighbouring countries, there is also the possibility of exporting industrial products, produced with renewable energy, which can reach new market niches and secure higher prices.

Currently, only 17% of the solar energy firms are local, but the target for 2050 is to reach 55% of the market (Fundacion Chile, 2015). In addition to the limitations that local players find to compete with foreign solar power firms, they also find difficulties to take advantage of the upstream and downstream positive externalities that this new industry creates. Foreign firms have high quality standards, which are not always met by local players. In the case of Chile, most solar firms' suppliers are from China and Europe. Thus, the scope to add local value in the solar energy value chain is reduced. Nonetheless, Fundación Chile's report (2015) shows that Chilean companies have a potential niche, as providers of solar power plants' related services, such as provision of software products to measure and control energy provision or engineering services. The study estimates that more than 45,000 new jobs could be created in Chile.

Thirdly, providing solar energy contributes toward reducing inequality and social exclusion, by giving access to electricity to off-grid remote rural areas, based on a cost-effective new business model. One essential aspect for this to work is to grant financial facilities to rural households, to acquire the panels and pay for the energy. Digital finance solutions, such as Pay As you Go platforms to pay for solar energy consumption increased their popularity in African and Asian countries, but need to be developed in Latin America. In Chile, more than 3,500 rural communities are still excluded from the interconnected power system (Letter, June, & Erlick, 2015) and could take advantage of PAYGo systems. This is included in the '*Energy 2050*' policy, which proposes energy access to 100% of Chile's vulnerable households by 2050. Furthermore, the Ministry of Energy encourages the use of solar panels in the rooftops of every household, small and medium businesses and public buildings. This

initiative aims for energy self-sufficiency for regulated clients, who can also provide their surplus energy to the grid (Relac, 2016b).

The impact of using technology innovations to grant access to decentralized energy solutions is immediate. It bolsters job creation as it enables business to grow by giving them more time to operate and improves education conditions by giving children more time to study. This could bring new opportunities to achieve transformational social change and development outcomes in developing countries. According to Ban Ki-Moon, former Secretary General of the United Nations, to reach universal energy access to 2030, USD 48 billion per year need to be invested (Ban Ki-moon & Nations, 2011).

A final reason to deploy a green growth strategy is for environmental reasons. In 2015, Chile committed to the Paris Agreement and its global goal of mitigating climate change, by reducing fossil-fuel energy sources and carbon emissions.

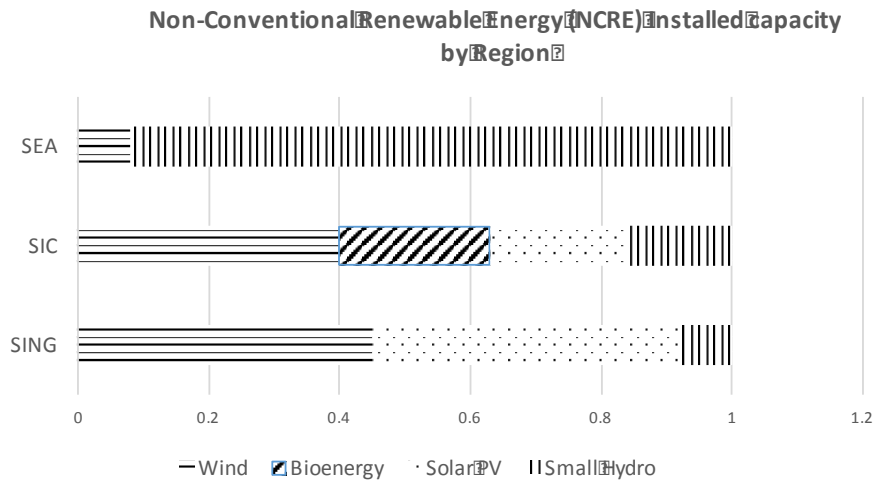
According to the NRDC Issue Brief (2013), targeting the 20% would reduce CO₂ emissions by 83 million tons. In addition, if hydro projects are replaced by NCRE, savings in water consumption will represent 11%, significant when considering Chile's lack of access to water.

Currently, Chile is among the highest energy consumers in Latin America, with 3,568 kWh per capita, but produces less than 35% of what it consumes. Thus, encouraging diversification of energy sources is crucial for a long-term development strategy. The government decision to set a green policy direction has been initially reflected in the National Energy Strategy 2012-2030, documented by Chile's Ministry of Energy

(Agostini, Nasirov, & Silva, 2015). Later, the current government launched a new energy policy, called '*Energy 2050*', which established a 70% threshold of NCRE to be reached by 2050.

Within non-conventional sources, the generation distribution is even between wind, with 28% of the market, small hydro 23%, bioenergy 23% and solar 21% (Center for Innovation and Development of Sustainable Energy (CIFES), 2015). Installed capacity for electricity generation based on renewable is also evenly distributed, but varies substantially by region (see Figure II). However, solar power in Chile is regarded as one of the sources with the largest estimated potential. The Atacama Desert, in north Chile, has the world's most powerful solar radiation. The location of these photovoltaic (PV) panels is strategic, because they feed energy into the Northern Interconnected Power System, SING, used by mining companies, the largest energy consumers in Chile (Griffith-Jones et al, 2017).

FIGURE II:



SOURCE: Own elaboration based on CIFES, 2015

However, both financial and non-financial barriers impede renewables to deploy its full capacity in Chile. As Nasirov et al. (2015) show, Chile has many renewable energy projects approved by the Environmental Evaluation Service, which have not gone to market yet. In 2015, only 52 projects with capacity to generate power for 2,338 MW were under construction, while approvals reached a power generation capacity of 17,543 MW (Center for Innovation and Development of Sustainable Energy (CIFES), 2015). While many limitations may be operating to prevent these projects deployment, this section will mainly focus on the financial constraints.

Nonetheless, many non-financial factors are at play. For instance, price instability, contract negotiations, path dependence, infrastructure conditions related to the poor grid connection between the Northern Interconnected Power System (SING) and the Southern Interconnected Power System (SIC) are factors. All these issues pose constraints on the supply side. However, policy makers should also focus on the demand side, which may frustrate promising projects from taking place if, for instance, local communities oppose PV solar projects because they occupy vast land

portions. This has been raised by ‘*Energy 2050*’ by establishing the requirement of community-firm ‘associativism’ in every green energy project. Greater efforts to involve local representatives are needed to prevent opposition. (Moguillansky, 2016). In this regard, Germany’s ‘*Energiewende*’ (‘Energy Turnaround’) green policy is well known for its capacity to involve the local community in the construction process, providing them clear information of the benefits of green energy (Zoellner, Schweizer-Ries, & Wemheuer, 2008). In fact, many of the actions taken by KfW, Germany’s National Development Bank, went far beyond funding green energy producers and targeted consumers by helping to promote the green economy and funding (and even subsidizing) households to increase their energy efficiency. Considering both sides of the green economy when designing and implementing renewable energy policy seems key.

However, one of the main barriers to deploy renewable energy projects is financial. Long-term innovative projects have limited access to traditional financial sources due to their particular characteristics. Their future cash flows are uncertain, their projects’ payback periods lengthy and their technical specificities are difficult to assess and monitor for credit rating evaluators. Finally, positive externalities from green growth projects, such as carbon emission reductions or job creation are not internalised by private investors. States conducting mission-oriented policies that intend to shape the market into a ‘green direction’, ought to support NRCE projects with long-term, patient, public funding (Culpeper, 2012). In particular, Chile’s solar projects have a payback period of 8 or 9 years on average (Moguillansky, 2016) and the private financial sector is not familiar with potential risks. Moreover, local bankers have limited experience with Project Finance structures, mechanism through which these

projects are usually funded (Nasirov et al., 2015). Local companies that intend to enter the solar industry, often have no track record or real collateral. On the contrary, the players in the electricity market that can use contracts as collateral are the traditional providers, frequently reluctant to diversify into green energy.

Traditional electricity generation firms in Chile did not have an interest in the new market, but are gradually being compelled to diversify their services into new venues such as desalination, due to the sudden increase of players in the electricity market and its plummeting price. However, they are still protected by national regulation, which ensures a 30% technical minimum for traditional companies with large variable costs. This norm, in fact, impedes solar power companies located in the North to inject electricity into the Northern Interconnected System.

As a consequence of this lack of market for renewables, many solar firms located in the Atacama Desert, are facing severe restrictions from both local and foreign financial institutions, which have become more risk averse and increased their requirements to NCRE projects. In this regard, representatives of private banks in Chile, have declared their concern towards new actors, without proper expertise, entering the market, and made it difficult for them to borrow (Relac, 2016a; Relac, 2017). This additional restriction pose a serious danger to achievement of the renewable energy production target, set by Acera. According to Acera, the Chilean Association for Renewable Energy, 2017 could deliver investments for USD 2,300, estimate based on 1,500 additional MW of installed capacity, at USD 1,5 million per MW. However, it is worth noting that fulfilling this challenging target, which would

reflect a 40% MW rise, will necessarily entail a steep increase in the available public financial mechanisms for the sector.

CORFO designed special financial mechanisms to provide a solution to the aforementioned concerns. As part of the productivity agenda, carried by the National Government and the Ministry of Economy, in 2014, CORFO designed a National Strategic Solar Industry program, within the Strategic Program of Intelligent Specialization and the '*Transforma*' initiative. CORFO, as part of this program, designed specific credit lines, whose funds are offered through public tenders.

The main financial support that CORFO has launched is a scheme to co-finance up to 70% of solar PV projects, to encourage adaptation of the solar energy industry to the local environment, the PV Solar Energy for Desert Weather and High Radiation. Its main goal is to nudge developers' adaptation to local conditions (of for example very high heat in the sun) and diminish the energy price. Among the requirements, CORFO demands the beneficiaries to innovate, associate with technology centres and strengthen local value added and exports. Also, public funding will be provided to incentivize self-sufficient solar models, quality certification and R&D.

Finally, CORFO has designed a credit line to support and help create value for local suppliers to develop prototypes, scale them and take them to market. Considering the government has detected a niche in service and product provision to the solar industry, this program could catalyse local sustainable growth throughout all the value chain. However, even if many of these programs are promising, they are relatively underfunded, by the Ministry of Economy. As with many other programs, the target is

not always clear and the bureaucratic procedures reportedly deter firms from applying (Moguillansky, opcit).

X. Conclusions

CORFO has since 1939, the year it was created, till the present played very varied roles, being seen overall by Governments of different persuasions as an efficient instrument to serve their development objectives and strategies.

CORFO, unlike many developing countries' national development banks, and despite its high level of non-performing loans in the late 1980s, was resilient to policy recommendations that advocated for its dismantling, with a highly positive response in the Chilean case (Rivas, 2012). The prevailing position argued that CORFO was essential to tackle market failures that could hamper SMEs development potential, as well as the need for greater innovation and diversification.

CORFO's instruments changed and it stopped granting direct loans, to continue as a second-tier bank, on-lending through financial intermediaries. Later, it shifted further from granting credit through financial intermediaries to focussing more on guarantees for credit (through financial intermediaries) and on subsidies. Currently, it focuses mainly on innovation and entrepreneurship, by granting subsidies through public tenders, as well as guarantees. CORFO has emphasized strategic collaboration with the private sector. Furthermore, it has stressed careful evaluation of the impact of many of its activities, which is a positive feature.

CORFO has been in recent years very innovative in several of its instruments. Above, we have discussed in some depth the Start Up Chile Program, which has received international recognition, and been emulated by other Latin American countries; there is however, room for improvement, for example in increasing its impact on variables,

such as employment and sales, as well as decentralizing its activities more to provinces. We have also detailed in depth the support that CORFO instruments have granted, in specific sectors, illustrating it with the case of solar energy development, which together with a very favourable policy framework, has positively contributed to the highly successful growth of solar energy. It is noteworthy that private financial mechanisms played a significant role in financing solar energy in Chile. However, the Chilean case clearly shows that private funds will discontinue their support towards RES projects as soon as price volatility scenarios or other risks emerge. Private financial institutions are not capable, nor willing to take the risks that green growth investment demand. Thus, relying on their funding only could jeopardize the green economy national strategy, if not supported by public financing. The role of CORFO becomes essential to provide stable funding to producers capable of adapting to special local conditions and fostering local value added, such as CORFO does through its credit line that encourages PV Solar Energy for Desert Weather and High Radiation.

More broadly, with the '*Chile Transforms*' program, launched in 2014, the government decided to enhance CORFO's goals by selecting strategic sectors with the potential to create dynamic competitive advantages, foster innovation, support structural transformation and increase productivity. This seems very valuable, and CORFO has undertaken the task with great enthusiasm; this is especially essential, at a time when the urgency for structural diversification is increased by the sharp fall in the price of Chile's main exports, and particularly that of copper. Though many valuable steps have been taken by CORFO, by the Government more broadly, and great efforts are being made to increase coordination with the private sector, it would

seem desirable to improve coordination between government agencies, including CORFO, to better focalize resources and efforts, as well as improve-on both sides- collaboration with the private sector.

It is noteworthy that an important part of the funding provided is non reimbursable, instead of loans. Furthermore, as pointed out, guarantees play a large and growing role. Thus, as discussed above, the main instrument of CORFO is not its loan granting, but its loan guarantees, which indirectly enabled loans for over USD 2,000 million in 2016. There seems to be a strong case to revisit this approach, as for the task of major diversification, credit instruments may be valuable and necessary, as for example the experience of KfW and renewable energy seems to demonstrate (Griffith-Jones, 2016, Moselen et al, in this book).

A further very important issue to consider is whether the scale of CORFO's capital and operations, even though it has grown in recent years, is sufficiently large, given the magnitude of the existing challenges, and the fact that overall CORFO is a very effective and efficient institution.

As pointed out above, CORFO activity is, in proportion to the size of the economy, and to total size of the credit to the private sector, much smaller than some of the other national development banks. The need for larger scale may be particularly true given the growing consensus for the need for productive diversification and innovation in Chile, to achieve more dynamic, sustainable and inclusive growth, as well as higher productivity increases. In such a case a sufficiently large scale of mission-oriented finance may be especially valuable. It is feasible to increase scale of

CORFO, with a small contribution from fiscal resources, as CORFO can raise funding, at low cost on international capital markets, given fairly high credit-rating of Chile, and also –especially, given depth of Chilean capital markets-, can raise funds at fairly low cost and long maturities, on domestic capital markets. This would allow greater leverage for fiscal resources.

Furthermore, CORFO, in coordination with other parts of the Chilean government, and in dialogue with the private sector, has already clearly defined important sectors and activities, which need support to achieve structural transformation. CORFO is carrying out a number of activities, many of them innovative, which have a very positive impact on the Chilean economy. Furthermore, CORFO is broadly seen as an efficient institution. It has also good teams that can help design, in close collaboration with the private sector, a more detailed industrial strategy. However, it lacks sufficient scale to deliver significant impact. It is therefore clearly necessary for CORFO to have the appropriate scale to have sufficient effect on helping fund the major structural transformation needed; the proposed mechanism, of raising funds in capital markets, seems to offer a tested and effective way of doing so. It could also help deepen and further develop Chilean capital markets, and possibly encourage use of new financial instruments, where CORFO could play the role of ‘market-maker’.

Finally, like many national development banks, CORFO has a vast range of programs. Though most of them seem very effective (which is verified by evaluations regularly carried out), a question can be asked, if it may not be more efficient to streamline them somewhat, to allow greater focus. Better information and transparency of the procedures to apply (as well as about the operations of CORFO) as well as simplification of those procedures seems also important for users. Finally, another

question to pose, may be whether CORFO programs should not be more flexible, to respond even better to companies' needs, that are not already met by the private financial sector.

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