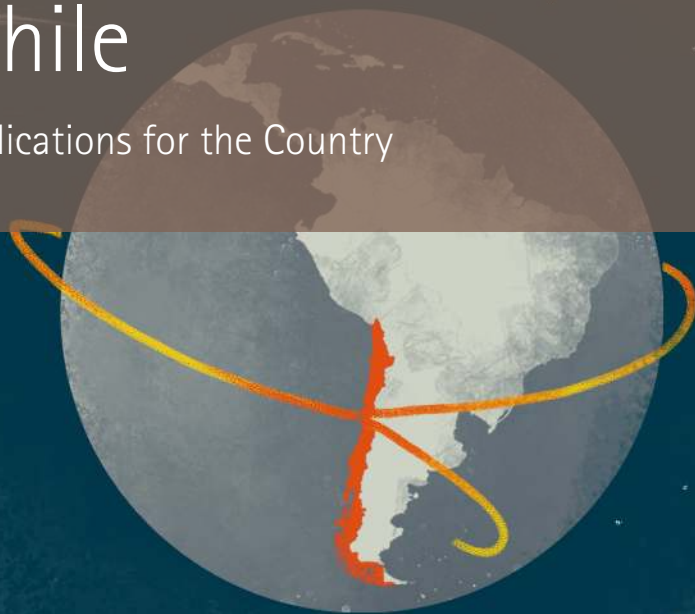




International Copper
Association
Copper Alliance

The Impacts of Copper Mining in Chile

Economic and Social Implications for the Country





Decades of Economic Growth through Copper Production

In the early '90s, Chile had the perfect climate for economic prosperity, one in which the mining sector played a significant role. The natural resource export model, combined with institutional and political reforms, allowed the economy to make an unprecedented jump onto the world stage. As a direct result of the changes, by 2016, less than a third of the population was below the poverty line, income quadrupled and Chile

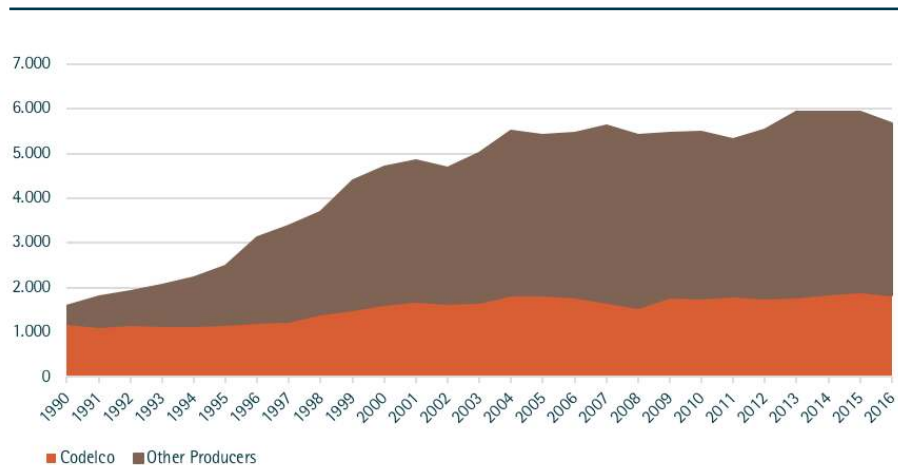
became one of the two high-income Latin American economies.

In the last three decades, the copper mining industry became a driver of development in Chilean exports. Codelco, the state-owned copper mining company, and the rise of Large-Scale Private Copper Mining (LSPCM) both played critical roles in the industry. Copper production in Chile went from 1,588 million tons (M.T.) of fine copper in 1990,

with a 25% total share of private companies, to 5,672 M.T. in 2016, with a 68% share of private copper mining companies. The industry has also created hundreds of thousands of jobs, both direct and indirect.

Chile continues to be the largest global copper producer and is ranked sixth in the world in terms of total mining production, after Australia, China, Russia, South Africa and the United States.

Copper production in Chile
(in thousands of M.T. of fine copper)



Chile stands out as an international example, both for its fiscal management and its successful mixed natural resource export model.

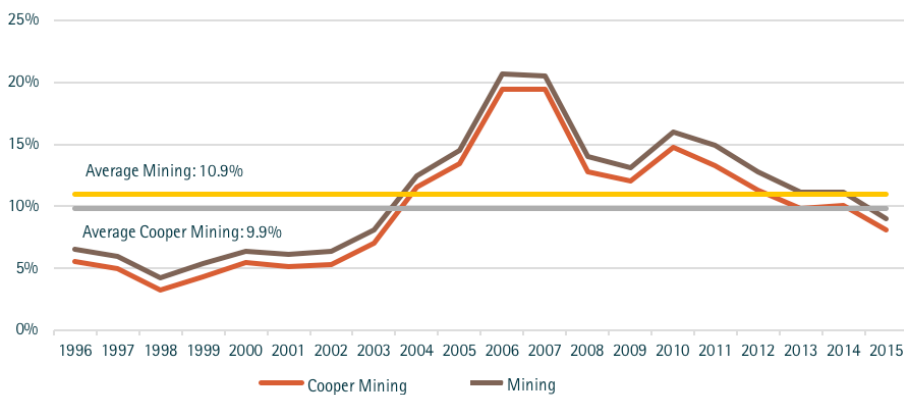
Source: Cochilco

Copper Mining and Macroeconomic Indicators

Copper mining has accounted for an average of 10% of Chile's gross domestic product (GDP) for the last two decades. In comparison, the mining industry as a whole represents 10.9% of GDP. Between 1996 and 2016, copper mining as a percentage of economic activity in Chile ranged between 3.6% (in 1998) and 19.6% (in 2006). It should be noted that price fluctuations in commodities have impacted copper's average contribution; Copper's price peak and stabilization period (its super cycle) started in 2000 and continues to date, with the metal's highest price in history occurring in 2011.

The copper industry has a strong multiplying effect, contributing to the consumption of goods and services in other industries. Available research shows that for every US\$100 contributed by mining to the economy, at least another US\$36 is indirectly generated.

Copper mining industry as a percentage of GDP (based on 2013 reference data)



Source: Central Bank of Chile

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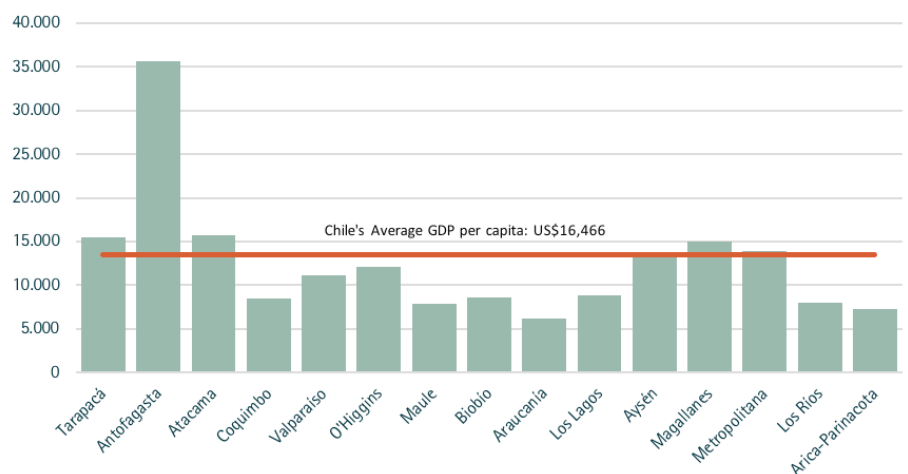
As observed in this graph, copper production directly contributes to the Chilean economy, as reflected in its percentage of GDP. At the same time, the copper industry has a strong multiplying effect, contributing to the consumption of goods and services in other industries. Available research shows that for every US \$100 contributed by mining to the economy, at least another US \$36 is indirectly generated. Considering these multiplier effects, the contribution mining activity makes to GDP could be up to 70% higher than what is shown in the graph above.

Copper also plays a key role in the country's export activity. Between 2003 and 2016, metal exports averaged 51% of the total shipments overseas, or the equivalent of US \$31,540 billion/year. Total copper exports have tripled between 2003 and 2007, mainly triggered by the start of the copper price super cycle.

Within Chile, a similar analysis found that mining became a game changer in the economic activity of some regions. For example, in Antofagasta, mining averaged 63% of the regional GDP between 2008 and 2014. For its part, Atacama had an average of 50% during the same period, while in seven other regions, mining activities accounted for over 15% of regional GDP.



Per capita GDP per region in 2015 (current prices, 2013 reference)



Source: Central Bank of Chile and National Statistics Institute

In mining regions, this industry accounts for as much as 63% of regional GNP, as in the case of Antofagasta.

Average salaries are between 80% to 110% higher than the regional average in regions where mining is identified as the most important activity.

The mining industry not only impacts regional income, but also wages and labor supply. Average salaries are between 80% to 110% higher than the regional average in regions where mining is identified as the most important activity.

As for job creation, the mining industry created 388,754 jobs in 2016, according to official records. Of these, 66,250 were direct mining jobs; 151,910 were contractor workers; and 170,594 were indirect jobs in the field.

As for job creation, the mining industry created 388,754 jobs in 2016, according to official records —equivalent to 5.4% of the country's labor force.

Copper Influence on Tax Revenues

Between 1990 and 2016, copper mining provided on average of 7.8% of tax revenue for Chile. The range of that income fluctuated between 1.6% and 20.7% due to the national budget policy and Chile's dependence on natural resource pricing. Given that, guaranteeing

fiscal stability has been a challenge throughout the nation's history, as is the case with other mining countries. Achieving fiscal stability requires creating mechanisms to ensure the high volatility of revenue does not impact budgetary policy, resulting in high debt service

expenses, among other things.

Among these policies and mechanisms is the Copper Compensation Fund (CCF), created in 1987 to buffer the changes in copper prices by increasing savings during periods of high revenue

(such as during the super cycle), then providing funding during the down cycle (period of lower copper prices). In 2001, an initiative was created based on the Cyclically Adjusted Balance, which was intended to determine the budget by isolating the price of copper and avoiding cost pressures. Lastly, the Fiscal Responsibility bill was passed in 2006, which created the Social-Economic Stabilization Fund (FEES, for its Spanish acronym), a prolongation of the CCF financed

by the Central Bank and fiscal surplus. This mechanism, in different scenarios, has served to offset external economic shocks, such as the 2008 crisis.

Fiscal responsibility policies mitigating the oscillating copper prices have served as an example for other countries in the region. Chile stands out for its fiscal management, as well as for having a successful economic development model regarding export of natural resources.

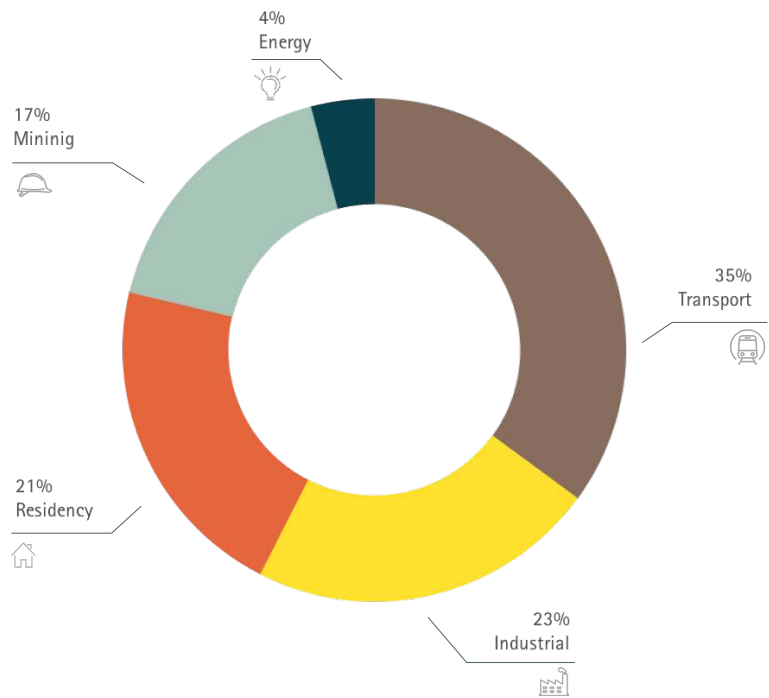
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Copper and Related Industries

Mining has related industries that form an important contribution to the market, creating additional jobs and indirect contributions. It is also true that the copper extraction process is more difficult and expensive now, due to lower ore grades, rock hardness and greater hauling distance required, among other factors.

For instance, the average copper ore grade in Chilean deposits has changed. In 2007, 0.87 metric tons of copper were extracted from 100 metric tons of rock, moving to 0.65 metric tons in 2016. With regard to electricity and fuels, copper mining accounts for 9% nationally and 17% for the mining industry in general—an example of its indirect contribution to job creation and the economy.

Energy consumption distribution per sector, at domestic level (Teracalories, 2016)



Source: Cochilco



Copper and Related Industries

In regions of greater mining importance, consumption of electric power fluctuates between 21% and 38%. Moreover, use of this resource has increased considerably (by 104%) in recent years as a result of the processing and desalination of seawater.

When it comes to water, the mining industry represents 3% of national consumption, defined as water to be consumed and not returned,

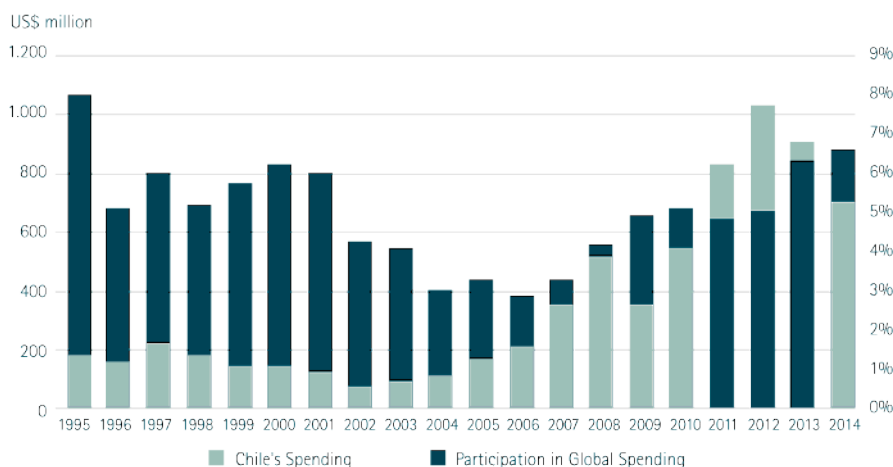
extracted from sources such as rivers, lakes and groundwater.

The main areas of the local economy that indirectly benefit from the mining industry's multiplier effect are the supplier industry, as well as goods and services. In addition to job creation, mining supplier companies represent approximately US\$20 billion of the national economy, taking into account the 18 mining operations representing

85% of copper production.

Another element that impacts the mining industry's multiplier effect on the local economy is exploration activity. This is the first step in every large-scale project: to identify whether the deposit has the desired mineral. Chile represents 6% of this US\$8 billion global market, making it the third-largest destination on the continent, after Canada (14%) and the United States (7%).

Investment in exploration in Chile. Comparison with global spending 1995–2014



Source: Cochilco

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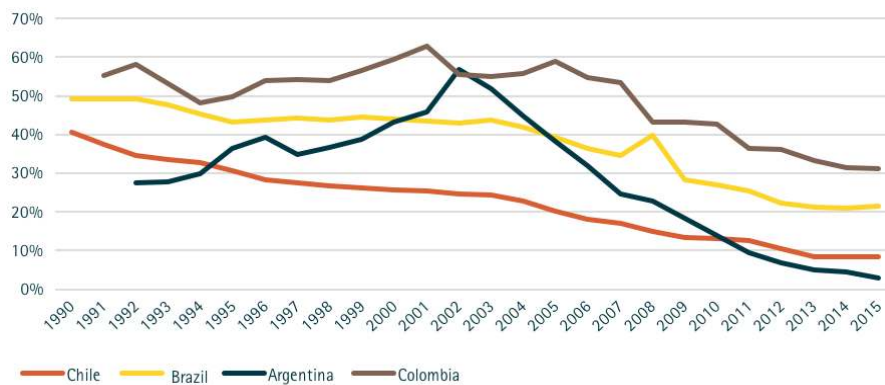
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Copper Mining and Local Communities

One of the key benefits of growth in the natural resource export model Chile developed was a considerable decrease in poverty rates, which fell from 40.5% in 1990 to 8.5% in 2015. The mining industry has also created nearly 400,000 jobs according to 2016 records, nearly half of them indirect.

Poverty rate in Chile and the largest economies in South America



Source: Sociometer-BID [Inter-American Development Bank]

Chile has developed from 1990 to date, a considerable decrease in poverty rates, which fell from 40.5% in 1990 to 8.5% in 2015.

Of note, mining regions have up to 50% lower poverty rates than the national average, and one-third lower than regions without copper mining. In other words, mining regions have better GDP, better wages and more jobs.

Regarding mining Research & Development, in Chile, there are more than 350 researchers with doctorates working in the mineral resource sector, which represents 6% of the total number of researchers with doctorates nationwide. Although there is no specific policy regarding mining research centers, there are numerous state-financed institutes, such as the Center for Scientific and

Technological Research for Mining (CICITEM), Center for Research in Solar Energy (SERC-Chile), Advanced Technology Center for Mining (AMTC) and the Center for Mathematical Modeling (CMM).

The direct contribution of the mining industry to the Chilean economy is also seen in the benefits companies have provided local communities, developing cultural, environmental and sporting interests. Most mining companies track their corporate social responsibility activities through sustainability reports. In these, companies chart their performance in different environmental and social dimensions, including

operational impact on local communities, labor practices, worker safety and water use.

In Chile, the mining industry is the most innovative economic sector, compared to other industries in the country. The proportion of mining companies innovating in their processes and organizational management is double the national average. This is even higher in mining suppliers, which has triple the national average in terms of the number of companies participating in marketing innovations, quintuple in terms of product innovation, double for process innovation and triple in organizational management innovation.

Conclusion

Copper mining is at the center of Chilean economic development.

The mining industry provides key economic activity and has been one of the main drivers in the rapid development of Chile's economy. From 1990 until 2016, copper production has increased more than two and a half times, led by growth in large-scale mining. As a result, poverty has dropped by more than 30%, per capita income has quadrupled, and Chile has become recognized as a high-income country.

According to various studies, the mining industry's contribution to Chile's economy fluctuates between an additional 30% and 70% for each dollar directly produced - amounting to a significant portion

of GDP. This becomes particularly relevant when developing instruments to ensure stable tax revenues, such as the fiscal responsibility policies that mitigate the oscillating price of copper. In this respect, the Chilean case stands out as an example to follow both for its fiscal management and its successful economic development model around the export of natural resources.

Chile has proven to be a successful player, able to overcome poverty and consolidate a strong natural resource export model. These characteristics are not isolated facts, but the result of an institutional strengthening process developed with a mixed model of copper extraction and social policy expansion.

This document is a summary of the study *Economic and Social Impact of Copper Mining in Chile*, issued by PlusMining at the request of International Copper Association, dated September 2017.



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