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The World Class Supplier Program for mining in Chile: Assessment and perspectives☆

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A B S T R A C T

The World Class Supplier Program, *Programa de Proveedores de Clase Mundial*, is a recent private sector initiative to strengthen innovation and collaboration between large firms and suppliers in the mining sector in Chile. The goal of the program is to develop innovations in domestic suppliers to provide technological solutions to specific problems detected by large firms and to sell them at a larger scale in international markets. This paper analyzes the evolution of this unique program and its prospects for the future. The program seems highly innovative and relevant as a tool for the development of suppliers but limited in size as to produce a substantial impact in the economy. Despite being successful in achieving its goals of creating technological solutions to large firms, the scaling up and internationalization effects of the program seem small. This is a result of the incentives facing large firms and providers. That is, while it is in the interest of large firms to collaborate with providers to develop solutions for their operations, they did not seem to have incentives to collaborate in the scaling-up and internationalization of providers.

1. Introduction

The mining sector in Chile is not only one of the largest contributors to economic activity, in terms of exports, fiscal contributions and employment creation, but also the most technologically advanced, as large mining firms operate with the highest international standards.[1] However, since recent years the sector has been going through difficult times characterized by decreasing ore grades and deeper mines, increasing extraction and operation costs and decreasing copper prices.[2] Local energy costs in mining have increased significantly over the last decade and they are much higher than in other mining nations like Australia, Canada, China, Peru and the United States (SCIRO, 2014). Due in part to a shortage of skilled labor, labor costs have also increased in Chile by more than in other mining countries while labor productivity declined. Indeed, according to Consejo Minero (2015b) labor costs in dollars increased by 52% between 2006 and 2014 and labor productivity declined by 30% in the same period. While Chile is the main copper producer in the world and the third largest in the production of molybdenum, labor productivity in mining is only one third of the existing in Canada and the United States.[3] In addition, local communities have emerged as key actors with concerns on the effects of the sustainability of mining activities on their living conditions. This imposes higher environmental sustainability standards that the mining sector must take into account as part of it social responsibility.

In a context where it is imperative for the sector to obtain productivity gains, the development of new technologies and the adaptation of existing ones is a central challenge. There are opportunities for innovation in different aspects of the sector's operation such as sustainability, health, water management and efficiency in the use of different energy resources, among others.

Despite mining production is heavily concentrated in a few large firms, the structural shifts towards a vertical disintegration observed in the mining sector creates space for the development of mining-related activities by domestic firms. Indeed, while in the past the sector based its development strategy on vertical integration, in recent decades Chilean large mining firms followed the international trend in organizational change of focusing on core activities and increasing outsourcing of other activities. It is estimated that about 60% of the

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[1] According to Consejo Minero (2015b), in 2014 the mining sector contributed to 11.2% of the GDP, 54.7% of total exports, and 9% of fiscal revenue. It is also estimated that the sector contributes directly and indirectly 10.7% of total employment in Chile.

[2] See the Cochilco (2015) Yearbook for information on the evolution of average mineral grades and extraction costs.

[3] These differences are not necessarily related to differences in capital intensity. Capital intensity is high in leading mining countries. A study by Cochilco (2014) shows that for copper investment projects, required capital intensity in Chile is even larger than in the United States and 30% lower than in Canada.

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operation costs of Chilean large mining firms, excluding energy, correspond to goods and services provided by suppliers (Fundación Chile, 2014). According to Korinek (2013) the trend towards outsourcing seems more pronounced in Chile than in other "mining" countries, such as Australia and Canada.

Although there are activities in the mining value-chain that are capital and energy intensive which make operating in large scales convenient, there are innovation, research and development opportunities with lower capital requirements in mining-related intermediate goods and services. With this in mind, one of the key aspects that can foster productivity levels is the development of suppliers with high technological innovation and managerial capabilities. Exports by mining-related suppliers have increased greatly over the last decades but they still have a large potential for further increases. While by 2001 they accounted for US$ 3.4 million (Korinek, 2013), according to Fundación Chile (2015) more than 300 mining suppliers exported by at least US$ 500 million per year in the period 2010–2014. In a similar line, Korinek (2013) claims that the potential for increasing exports seems important, as the ratio of exports of mining-related goods and services relative to the size of the mining sector is still very low in Chile compared with other "mining" countries, even when it has greatly increased over the last years. Australia, Canada and Finland are mentioned as cases of countries with successful stories of developing a world-class cluster of firms providing mining-related technology services.[4]

Suppliers to the mining sector in Chile are largely heterogeneous; they have varying technological and organizational capacities and most of the relationships with large mining firms are transactional rather than collaborative (Urzúa, 2013; Fundación Chile, 2014). The coexistence of firms with significant differences in productivity and technologies limits the scope for knowledge transfer and spillovers within the sector. One of the relevant market failures affecting the mining activity is therefore the existence of important information asymmetries. The limited knowledge on the operational challenges of lead firms makes it difficult for suppliers to perceive their needs, restricting innovation and learning within the mining sector.

Perhaps the most important initiative for the development of the industry of suppliers to mining in Chile is the World Class Suppliers Program, or *Programa de Proveedores de Clase Mundial*, henceforth PPCM. This program contributes to the reduction of information asymmetries, coordination and transaction costs, facilitating the development of productive relationships beneficial for both lead firms and suppliers. The PPCM was announced in 2008 by BHP-Billiton, one of the largest mining firms, later followed by the public-owned firm Codelco. Both firms account for about half of the copper production of the country. The first PPCM projects started to operate by 2009. The program aims to create opportunities for innovation in local suppliers to the mining sector and to transform them into world-class suppliers.[5] The first stage in the innovation channel is the match between a leading mining firm and a supplier. The partnership is intended to tackle an operational issue detected by the leading firm. Once the leading firm publicly announces a technological challenge, prospective suppliers express their willingness to participate. The successful applicant and the mining firm start a bilateral investment and innovation relationship. Despite the terms of the contracts between suppliers and mining firms are private information, the program claims that suppliers have the property rights over the innovation. In a final stage, the program offers advice (through external consultants and accelerators) to the suppliers in order to scale up their innovative solution and to introduce it in international markets. The program targets two goals simultaneously: solving operational problems of lead mining firms and building technological and organizational capabilities in local suppliers. Up to date the PPCM has benefited more than 100 projects, many of them with great success, and has a goal of reaching 250 suppliers by 2035.

Having acknowledged by its administrators that the program is under a transition stage towards a new format, amid the sharp recent decrease in copper prices affecting the sector, this study presents an analysis of the evolution of the program and its prospects for the future. Some questions that we address are how has the program evolved over time, how has it affected it beneficiaries, and what can we suggest for the role of the program to be in the future. We present a descriptive analysis of the projects and suppliers that participated in the PPCM over its life. We also give special attention to the need to implement an impact evaluation as an instrument for monitoring and evaluation of the performance of the program. Impact evaluations of programs like the PPCM also contribute to the development of knowledge on what works in productive development policies and what does not.

From a public policy perspective, it is important to study the aggregate effects of the program on the mining sector. The analysis suggests that the program is still small and has had a positive but limited impact in the economy. The program seems to work well in fostering innovation but the results in terms of scaling up and internationalization are not still evident. There are a number of incentive problems that may explain this result. In particular, while there are incentives for joint collaboration during the innovation phase it is not clear what lead firms gain for providing facilities for piloting and testing during the scaling up phase.

Despite the progress achieved with the PPCM, there persists information asymmetries and other market failures in the functioning of the mining sector (in relation with suppliers) that call for a more active role for corrective public policies. It is considered that a greater involvement of policy makers can contribute to expand the impacts of the program. In particular, scaling up and incubating seem two essential areas for development. Actually, consistent with the analysis of the paper, a new version of the program that was announced earlier in 2017 requires mining firms to commit to collaborate in piloting, testing and scaling up, and also considers greater involvement of the public sector.

This paper is structured as follows. The next section presents a description of the program, its origins, its participants; and milestones, among other aspects that would help us understand how the program works and how it has evolved over time. Section 3 presents a descriptive statistics analysis of the projects and suppliers of the program and some tentative indicators of their performance before and after their participation in the PPCM. Section 4 concludes and discusses the prospects of the program towards the future based on the analysis of the previous sections. In the Appendix, section A1 discusses to which extent and under which conditions it would be possible to perform an impact evaluation of the program.

2. Program description

This program was put in place by the end of 2008. The main idea was to develop innovations in domestic suppliers to provide technological solutions to specific problems detected by large firms. The program also would offer external consulting to suppliers in order to prepare them to sell those solutions in international markets.

As mentioned in the introduction, the program matches suppliers with a mining firm to solve a mining firm's challenging problem. These operational problems are announced sequentially by the different leading firms at no predefined dates. This process considers, in a first stage, the identification and prioritization of mining-firms' problems that need innovative solutions. These initial activities are developed by the mining firms' operation areas. Typically the challenges are announced on the program's website, www.desarrollodeproveedores.cl, and notified to potential suppliers who are invited to apply with a project, a term used in the program's official documents. In a second

[4] For a comparison between industry of mining suppliers in Chile and Australia, see Meller and Parodi (2017).

[5] According to Corporate Citizenship (2013), world-class suppliers are those that export more than 30% of their production, have standards equal to the industry leader and add provide a high value added to their customers.