

Spreads Determinants of Corporate Bonds in State-Owned Companies. The CODELCO Case

Introduction

The state owned company (SOE) is currently playing a visible role in world economies. The privatization wave that the world experienced, with different intensities depending on the region since the 1970s, failed to eliminate the state corporate action in the economic sphere. Large companies survived and now they control important resources. Thirteen SOEs control 74% of oil reserves in China (Guajardo, 2013) playing an active role in the economic development. Russian state - controlled companies such as Gazprom, have been vital in Russia's return to centre stage of international politics. In Latin America, the states continue to control major companies for their national economies apart from the phenomenon of the renationalisation of previously privatized companies (see, for example, Serrani, 2013).

In the academic sphere, renewed interest in studying SOEs is also seen. *Annals of Public and Cooperative Economics* has been vital at this point, publishing special issues that have opened a debate on topics such as forms of ownership of these companies (Bance and Obermann, 2015) as well as the efficiency of these companies (Mühlenkamp, 2015). In Latin America there have also been studies that account for the persistence and renewed air of the state enterprise (for example, Cortes and Chavez, 2013; Chavez and Torres, 2013; Lustosa and Miano, 2013; Guajardo and Labrador, 2015; Guajardo, 2016). As Guajardo (2013) points out, the SOE is a leviathan that refuses to disappear.

Some SOEs aim to provide public services, others seek to regulate markets, while a third type of companies are created to boost economic activity in territories and / or specific industries. Finally, there are companies whose function is to generate revenues for the state, and thus help finance social spending (see Camacho, 2010). In the latter type of companies,

the most important in Latin America, such as PEMEX in Mexico, PDVSA in Venezuela, PETROBRAS in Brazil and CODELCO in Chile are found. These SOEs are mainly engaged in the sale of resources (usually commodities) that are traded on international markets. This makes them be exposed to international economic cycles. Similarly, since they have the pressure of state authorities to generate resources, the way of financing investment become crucial for the sustainable development of this activity.

This article aims to measure the impact on CODELCO debt financial spreads (one of the state's largest copper companies in the world) as a result of the changes in various factors, mainly resulting from the fall in copper prices. In this sense, the article addresses a public policy issue in today's Chile, which is also interesting for other SOEs engaged in the sale of commodities, highly exposed to international economic cycle. CODELCO's financial situation became one of the main topics of political discussion in Chile. The low copper prices have reduced the company's contributions to the treasury. In fact, during the first half of 2016, the company recorded losses. Similarly, in August 2016 officials of the current government and the previous one they have accused each other regarding who is to blame for the lack of investments and the increase of the company's debt (Valenzuela, C., 2016).

Being Copper its main product, these systematic falls in price have adverse effects on the liquidity of the company affecting the normal operational cycle. The effects of changes in credit risk are also included, which affects the risk perception of financiers who hold positions in the company. The high level of debt that CODELCO shows is due, among other reasons, to a nonexistent political capitalization of profits for the development of new structural and long - term projects. Since the contributions provided by the government to CODELCO are non-systematic and are not defined in a clear rule of profits reinvestment, therefore, sporadic capitalizations are the product of political pressure from various current situations, rather than based on a clear long - term investment policy, which should be originated taking in account the profits of this company.

The end of the super-cycle of raw materials, which has been accompanied by a slowdown in China in recent years, has revealed these institutional weaknesses that affect this Chilean copper producer. Increases in spreads on corporate bonds (financial cost of debt) that the company has issued in all past periods, is a warning sign of international debt markets, and also given the relative importance of CODELCO in Chilean economy (in terms of GDP and exports), sectoral effects and at an aggregate level are already beginning to negatively impact the economy. Consequently, the fact of making a company's investment policy (although it is a state run company and enjoys the low country risk of Chile) to depend on a

mixture of financing based mainly on corporate debt issuance, it has adverse effects on the financial costs especially when the operational cycle deteriorates as a result of falling revenues.

II. CODELCO. A BRIEF HISTORY AND THE INSTITUTIONAL FRAMEWORK

The beginnings of the massive exploitation of copper in Chile are associated with the arrival of capital from the United States in the early twentieth century. Between 1904 and 1910, two companies, Branden Copper Company and Chile Exploration Company, began the exploitation in the mines of El Teniente and Chuquicamata, respectively. In the 1920s new American actors such as Anaconda Copper Company and Kennecott Cooper Corporation (Vergara, 2015: 229) entered the market.

The copper business gained a major importance in the Chilean economy. Between 1930 and 1970, copper sales represented 70% of Chilean exports (Nazer, 2004: 3). This situation generated a broad political debate about what to do with this industry. During the 1950s there were voices criticizing the fact that copper were in foreign hands. In 1951, the so - called Washington Agreement was signed. This agreement made available a 20% of the production for Chile. In 1955, the state created the Department of Copper, to conduct studies on production and sales as well as exercise control in the industry (Correa et al., 2001).

There were two approaches among those who raised the need to increase national participation in the copper industry: the Chilenization, which indicated that the state should take the 50.1% of the property, and the nationalization, which advocated a complete statization. The discussion took power under President Eduardo Frei Montalva (1964-1970). The sharp increase in copper prices during the 1960s increased profit margins in the industry. In this new scenario, the taxation scheme proved disadvantageous for Chilean interests. Thus, a favourable environment was generated and this led to the adoption of the law 16,425 of "Chilenization of Copper" resulting that state could control the 51% of the most important sites in the country (Correa et al. 2001).

The State having participation in the economy was not new in Chile (see Guajardo, 2016). In fact, the early history of SOEs in the independent Chile date from the second half of the nineteenth century, a period in which the State had to take over rail projects abandoned by the private sector (see Crowther, 1973; Allende, 2001; Guajardo, 2007). In addition, this decision on the copper comes at a time when Chile developed a

strategy of import substitution, which had the paradigmatic case of the creation of the Corporation of Development and Production (CORFO) in 1939 (see Ortega, et al, 1989;. Correa et al., 2001; Ibáñez, 2003; Silva, 2008). CORFO was created after the earthquake of Chillan city of that year and came to realize the Chilean version of ISI (Import Substitution Industrialization). The corporation was intended as a public agency responsible for establishing economic development plans, acting as an entrepreneur and providing subsidies to the private sector (Fermandois, 2005).

The focus of the Chilenization of copper, promoted by President Frei Montalva, will be replaced by the nationalization. In September 1970, Salvador Allende (1970-1973) won the Presidency of the Republic, taking on 4 November. Allende's economic program contained among its measures to move towards full control of the copper industry. That was materialized with the enactment in 1971 of the law 17,450 (see, for example, Correa et al. 2001). Allende also urged greater state control throughout the economy. To do this, he advanced in the creation of a social area in the economy: a group of companies, which were private until that moment, were transferred to the State (Ortega, et al, 1989). This process materialized in making de facto companies by workers, which reached such a rate that 70% of industrial property came under the social sector (Arellano, 1984: 44).

However, the social area and the state company as a significant economic player had an end with the coup carried out by the military to overthrow Salvador Allende. The military dictatorship of Augusto Pinochet (1973-1990) introduced what Manuel Gárate (2010) has called a “capitalist revolution”, characterized by the implementation of a neoliberal economic model, with minimal state involvement in the provision of social services, and a pro - business legislation that, among other things, has inhibited the development of relevant factors such as workers’ unions (Frank, 2000).

In the area of state enterprises, a first measure taken by Pinochet and the *Chicago Boys* (a group of monetarist economists trained at the University of Chicago), was to return to the private sector the companies that were passed to the social area. This first stage also included, among other things, the creation of a private pension system (dominated by Pension Funds Administrators, AFPs) (Saez, 1996). Between 1985 and 1988 a second wave of privatizations was developed being highly controversial because several people in charge of developing the process ended up being the owners of these companies (Monckeberg, 2001). In the package there were companies created under the eaves of CORFO, which fulfilled functions of providing public services (Company of Telephones of Chile, CTC: The national Airline, LAN Chile, the National Telecommunications Company, ENTEL, the

Chilean Electricity Company, Chilectra) and production of inputs for industry (ENDESA, CAP and Mining and Chemical Society of Chile, SOQUIMICH). Banco Estado (Chile's State Bank) and ENAP (National Company of Petrol) continued in state hands, being considered strategic enterprises (Gárate, 2010).

In terms of copper, the dictatorship had an agenda that moved in several directions. On the one hand, in 1976, through the acts 1,939 and 1,940, an institutionality capable to manage and exploit the deposits nationalized at the time of Salvador Allende was established. This through the creation of the National Copper Corporation (CODELCO) as a state enterprise with legal personality and its own assets (CODELCO, 2015). Since its inception, the company has been conceived as a SOEs that aims to generate resources for the treasury (see Camacho, 2010; Barría, 2015). The military also associated their fate to the company when reforming the law 13,196 in 1975 through Decree Law 984, rules of confidential nature which states that 10% of the gross sales of CODELCO should go to the Armed Forces.

On the other hand, progress was made to develop an agenda that was intended to allow foreign investment in general, and particularly in the mining industry. On the first point, in 1974 a general regulatory framework (Decree Law 600) was issued. In 1981, an Organic Law on Mining Concessions was passed beginning to have an effect of attracting foreign investment late in that decade. Between 1985 and 1989, investment reached US \$ 6 billion (Nazer, 2004: 8-10).

In the 1990s, under the governments of Concertación, a centre-left coalition that replaced Pinochet, a third wave of privatizations was held, covering water companies in state hands and Empresa Portuaria de Chile (Chile's Port Company), divided in ten companies, seven of which granted port management to the private sector. Instead of promoting the development of the SOE, what has prevailed was the conception of a Subsidiary State, characterized by the dominant role of private actors in meeting social needs (see, for example, Bravo Lira, 1995). The copper industry has grown thanks to the emergence of fields operated by international companies. Although this has led to a process that some call denationalization of copper (see Nazer, 2004), CODELCO continues to be a major player in this activity, as shown below.

Currently, the corporate governance of CODELCO is ruled by law 20,329. This regulation came on a proposal by President Michelle Bachelet in her first term (2006-2010), which sought to make some innovations to the way the company was managed. On the one hand, the proposal explicitly stated the desire of the Executive to incorporate the OECD

guidelines for the management of SOEs. Among them, it considered subjecting CODELCO to the rules of private enterprises (except in matters that were incompatible with the rules established in 1976), setting a mechanism of board selection that would meet an eligibility criteria. Similarly, it separated the functions between the board and the CEO of the company. Currently, the board is composed of nine members: three are directly appointed by the President of the Republic, four were selected via the Senior Public Management System (the mechanism through which the highest public managers are selected) and two members nominated by workers' associations (BCN, 2009)

At present, the company consists of eight production divisions: Radomiro Tomic, Chuquibambilla, Gabriela Mistral, Ministro Hales, Salvador, Andina, Ventanas and El Teniente. Each of them has high levels of decentralized management (CODELCO, 2015).

CODELCO is therefore an important player in the Chilean economy, geared to international trade and is dependent on the exports of raw materials. From the 1960s until now, exports represented 21.1% of Chile's GDP, reaching in recent years to about 30% (Graph 1 Appendix 2)

Within exports, the ones corresponding to copper have a ponderous weight. In the period 2010-2014, they reached 54% of total exports (Graph 2 Appendix 2). Of these, approximately one third of the production, corresponds to CODELCO (Graph 3, Appendix 2).

Chile concentrates approximately 30% of world production of copper. Specifically, CODELCO represents almost 10% of the world production. In other words, the company is the largest producer in the world and also has near 10% of the world's reserves and 32% of Chile's reserves. In fact, the reserves of the company exceed that of countries such as Mexico and the United States (Cochilco, 2014).

CODELCO is not only the leader in the world in copper production, but also plays a key role in tax collection. As shown in another study, the company fulfils the role of generating revenues to the treasury and, in fact, there is no other company that delivers such amount resources (see Barría, 2015). They are derived from taxes on profits that every company must pay (20%), a tax of 40% for SOEs (Decree Law 2.398), along with a variable royalty payment (between 5 and 14%, law 20,469) and a 10% tax on exports (law 13.196). To this the contributions established by the Copper Reserved Law must be added. (Graph 4, Appendix 2)

The importance of the copper industry for the economy and CODELCO for the treasury makes the budget formulation process depends heavily on earnings projections of the company (which in turn depend on the price of copper). Since 2001, Chile's fiscal policy is based on a rule of structural adjustment, called Balance Cyclically Adjusted (BCA). This makes it even more necessary that financial organization of the company in terms of corporate governance may be well defined so that it can match its contribution to the Chilean State and its financial sustainability that clear rules should consider reinvestment of profits.

III. THEORETICAL FRAMEWORK

The following proposed model is based on determining how a state company is strongly impacted on their sources of funding due to governance problems in terms of not having a clear policy of profits reinvestment.

The literature on the determinants of corporate debt spreads is relatively divided since different authors have reached different conclusions. On the one hand, results such as the ones by Elton, Gruber, Agrawal and Mann (2001) can be found and they conclude that the spread of the debt is explained by the risk of default as well as specific state and local taxes that only affect corporate bonds rather than government bonds. The reason is that the latter assume a de facto sovereign risk (the risk of default state) because there is a belief that the state in this case would be a "lender of last resort" in the event of financial problems in state - owned enterprises. Also the spread of the debt is explained by macroeconomic factors such as the existence of a return due to systemic risk within the spread. While Longstaff, Mithal, and Neis (2005), through the analysis of Credit Default Swaps¹ to five years for a set of 68 firms, found that a significant proportion of the spreads on corporate debt are explained by the risk of credit. Meanwhile, Covits and Downing (2007) report similar results for their analysis to a set of short term US financing instruments, in which credit risk is a major determinant of the spread even in those with a maturity of less than one month. On the contrary, Delianedis and Geske (2001), who by using data for US firms between 1991 and 1998, argue that the bond spread is determined in part by the credit risk, but another important part could also be explained by taxes, market liquidity and macroeconomic risk factors. In line with this, Huang and Huang (2012) analyzed data from US companies between 1973 and 1998, concluding that consistent estimates of the debt spread can be obtained by various economic considerations, so credit risk corresponds to a small part of the spread for Investment Grade bonds² and a somewhat larger ratio in the case of High Yield bonds³.

¹ Credit default swaps (CDS) consists of a risk coverage financial operation that is materialized by a contract on a credit instrument (usually a bond), in this, the buyer of the CDS makes a series of periodic payments to the seller, in return, the latter receives an amount of money if the title that serves as the underlying asset at the CDS is not paid at maturity or the issuer incurs a cessation of payments.

² There are several ways to categorize fixed income instruments, and one of them is according to the rating of risk, it corresponds to a note that provide information about the ability of a firm to meet its financial commitments, which is granted by a sorter, such as Standard and Poor's, Fitch, Moody's, etc. In this case, it is called Investment Grade bond to those with the best risk rating, that is, they receive a note from AAA to BBB-.

³ It also corresponds to a category of bonds based on their risk rating. In this case, High Yield bonds are those who receive a note from BB + and C. Below the C classification are the default bonds corresponding to firms that have gone bankrupt.

However, in neither case would be the main variable. Finally, Collin-Dufresne, Goldstein and Martin (2001), who studied a basis of monthly data for US companies in the period between 1988 and 1997, and concluded that changes in the spread of corporate debt can be attributed to supply / demand shocks independently of credit risk and market liquidity risk. Whereas there is no consensus in the literature regarding how important are the systematic risk factors and market liquidity risk as part of the debt spread, there is in fact an agreement that the credit risk is one of its components, except Collin-Dufresne, Goldstein and Martin (2001). Considering this, our model will focus on variables related to the credit risk of the firm, since so far it is the only factor in which there is a majority consensus in the literature.

In the case of CODELCO, and as noted in Section I, the legal nature of this state enterprise prevents the capitalization of profits for new investment projects. The Decree Law 1,350, requires that all surplus of the company must be distributed to the Chilean treasury. In recent years, only 10% of company profits have been reinvested which corresponds to a quarter of what the industry internationally does (Source: Nelson Pizarro, CEO of CODELCO) to keep competitive in the company and make their structural projects.

Given these constraints on equity, the company has prioritized the issue of corporate bonds in the debt markets to finance their projects. In periods of relatively high copper price (until 2011, when it reached its peak), fears regarding high indebtedness of the company were minimal, since its equity is revalued on par with the increase in the price of copper. However, the fall in copper prices in the last year and a half has been about 80%. This reduction in the price of copper devalues the assets, generating a drop in operating income of the company and deteriorating the company's cash flow. Simultaneously, the credit risk of the company increases which is the result of these market events. Although ultimately CODELCO has a "lender of last resort" and assumes sovereign risk, the cost of financing abroad has begun to increase. This opens up a great debate in Chile about how to capitalize the company so that it can rush these structural projects that will maintain the competitiveness of the company in the international copper market.

We will develop the econometric model of its results, showing how these variables focused mainly on the credit risk of CODELCO may have an impact on the financial cost of debt.

IV. COMMENTS REGARDING THE RESULTS OF THE ECONOMETRIC MODEL

The analysis is performed with a sample of 51 data that are quarterly arranged and range from the second quarter of 2003 to the fourth quarter of 2015, and the goal is to measure the debt spread determinants from a credit risk perspective. Debt spread will be understood as the average of the difference between the yield of Codelco's corporate bonds issued abroad in dollars and their respective equivalent treasury for each quarter.

Among the explanatory variables, the variation in the price of copper is included, considering that much of the risk associated with the fulfilment of obligations should be related to the results of its operations, which in turn should be linked to the price of copper. Among the variables chosen to measure credit risk in this study, credit rating and distance to default (DtD) were considered. The rating corresponds to the risk rating assigned to each asset (bond in this case) that has been issued by the firm. It corresponds to the risk rating average given by the three major rating agencies, following the coding proposed by Covitz and Downing (2007) for credit ratings: AAA = 1, AA + = 2, ..., BBB- = 10, which in the case of Codelco, the following scale is presented:

Table 1. Risk Classification.

AAA	1
AA +	2
AA	3
AA-	4
A +	5
A	6
A-	7

Table 2. Codelco Risk Classification.

	Rating	Scale
1997 -	A-	7

2003		
2004 - 2012	A-	6
2013 - 2015	AA-	4

A positive relationship between the spread of corporate debt and risk classification is expected, since increasing the value on the scale also increases the level of risk which is expected to be reflected by a greater spread.

The company's default risk is measured using the probability of default calculated by Bloomberg, which is based on the distance to default (DtD) of Merton (1974), which assumes that the equity of a firm is a purchase option on total assets whose strike price is the value of its liabilities, so it follows that if the value of the assets is greater than or equal to the strike then the company does not enter into default. However, this method has the weakness that assumes that the company can only enter into default when there is a maturity of its debt. Because of this fact, Bloomberg methodology is applied, which assumes that the option is a one-year term, which places greater demands on measuring the risk of default.

With respect to liquidity risk, the variables are Cash over Total Assets and Maturity. Cash over Assets is defined as the ratio of the sum of cash and short - term liquidating assets regarding total assets, and indicates the issuer's ability to meet its short - term financial obligations. A high level of cash available on total assets indicates a profile with high liquidity in the funds available by the issuer. In general, it is expected that this variable is negatively related to the interest rate spread, assuming that low liquidity of the issuer implies that when paying their obligations they could also face high levels of financial stress. However, a level of cash on excessively high asset may represent high inventory costs, which in some cases could lead that above some level, a high level of cash implies an increase in the spread.

Maturity corresponds to the average term a corporate bonds is due for a given quarter. The idea behind this variable is that bonds with shorter time to maturity are more attractive (higher demand) so they could put pressure on the financial structure, requiring funds to be paid.

Considering the information above, the model has the following form:

$$spread = \beta_0 + \beta_1 Cu + \beta_2 DtD + \beta_3 Clas + \beta_4 Mat + \beta_5 CoA + \varepsilon$$

When analyzing the variables serial correlation problems are not found, however, after performing regression, Breusch - Pagan test is administered and heteroscedasticity problems are encountered, therefore the estimate is made using robust errors by the method of White (1980). Finally, the following results are obtained:

Table 3. Results of the model.

	Coef.	Std. Err.	t	P-value
CoA	319.2636	120.7154	2.64	0.011
Mat	-3.788338	1.590042	-2.38	0.021
clas	-7.979305	6.735167	-1.18	0.242
DtD	6004.891	966,536	6.21	0
Cu	-160.8321	38.53419	-4.17	0
Cons	150.6692	32.8354	4.59	0

The only variable that is not statistically significant is the risk classification, the result also contradicts the positive relationship expected, as intuition suggests that as the risk rating worsens (increases the number of coding) then the firm should have a greater spread, however, given the lack of statistical significance, there are no problems if this variable is removed to estimate the model (Appendix). The ratio cash to total assets relates positively, this is contrary to what is expected, since a high level of these liquid assets are associated with a good ability to repay debt therefore it should relate inversely with the spread, however, the increase in short - term assets could be also related to an increase in inventories, which could be perceived negatively by the market and explain the positive relationship observed. The relationship between the average maturity of the bonds and the spread is inverse, as the shorter is the maturity the more liquid are the bonds, since they are closer to be asked, which could put pressure on the payment ability of the firm, increasing the risk perception and therefore increasing the spread. The probability of "default" and the bond spread relate positively as expected. Finally, the price of copper is related negatively with the bond spread, which is in line with expectations, because if the price of copper

risks, one would expect an improvement in the sales of the company which reduces the risk of default, so the spreads should be reduced.

V. CONCLUSIONS

CODELCO represents a significant percentage of exports and tax revenues in Chile, which has been a company with a strategic importance in the economic development of this country. This is why it is expected that the financial management of the company may not be a trivial matter for the state, since its deterioration would have a significant systemic impact for the Chilean economy. However, evidence shows that not having a policy of capitalization of profits (reinvesting of earnings) affects the normal development and planning of new structural projects.

In addition, since the contributions provided by the State to CODELCO are not systematic and there is also no clear rule regarding the reinvestment of profits, then sporadic capitalizations have been the result of cyclical political pressure, rather than a clear guideline of long term investments, which should be based on reinvesting the company's revenues. As noted in Section II, only 10% of CODELCO's profits have been reinvested in the last decade. This has exacerbated the pressure for corporate debt issuance in international markets. While copper prices rose sharply between 2009 and 2013, levels of financial leverage (debt / equity) rose during that period to more than two times (Source: Codelco Financial Statements). Clearly the increase in copper prices served as collateral to support an emission level of more aggressive debt (Appendix 2, graph 5)

Then, being CODELCO one of the most important players in the copper mining world and given its relevance for the Chilean economy it is important to measure the impact on the financial spreads of CODELCO's debt, as a result of changes in factors such as the fall in copper prices and changes in credit risk. From the results of the implemented quantitative model, the debt spreads proved to be sensitive to variations in the price of copper, and also have an inverse relationship, indicating that a fall in copper prices will lead to an increase in the spread of debt, which is a sign that financial markets are able to see that these falls have adverse effects on the company liquidity, affecting the normal operating cycle and therefore it is manifested by a punishment to the value of debt issued by CODELCO (through an increase in the interest rate on its bonds). In relation with the effects of changes in credit risk of the company, these are measured through the Cash to Total Assets

variables, distance to default, the average maturity of debt and the results in general terms indicate that the perception of inventories excess may be consistent with a fall in demand for copper eventually manifest itself in falling prices, or excessive pressure on cash flows due to short-term payments, they increase the risk perception of investors, leading to an increase in spreads on corporate debt of CODELCO. Finally, it is striking that the risk rating of the company has no relation to debt spreads, which probably shows that investors perceive the company as a significantly important element for the treasury and the Chilean economy, if this experiences financial difficulties, they believe that the Chilean state will provide the necessary financial support (the existence of a “Lender of Last Resort”)

VI. Appendix 1.

Appendix 1: Correlation matrix of variables.

When analyzing the correlation matrix for potential multicollinearity problems, the following results are obtained:

Table 4. Correlation matrix.

	spread	Asset	Mat	clasif	DtD	Cu
spread	1					
CoA	-0.1243	1				
Mat	-0.3526	0.5079	1			
Clas	-0.3107	0.5516	0.7869	1		
DtD	0.6385	-0.2734	-0089	-0101	1	
Cu	-0.5275	0.0989	0.2739	0.2406	-0.0167	1

We found a significant correlation between the spread on bonds and the distance to default and also with respect to the copper price, considering that these two are expected to be variables able to explain the spreads of debt, the existence of this correlation is not a problem. An important relationship of risk classification is also observed with respect to the maturity of the debt, which can be explained by considering that increasing maturity of debt means that the firm maintains cash flows exposed for a greater amount of time, therefore it keeps most at risk.

Appendix 2: Regression

The p-value of the F statistic is zero, so also it is as a whole, while the coefficient of determination is 0.7507, so the regression shows an acceptable fit.

Table 5. Linear Regression Model Statistics.

F (4,46)	16.30	Number of obs.	51
P-value	0.0000	R-squared	0.7507

Appendix 3: Regression omitting the variable "risk rating".

When estimating eliminating the risk classification the following results are obtained:

Table 6. Model results excluding risk classification.

	Coef.	Std. Err.	t	P-value
CoA	291.7664	111.0473	2.63	0.012
Mat	-5.102809	1.474878	-3.46	0.001
DtD	5987.427	964.2696	6.21	0
Cu	-162.2871	37.24144	-4.36	0
Cons	139.2364	29.92111	4.65	0

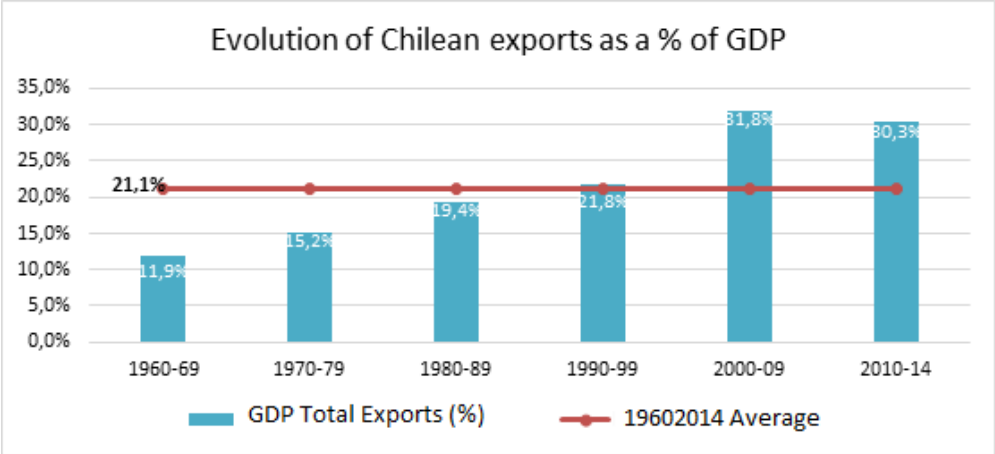
Table 7. Statistics for the model excluding risk classification.

F (4,46)	20.97	Number of obs.	51
P-value	0.0000	R-squared	0.7462

It is appreciated that the model has statistical significance for both individual variables and as a whole, whereas the determination coefficient undergoes a decrease which is negligible. As regards the signs of each variable, these remain equal to the original model, so the same conclusions are held.

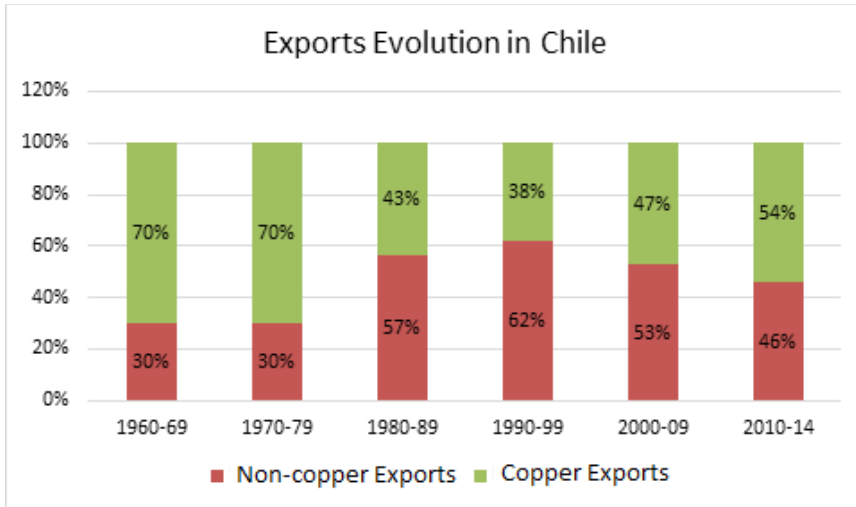
Appendix 2:

Graph 1: Evolution of Chilean Exports as a Percentage of GDP



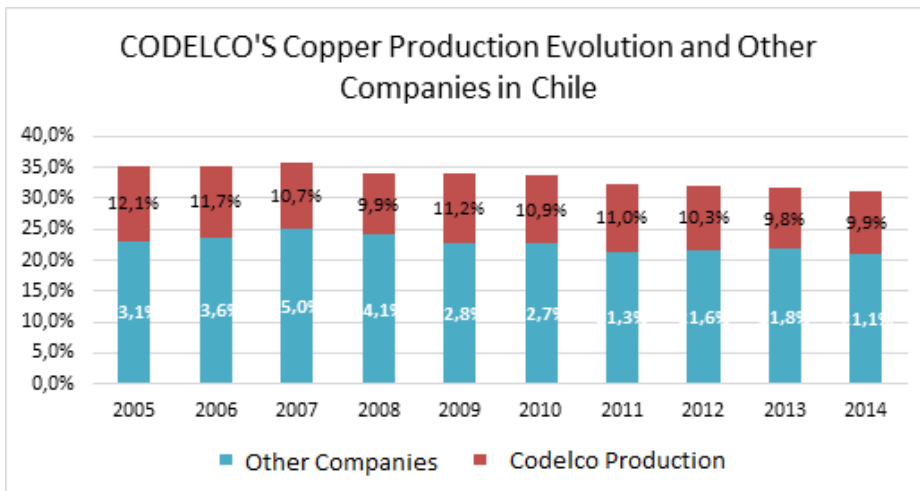
Source: Rodríguez et al. (2015).

Graph 2:



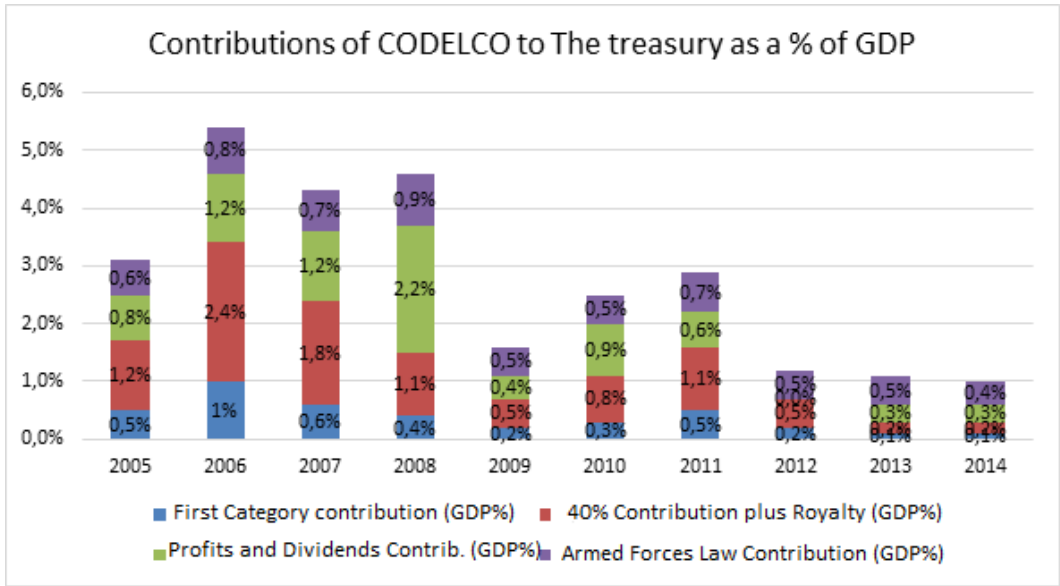
Source: Rodríguez et al. (2015).

Graph 3: Production of CODELCO as part of the total Chilean copper production



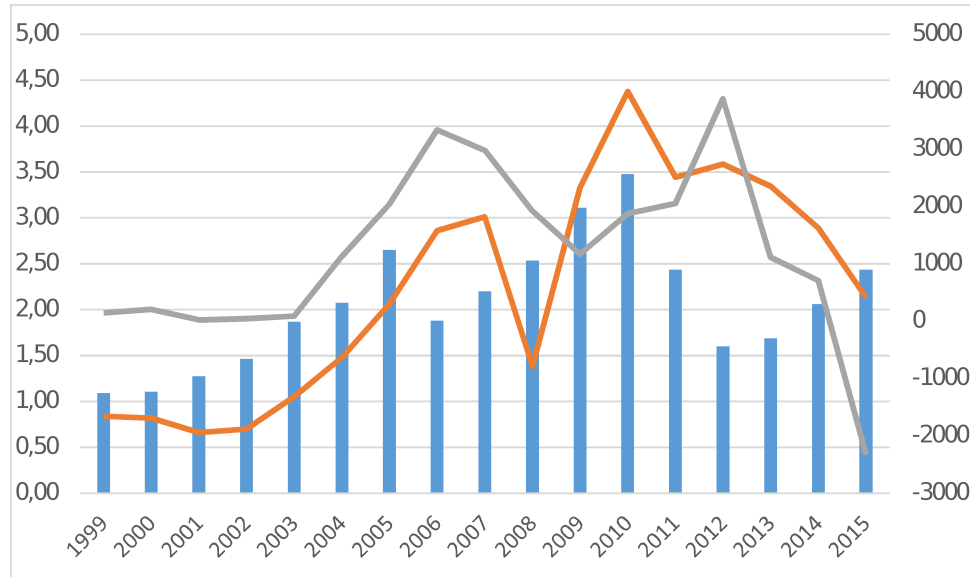
Source: COCHILCO (2014).

Graph 4: Contributions of CODELCO to the Treasury as a Percentage of GDP



Source: DIPRES (2014)

Graph 5: Financial Leverage and Profits



Source: Own elaboration. Based on Company's balance sheet

Grey	Profits of each year
Orange	Copper's price at end of each year

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