



INTERGOVERNMENTAL FORUM  
on Mining, Minerals, Metals and  
Sustainable Development

IGF Guidance For Governments:  
Leveraging Local Content Decisions  
for Sustainable Development

## CASE STUDY

# CHILE: HORIZONTAL LINKAGES

## USING TAXATION TO FOSTER HORIZONTAL LINKAGES

### OVERVIEW

#### LEVEL OF OPERATION:

National, industry

#### GOVERNMENT ROLE:

Funder, program facilitator

#### FOR MORE INFORMATION:

See [Mining Skills Council](#); [Fundación Chile](#), [National Council on Innovation and Competitiveness](#); [BHP Billiton's World Class Suppliers program](#)

#### KEY COMMODITIES:

Copper (world lead), iron ore, nitrates<sup>1</sup>

#### TOTAL NATURAL RESOURCE RENTS (AS % OF GDP) (2015):

12.2 per cent<sup>2</sup>

#### NATIONAL EXTRACTIVES COMPANY:

Codelco (copper mining)

#### UNDP HUMAN DEVELOPMENT INDEX VALUE (2016):

0.847 (Global Rank 38)<sup>3</sup>

The Chilean historical experience highlights the difficulty of development policies for a mining-rich country. Chile attempted both import substitution policies and free market approaches and achieved only limited success with each. The country's experience shows that many factors need to be aligned for sustained growth to happen. Ultimately, the Chilean government came to the view that the private sector is the engine for growth, and the state's role is to act as facilitator, setting the rules and creating a conducive environment.

Chile identified the need to leverage its mining resources early on. However, its approach was different from many other mining jurisdictions. Instead of requiring that mining firms reach specific local development or local content targets, it used income from taxes and royalties to fund its

<sup>1</sup> Central Intelligence Agency (CIA). (2017). *The world factbook*. Washington, DC: CIA. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/fields/2111.html>

<sup>2</sup> World Bank Group. (2017). *Total natural resource rents (% of GDP)*. Washington, DC. Retrieved from <https://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS>

<sup>3</sup> United Nations Development Program. (2016). *Human Development Reports: Chile*. Geneva, Switzerland. Retrieved from <http://hdr.undp.org/en/countries/profiles/CHL>



broader goals. Projects to diversify the economy started as early as the 1970s and have continued to be a policy focus. An important part of the policy is the sustained drive to improve skills, R&D, and innovation, which fuel diversification and generate broad benefits for the economy.

## BACKGROUND AND CHILE'S HISTORY OF REFORMS

Chile is the world's primary producer and exporter of copper. It has 38 per cent of the world's reserves and in 2012 accounted for 33 per cent of global production. It is also a leading supplier of molybdenum, rhenium, silver, gold, iron and natural nitrates. The mining industry in Chile has been a mainstay of the country's development throughout its history. In recent decades, the industry has been a crucial catalyst of economic growth, driven by considerable increases in mining investment.<sup>4</sup>

Initially, Chile attempted to develop through import substitution, high levels of government intervention and basic price controls. This period (1934–1973) relied heavily on the extractive industries and agriculture.<sup>5</sup>

However, these policies created many distortions, a lack of dynamism (as large, vertically integrated state-owned entities dominated the market), and did not result in high growth rates. The government implemented market-friendly reforms in the 1970s and launched the first attempts to diversify through projects that openly steered away from the extractive industry. These reforms gave a much greater role to the private sector but did not result in rapid growth. Macroeconomic instability finally led to a financial

crisis in 1982. Following this crisis, several reforms were enacted to regulate the financial sector and capital markets and to correct previous failures in macroeconomic management. Some capital controls and tariffs were reinstated, and the government actively pursued an explicit policy to boost exports. It was during this period that the export capabilities were developed, mainly through state-led programs.<sup>6</sup>

The restoration of democracy in 1990 delivered a third set of economic reforms focusing on macroeconomic stability, the financial sector and free-trade agreements. A new approach to industrial policy generated productivity gains through the implementation of a set of horizontal policies. Since then, the economy has undergone astonishing development in real terms compared to the rest of Latin America. Between 1986 and 1998 Chile had growth rates averaging over 7 per cent, similar to the "Asian Tigers." While growth was slower in the 2000s, it was still consistently higher than Latin American peers and advanced economies.<sup>7</sup> As a result, Chile lowered the proportion of its population living in poverty from 26 per cent to 7.9 per cent between 2000 and 2015.

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Chile has managed to diversify its economy and develop innovative industries. In 1973, mining made up 89 per cent of Chilean exports, but this fell to 59 per cent by 2012.<sup>8</sup> Chile's successful diversification is illustrated by the growth of other export

<sup>4</sup> African Development Bank. (2016). *Chile's fiscal policy and mining revenue: A case study*. Abidjan: African Natural Resources Center, African Development Bank Group. Retrieved from [https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/anrc/CHILE\\_CASESTUDY\\_ENG\\_HR\\_PAGES.pdf](https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/anrc/CHILE_CASESTUDY_ENG_HR_PAGES.pdf)

<sup>5</sup> Varas, M.E. (2012). *Economic diversification: The case of Chile*. New York: Revenue Watch Institute. Retrieved from [https://resourcegovernance.org/sites/default/files/RWI\\_Econ\\_Diversification\\_Chile.pdf](https://resourcegovernance.org/sites/default/files/RWI_Econ_Diversification_Chile.pdf)

<sup>6</sup> Ibid.

<sup>7</sup> Urquiza, R. (2014). *Policy for the mining sector in Chile*. Santiago, Chile, Government of Chile: Ministry of Mining.

<sup>8</sup> Ibid.



industries, notably wine and fruit production, along with salmon farming, where Chile is now the world's second largest exporter. Mining accounts for 12 per cent of Chilean GDP, similar to manufacturing (12 per cent), but substantially smaller than the services sector (64 per cent). Mining is still considered the “engine room” of the economy due to its strong linkages with the rest of the economy and its ability to attract investment.

In contrast to many other case studies discussed here, Chile's mining sector framework does not include any formal requirements to increase local content. Instead, the country uses revenue generated from royalties and taxes<sup>9</sup> to support upstream linkages, R&D, skills development, diversification projects, health, pensions, disability programs and innovation. There is also a strong culture of public–private collaboration in supporting supplier development and local procurement. One example of this is the *Consejo de Competencias Mineras* (Mining Skills Council) (or CCM), to which all mining enterprises provide information on their needs in relation to a skilled workforce.<sup>10</sup>

## CAPABILITY-LED HORIZONTAL LINKAGES: BUILDING A KNOWLEDGE AND INNOVATION BASE

Chile has long acknowledged that resource windfalls should be used for long-term economic development programs, and improving skills, knowledge, and R&D has consistently been a strong part of this drive.

Fundación Chile was formed in 1976. It is a non-profit private organization started by the Chilean government and the U.S.'s ITT Corporation to transfer management and technological skills for use in natural resource sectors, through undertaking R&D, adapting foreign technology and aiding in the diffusion of technology. Fundación Chile's worked to find venture capitalists to invest in innovative projects promoting technology transfer and new business models that could benefit the country as a

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whole, and, once the start-up achieved a sustainable operational level, sell its participation and reinvest the proceeds in new projects. The foundation's privately endowed R&D department proved crucial in the 1980s when the military government withdrew subsidies from research institutions and many organizations were forced to undertake short-term, less innovative projects.<sup>11</sup>

This initiative has been central to the development of non-copper industries (including salmon, wine, pork and berry industries) and is thus important in Chile's successful diversification. Among its key achievements are the development of a salmon industry: salmon exports exceeded USD 1 million in 1986 and rapidly increased to USD 159 million in 1991 and an all-time high of USD 2.4 billion in 2008. Other achievements are quality wine production and the facilitation of fruit exports; in 2010 Chile became the leading exporter of

<sup>9</sup> The biggest sources of income are the two state-owned companies, the Chilean National Copper Corp. (CODELCO) and the much smaller National Mining Co. (ENAMI)

<sup>10</sup> Östenson, O. (2017). *Local content, supply chains, and shared infrastructure* (WIDER Working Paper 2017/96). Retrieved from <https://www.wider.unu.edu/sites/default/files/wp2017-96.pdf>

<sup>11</sup> World Bank. (2014). *Fundación Chile incubator: Chile case study*. Washington, DC, World Bank Group. Retrieved from <http://hdl.handle.net/10986/20109>



blueberries in the southern hemisphere with USD 164 million of exports.<sup>12,13</sup>

Fundación Chile's setup was critical to its success. Designed as a public-private joint venture, it has a clear public mission and a strong private sector corporate structure. It was built not as a "think tank," but a "do tank." Private co-governance gave Fundación Chile stability and guaranteed that the funds were used well. In addition, the foundation was designed to be insulated from political influence. Fundación Chile has developed and maintained a strong neutral brand as an independent broker.<sup>14</sup>

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Then, in 2005, the National Council on Innovation and Competitiveness (NCIC) was created. Its aim was to implement a new 15-year National Strategy of Innovation for Competitiveness that would put in place a set of horizontal and vertical policies in pre-defined industry clusters. In 2006, a new royalty on mining activities took effect that allowed the state to take part in the cyclical windfall, particularly of copper (and later molybdenum) prices. The new royalties permitted the establishment of three large funds, including the Innovation for Competitiveness Fund (ICF).<sup>15</sup> The ICF acted as the funding tool for NCIC and became the main instrument through which the state managed and funded the initiatives for innovation and competitiveness. This led to a doubling of

the funding allocated to science, technology, and innovation between 2006 and 2010, from USD 350 million to USD 700 million. Chile has also put in place strong broader education policies. The country has two of the top 10 universities in Latin America and stands out for its high-calibre professionals. For example, it was ranked 26th out of 60 economies in the Global Talent Index 2015 of *The Economist's* Intelligence Unit.

The ICF funds other government and private agencies, with the bulk of the funds going to the *Comisión Nacional de Investigación Científica y Tecnológica* (CONICYT) and the Chilean Economic Development Agency's (CORFO) Innova Chile program. CONICYT focuses on programs for science and technology R&D, while the Innova Chile program acts more like a developmental bank, funding innovative programs through seed capital (and other types of finance) and providing technical support.

Mining royalties were thus employed to build long-term

R&D capacity but also support short- and medium-term innovation by funding entrepreneurs and existing businesses. The development strategy was based upon a subsidiary role of the state operating in partnership with the private sector to create "a new economic model in which higher levels of competitiveness are based on knowledge, innovation and human capital." The government also did not directly target upstream linkages. Instead, it attempted to use mining sector revenues to create an environment that fosters innovation across the economy, and to diversify into sectors identified through studies as Chile's competitive advantage. The initial 11 clusters were later merged into seven: aquaculture, fruit cultivation, swine and aviculture, global services, specialty tourism and

<sup>12</sup> Varas (2012), Id. note 5.

<sup>13</sup> Havro, G.B. & Santiso, J. (2008). *To benefit from plenty: Lessons from Chile and Norway* (OECD Policy Brief No. 37). Paris: OECD. Retrieved from <https://www.oecd.org/dev/41281577.pdf>

<sup>14</sup> World Bank. (2014), Id. note 11.

<sup>15</sup> The other two were the Economic and Social Stability Fund (ESSF) created to finance possible fiscal deficits and/or to amortize public debt (macroeconomic stabilization), and the Pension Reserve Fund (PRF) designed to finance programs introduced by pension reform and covering basic old age and disability solidarity pensions.



health foods, in addition to mining. Innovation still occurred more often within the existing value chains: Sepulveda et al. (2014) found that innovation inputs came from: suppliers (62.1 per cent), customers (33.3 per cent), consultants and specialized laboratories (33.0 per cent), competitors (29.5 per cent), universities (23.6 per cent), and public research institutes (10.2 per cent).<sup>16</sup>

In 2010, an evaluation report on the NCIC found that it had been a key factor in achieving growth and higher levels of innovation.

However, the system met some challenges and results were still below expectations. The obstacles cited by the 2010 review included the fact that the NCIC was set up as an advisory council and its recommendations to the Inter-Ministerial Committee on Innovation are non-binding, meaning that it did not have a strong enough role in monitoring the implementation of the Strategy and the evaluation of its impact and advances. As a result, many of the recommendations of the NCIC were not implemented. Major government investments in innovative capacity through such agencies as CORFO, CONICYT, and through the tertiary education sector were also hampered by significant coordination failures and weaknesses in institutional capacity. The review also highlighted that, with investment being diffuse rather than focused, the shifting of the priority of the science capabilities toward industrial and societal needs had not been totally effective. While export products and markets increased, there has been a halt in the diversification process, and there still are important gaps to fill in terms of human capital and innovation.<sup>17</sup> However, diversification and the creation of a knowledge-driven economy are long-term efforts with slow incremental gains. Therefore, the full results of the programs and policies of the NCIC may not be visible even five to seven years later.

## HORIZONTAL LINKAGES THROUGH SUPPLIER DEVELOPMENT: BHP'S WORLD CLASS SUPPLIERS PROGRAM

The World Class Suppliers program was launched by BHP Billiton in 2009 and joined by Codelco (Chile's main state-owned mining firm) in 2011. The program has identified five areas—water, energy, HSEC (health, safety, environment and community), human capital and operational efficiency—that require innovative solutions to support the mining companies. For example, water efficiency has become increasingly important to miners in Chile, some of which have found ways to reuse water or source water from the sea. Chile's state copper commission, Cochilco, estimates that desalination will provide half the water demand of Chile's copper mining industry by 2026.<sup>18</sup>

The key to the program is that the mines have not attempted to procure a specific technological solution. Instead the program aims to provide the right collaborative environment for suppliers to innovate and propose new technological solutions. The program also supplies some financing for R&D and managerial support, gives access to mining operations as testing grounds for the new technologies, aids in accessing international markets and can potentially acquire the intellectual property if the research results in a successful product. This approach, by focusing on innovation, increases the occurrence of horizontal linkages. Firms are likely to find solutions that have wider applicability for other mines or other industries.

As of December 2012, the program was working with 36 suppliers that employed more than 5,000 people on a total of 43 projects with combined sales of USD 400 million. Suppliers participating in this program were more likely to export (about 51 per cent of the suppliers who participated) than those suppliers to the mining sector that did

<sup>16</sup> Sepulveda, J., Alfaro, M., & Vasquez, E. (2014). Management of innovation in Chile: A case study for enhancing innovation capability of SMEs. *Journal of Innovation Economics & Management* 1(13), 115–128. Retrieved from <https://www.cairn.info/revue-journal-of-innovation-economics-2014-1-page-115.htm>

<sup>17</sup> Varas (2012), Id. note 5.

<sup>18</sup> Columbia Center on Sustainable Investment (CCSI). (2016). *Water risks in the mining sector: Chile*. New York, CCSI.



not have the same support mechanisms (34 per cent of those were exporters), although this could also be due to selection bias.<sup>19</sup> The program has led to significant developments from the suppliers involved, for example:

- Tesra and their technology partner Sixth Sense Processware reduced electricity consumption per ton of copper by two per cent through an automatic scanning system detecting shorts.
- Prodinsa developed a solution that increased the useful life of cables on Escondida's electromechanical shovels by 40 per cent. With annual sales of USD 50 million and 200 employees, Prodinsa is one of the program's largest suppliers, and exports account for around 50 per cent of its sales.
- Power Train Technologies (PTT) significantly improved its health and safety standards and obtained government certification as a research and development centre.

The World Class Suppliers program aims to create 250 world-class mining suppliers in Chile by 2020. While this mutually beneficial program has been successful, it has struggled to scale up. The goal of 250 suppliers is unlikely to be reached as the program has not been able to incorporate more companies.

## KEY LESSONS

- Sustained, long-term funding is necessary for successful R&D programs. This often requires some insulation from political processes.
- Horizontal linkages can be supported through investments in the National System of Innovation. This intervention seeks to advance skills and knowledge with a view toward application to related and unrelated sectors. This can include building ties between the mining sector and higher education institutions, which focus on mining-related science and technology, offering R&D and innovation incentives, or directly contributing to R&D programs. Results, however, are not likely to be felt in the short term.
- Supplier development programs aimed at serving diversified clients can foster knowledge transfer, innovation and horizontal linkages. However, these are not likely to have an economy-wide impact.
- Supplier development programs aimed at serving diversified clients are difficult to scale up, due to the amount of resources required and a lack of qualified companies.

<sup>19</sup> Ibid.



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