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Behind copper prices:
a historical perspective 1850 - 1950[1]

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Abstract

Commodity prices and their secular trends are at the core of many different development theories, particularly relevant for the Latin American region, like the Prebisch-Singer hypothesis, the natural resource curse theory or the somehow malthusian scarcity prediction. In this article we review the international copper price indices available in the literature and we compare them with a new data set, elaborated from the Official Foreign Trade statistics of one of the main copper producers (Chile) This data has included information on value added and several price/volume indicators allowing to elaborate a more accurate copper price estimation in the long run. This information will enhance our knowledge on commodity prices, mineral trends and structural change.

Key Words Copper prices, product diversification, Natural Resources, Price Indices

JEL-Codes: N16; N50; Q32;

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1 Introduction

Commodity prices and their secular trends are at the core of many different development theories, particularly relevant for the Latin American region. At first, there is the famous Prebisch-Singer hypothesis, which considers a constant decline on terms of trade for countries specialized in raw materials. New works based on improved data analysis have found mixed results, showing that there are major differences among commodities, periods and regions. It has to be said that the export commodity prices is only one part of the Prebish-Singer hypothesis, namely the numerator in the case of underdeveloping countries. Terms of trade are also being determined by the evolution of prices of manufactures imported, a matter that has not been so commonly studied in the literature. Additionally, a country migh explore diversification of its export portfolio as long as it experiences a downward on the price of the main commodity exported. Without denying the relevance of the previous considerations, it remains clear that the price of some commodities have strongly influenced the terms of trade of Latin American countries in the long run. Regarding the evolution of prices in the long-run for non-renewable resources the empirical evidence is less ambigous and it usually shows a persistent downward picture. In contrast, econometric estimations of the Prebish-Singer hypothesis are far from any consensus, results differing a lot depending on the equation specified and the consideration of the integration properties of the commodity price series (Ocampo & Parra-Lancourt, 2010). Commodity prices or more precisely its volatility, also play a crucial role in the theories of the "natural resource curse", being one of the mechanisms through which a country can be trap in a backwardness path (Keay, 2015; Ploeg, 2011; van der Ploeg, 2017).

For environmental studies, the long-run commodity price trend has been used as an indicator of increasing scarcity, of non-renewable resources. In that case, the empirical evidence has not given clear support to the scarcity prediction as prices show a downward trend instead of a U-shape trend predicted by the theory. Conversely, the fall of prices in the long run gives support to the Prebish-Singer Hypothesis. Works focusing copper prices, as an example of the scarcity paradox, have highlighted the importance of non-market factors and the endogeneity of technological changes (Brown & Wolk, 2000; Mueller & Gorin, 1985), the counterbalancing role of inventories (Bresnahan & Suslow, 1985) or the misleading use of the USA producer price index as a deflator for the price series (Cuddington, 2010; Svedberg & Tilton, 2006).

In this article we will revise copper price indices and we will compare them with new data, elaborated from the Official Foreign Trade Statistics of one of the main copper producers (Chile). This data has information on value added and several price/volume indicators allowing to elaborate a more detailed copper price estimation in the long run. This information will enhance our knowledge on commodity prices, mineral trends and structural change.

The paper is organized as follows. In a first section we briefly describe the main features of the copper market in the long run. Next section presents the particularities of the copper sector in the chilean economy. A third section analyses the copper price series as well as other indices available from previous works. In the fourth section we explain the methodology we propose to obtain a new serie of copper prices, which includes variety in qualities, in stages of processing and of country of origin.

2. Copper: a global commodity in international markets

(Evans & Saunders, 2015) analyzed the changes in the copper market after 1830, when a major technological breakthrough occurred as the extraction and the smelting became geographically detached allowing for the emerging of a global ore trade, where Chile was an important player. It was the heyday of the Swansea region, hailed as "Copperopolis" in the Victorian era, thanks to three main factors: coal diposits, the reverberatory furnaces, which allowed the use of heterogenous minerals in contrast with the thechnology used in continental Europe, based upon homogeneous minerals, and seaborne ore. The region accounted for over 40% of the world's smelted copper during the first half of the 19th century (Evans & Saunders, 2015).

Ore trade became global thanks to lower transport costs as well as a significant reduction in the British tariff regime adopted in the 1820s. From circa 1830 to the 1860s, in trade volumes, it was dominated by Latin America, Cuba overcoming Chile only between 1840-1860. From 1840s onwards, South Australia also played a role and Cape Town was in the game since 1850. Tariffs played a role into that change, as between 1842 and 1848, British laws penalised foreign copper importation, outside the Empire. Nonetheless, Chile was resilient until the 1890s, although British North America and British South Africa overtook it (Llorca-Jaña, 2017, p. 33). In terms of trade values, Cuba overtook Chile in the early stages, meanwhile Australia was at the front since the 1840s until 1860s (Evans & Saunders, 2015).

This world of copper centered in Wales collapsed in the aftermath of the American Civil War, wich fostered an increase on copper prices due to the war, giving birth to a more dispersed geographical pattern for the smelting sector afterwards. It followed up also the beginning of the US copper sector and the re-organization of the global production. The benefits of "native copper" in the US were reinforced by a high tariff against foreign copper adopted in 1869. The sector experienced huge technological changes in North America regarding the energy sources, with the electrolytic refining; the methods of extraction, with the adoption of non-selective techniques called "mass destruction" methods; and in its size, with vertical integration processes and the emergence of big corporations. Even in Britain there were significant geographical as well as technological changes. Liverpool replaced Swansea and copper emerged as a by-product in the chemical industry. Before the final third of the nineteenth century a revolution took place in the copper consumption, in the form of tubing of steam locomotives, in telegraphic cabling, in the roller-printing of cotton and in the generation and transmission of electrical power (Evans & Saunders, 2015).

Copper is a non-renewable resource, and as such, in the long-run, its price should theoretically follow an upward trend due to increasing scarcity driven by geological depletion and quality exhaustion. Nevertheless, empirical evidence does not give clear support to this prediction. Many scholars have tried to explain the lack of concordance between the theory and the empirical evidence. According to (Mueller & Gorin, 1985), from 1870 to 1972 the evolution of copper prices was mediated by three main factors: monopoly power and cartels, tariffs and subsidies and wars. There were some periods trough which market prices were distorted, either manipulated by the authorities or from collusive firm practices: 1870-83, 1888-90, 1900-01, 1914-18, 1929-35, 1939-57 and 1962-64. But it was the technological change from the 1900s, i.e. the rapid and extensive use of open-pit mining methods by the gradual shift to nonselective processing techniques, that interfered the most into the influence of scarcity on long run prices. In that sense, increasing scarcity of non-renewable resources have been counterbalanced by technological shocks that have increased natural resource availability, something that resembles the Malthusian prediction's flaw in the awakening of the industrial revolution (Brown & Wolk, 2000).

Notwithstanding, (Svedberg & Tilton, 2006) find an alternative explanation based on the use of wrong deflators. Estimating such errors with an adjustment of 1%, their price serie shows that the real price of copper has trended upward over the past 130 years, vanishing the Prebish-Singer Hypothesis and giving more support to a kind of malthusian pessimism. Aside from this particular correction, the authors question the existence of one constant secular trend for copper prices assuming that the long-run trend has changed from time to time due to new end uses for copper, the appearance of close substitutes, the adoption of technological innovations, and the structural changes of the world economy. According to them, the trend was more or less constant between 1870 and World War I, fell over until mid-1930s, rose again until the early 1970s, and since then has fallen. Their results are based on a modified deflator on the LME price index (Svedberg & Tilton, 2006). (Cuddington, 2010) using a deflator's quick correction method, conclude that for any inflation-bias correction between 0 and 2%, the real price of copper from 1870 to 2006 is trendless, given the large volatility in the real price series. From 1800 to 2003, (Harvey, Kellard, Madsen, & Wohar, 2010) find also a zero trend for copper prices. Neither Prebish-Singer or Malthus seem to have enough empirical support, in those cases. Aside from the non-existence of any price trend, the authors previously mentioned also identify a long-run cyclical component, which is of 28 years in average for the copper case (Harvey et al., 2010).

(Arezki, Hadri, Loungani, & Rao, 2014) test the Prebish-Singer Hypothesis for 25 commodity prices, including copper. In the case of this mineral, they find 3 structural breaks on the period 1872-2005, placed in 1898, 1946 and 1974 (Arezki et al., 2014). Surprisingly, they find no breakpoints in the volatility of the serie for the whole period considered, i.e. it has remain high since the beginning (Arezki et al., 2014). (Bresnahan & Suslow, 1985) have analysed the high volatility of copper prices, based on the LME serie, for the period 1958-80. They linked it to the holding of inventories as the main reason to diverge from the expected exhaustivity trend, arguing that inventory holding can neutralize the rise of long-run marginal costs in the extracting sector by anticipating price increases.

3 Copper and the Chilean economy: a long run persistence

In the Chilean case, copper has been resilient since the colonial times. During the colony, copper was of minor importance, gold and silver being the main minerals exported. At that period of time, the main destination for Chilean copper was Asia but after independence, it was gradually

redirected to Britain increasing at the same time its participation on the export basket. Traditional technology was combined with British innovations in the 1830s allowing the increase and diversification of its exportation which experienced a boom in the early nineteenth century. Copper was the main good exported from Chile to Britain during the last half of the nineteenth century (see table 1). It was gradually losing importance in favour of the exportation of wheat and flour, but it remained the main good exported until the 1880s. Although Britain was not the main destination of Chilean copper in the 1840s (35%) staying behind US (44%), it was at the first position in the last half of the nineteenth century with a share between 59% in 1850s and 74% in 1890s, with a maximum of 89% in 1870s (Llorca-Jaña, 2017). Clearly, the British market has been crucial for the copper age of Chile.

Table 1 - Copper share over total British importation from Chile, in values.

1854-59	1860-69	1870-79	1880-89	1890-99
71%	74%	67%	51%	24%

Source. (Llorca-Jaña, 2017), based on the Official British Foreign Trade Statistics

The reverberatory furnace was introduced into Chile in 1830s starting a modern smelting sector that was eased by domestic coal production as well as imported British coal. The modern smelting sector coexisted with one of traditional wood-burning technology without external investment. As a consequence, although most copper exports were ore, significant volumes were smelted locally using both traditional and modern methods. In fact, the first Chilean export to Britain was copper bars in 1821 (Llorca-Jaña, 2017). Furthermore, Chile was prominent and almost hegemonic into the export of "regulus", i.e. a copper matter with a metallic content of 40 to 50%, wich implied to retain preliminary processing within Chile (see Table 2). Regulus was especially profitable at times when ore prices were falling or its quality was declining. Chile was particularly involve into the regulus' exportation because that was a strategy to minimize higher transport costs. Ore was heavier than regulus, because it included more stone. Chilean regulus was at the forefront of British importation until 1880, accounting for more than the 80% of the British importation of that kind of copper between 1850 and 1870, in volumes. The share diminished to 65% in the 1870s due to the Spanish competence. It was in the last two decades of the 19th century when Chile lost its first position in favour of Spain, US and Portugal. Chilean refined copper was also important in the British market between 1830 and 1890 (Llorca-Jaña, 2017).

Table 2 - Chilean share over British copper importation, by type of product. Shares on volumes.

	1830-39	1840-49	1850-59	1860-69	1870-79	1880-89	1890-99
Ore	35%	23%	27%	26%	8%	1%	11%
Regulus			83%	88%	65%	9%	3%
Refined Copper	50%	66%	49%	63%	64%	58%	25%

Source. (Llorca-Jaña, 2017), based on the Official British Foreign Trade Statistics

Table 3 - British copper importation from Chile, by product. Shares on values.

	1854-59	1860-69	1870-79	1880-89	1890-99
Ore	33%	15%	4%	1%	13%
Regulus	40%	39%	28%	13%	11%
Refined Copper	27%	46%	68%	86%	76%

Source. (Llorca-Jaña, 2017), based on the Official British Foreign Trade Statistics

Table 3 shows the composition by product of British copper importation from Chile. Data starts in 1854, due to lack of accuracy related to values for previous periods. In the first decade, ore was important but not so much as regulus, and it was not so far from refined copper. In the following periods, the lower valued item was clearly losing path in favour of the most valued ones. The increase of bars was due to a tariff change in Britain in 1848. This clearly point outs to the strong capacity and competitiveness of the smelting industry in Chile in the nineteenth century. Chile was constantly adapting to the variability in the relative prices of different types of copper as well as the tariff changes ocurring in Britain. The data in tons allows to enlarge the picture to previous periods of time (see table 4). During the first half of the ninenteenth century, Chilean copper sent to Britain was mainly composed by ore. It was from the 1850s onwards when the value added began to increase.

Table 4 - British copper importation from Chile, by product. Shares on volumes.

	1830-9	1840-9	1850-9	1860-9	1870-9	1880-9	1890-9
Ore	97%	95%	57%	34%	11%	4%	39%
Regulus	0%	0%	32%	43%	42%	22%	12%

Refined Copper	3%	5%	11%	23%	47%	74%	49%

Source. (Llorca-Jaña, 2017), based on the Official British Foreign Trade Statistics

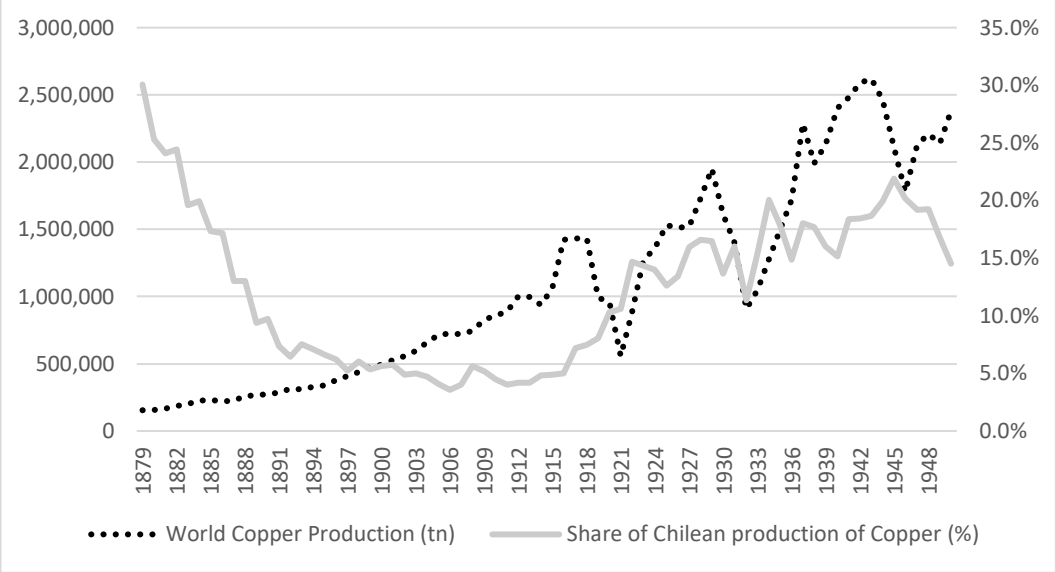
Between 1830s and 1870s, there were also close links between the mines in Australia and Chile. For instance, Chilean mules were transported to Australia in order to be used on land routes to the sea (Davies, 2017, p. 112). The previous tables, have shown the composition of Chilean copper exportation to the British market, but if we focus on the domestic production, smelting appears as an earlier phenomenon. Between 1844-49, it is estimated that 60% of the production was in form of bars, regulus represented a 21% and ore only 19%.

In that sense, Chile would have been the second world copper smelter, behind the British. Such a success has been explained by a wide array of factors by the Chilean literature, summarized as follows: 1) The adoption of technological innovations from Wales (reverberatory furnace) financed by British capitals and which implied an inflow of technical staff from Britain; 2) The previous colonial tradition in copper smelting, with labour intensive technologies; 3) A British tariff against the importation of foreign copper ore, which was an incentive to move to higher value added types of copper; 4) An increase of the smelting copper prices in the international markets in the last decades of the nineteenth century; 5) The adoption of a free-tariff import's legislation for foreign coal in Chile since 1845; 6) The widening of the privilege of dealing with foreign coal, that was previously only given to the ports of Valparaiso and Coquimbo; 7) The development of domestic coal production which began in 1840s; 8) The Chilean ownership of the copper mines, and the affluence of foreign capitals, mainly British, to the smelting industry and trading activities; and 9) Improvements in local transport within the country that lowered the price to move copper as well as coal, mules being replaced by railways in the 1860s.

The production of copper bars in Chile preceeded its irruption in the British market, a fact that indicates the role played by third markets, an issue that has not been so well explored into the literature. According to the first Chilean trade statistics, US was the main partner for copper bars, and France would have been a second player before 1844. US was again a salient importer of copper bars in the 1850s and 1860s, although it also imported ores in significant amounts at that period. France, Germany and China were secondary markets for Chilean copper bars (Llorca-Jaña, 2017).

The Pacific War marked the end of the copper era in Chile, driven mainly by a huge drop of the international prices. The increase of copper production in US and Spain created an overproduction at that point. That coincided in time with the depletion of the high quality copper reserves in Chile and the exploitation of lower quality mining veins. Additionally, copper lost competitiveness due to high taxes, as copper had been an important fiscal source for the Chilean State, and it also suffered from technological backwardness, caused by the incapacity to adopt the new US technologies. As a consequence, from 1880 to 1930, copper was replaced as the main commodity in the Chilean export basket by saltpeter. The higher wages paid by the nitrate sector caused a labour migration from the copper regions to the new mines in the North of the country.

Figure 1 – World Copper Production (tons) and Share of Chilean production over Total Production



Source: Diaz et al (1998), SONAMI (1903), Copper Statistics. US. Geological Survey (2010).

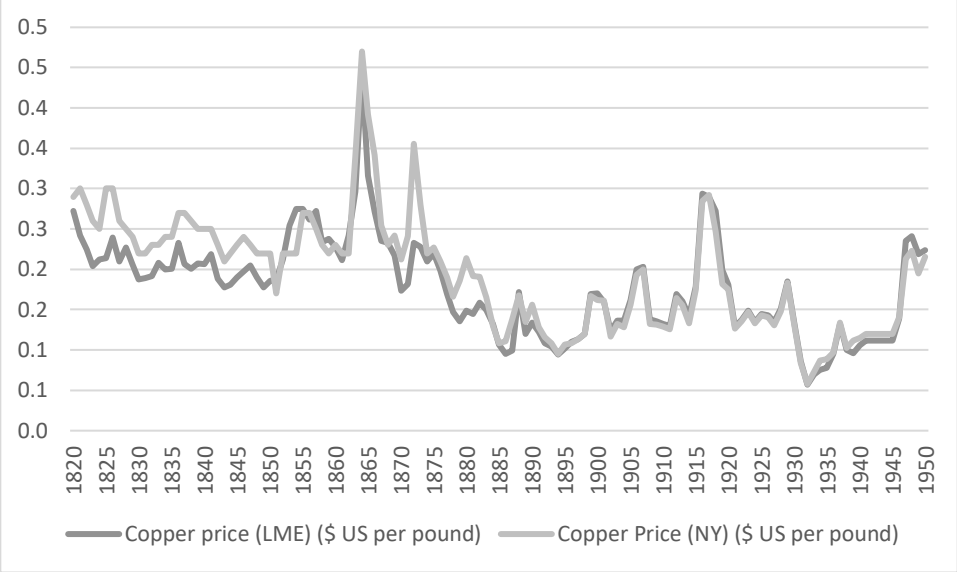
But even during the nitrate golden era, copper did not completely disappeared (see figure 1). Copper arised again in the 20th century, especially after World War II, thanks to US-based firms, and from the turn of the century, it drove the commodity price boom, due to the Asian demand (Badia-Miró & Díaz-Bahamonde, 2017). Around two centuries later, Chilean copper has somehow fullfilled the circle, returning to the Asian markets as its main destination. Nonetheless, the scale of the trade between those two distant periods of time, is significantly different.

4. A puzzle: Is there one single price for copper in the long run?

As it has been seen in the previous section, the treatment of copper as a homogeneous good can be misleading, as it is an heterogenous good whith a variety of stages of processing from crude ore to copper bars, including regulus. We can find it in very different forms in the records of trade statistics, although the aggregations do not always allow to identified each particular kind of copper in the same way in different countries. There are also huge variations regarding the level of detailed information through time. (Llorca-Jaña, 2017) has emphasized this issue by comparing the British importation data with the Chilean one for the period 1830-1880. In a similar vein, (Peres-Cajías & Carreras-Marín, n.d.) have highlighted the statistical accuracy concerns that arise from differences in qualities and stages of processing for the particular case of the Bolivian tin exports.

In contrast with the previous considerations, most of the literature usually treat copper as a homogeneous good, because by "copper" they chose a very specific "type of copper". For instance, (Svedberg & Tilton, 2006) analyze the copper price evolution between 1870 to 2000, but they really focus on "refined copper" which is composed by 99% pure copper. That is not a minor choice, specially for a long-run analysis. These authors use the London Metal Exchange copper price index (LME) which includes the following types of products: a) 1780-1879: "Tough Copper": fire-refined averaging 99,25% copper: b) 1880-1914: "Best Selected Copper": fire-refined averaging 99,75% copper; and c) after 1914: "Electrolytic wirebars": averaging 99,99% copper. Another price index for copper is COMEX which is the primary market for trading metals such as gold, silver, copper and aluminum. Formerly known as the Commodity Exchange Inc., the COMEX merged with the New York Mercantile exchange in 1994 and became the division responsible for metals trading. Figure 2 shows the evolutions of those two price series from 1780 to 2016.

Figure 2: Copper price indexes. 1820 – 1950



Sources: LME Real and COMEX real from cochilco.cl, accesed May 15, 2017.

In contrast with the previous price series that assumed copper as being a homogeneous product,we focus on heterogeneity in three senses:

a) Differences in qualities (i.e. different grade of ores)

b) Different stages of processing: ore-regulus-bars, etc.

c) Geographical differences: current indexes used US prices because they assume that the market was integrated the whole period. This is not necessary true as there were deglobalization periods as well as control price measures. That allows the interference of trade costs (transport costs plus other trade cost as for instance tariffs) on copper prices.

One possible way of solving the heterogeneity puzzle is to consider the grade of the product and convert it into fine copper, moving from heterogeneity to homogeneity. In fact, most authors consider this proxy to obtain the total copper production of a country or its exports (in values), mutiplying the pure copper content conversion, in wheight, by the international price of copper (namely NY price or London price).

5. Introducing heterogeneity and history: a new copper price index

A deeper analysis of the evolution of the copper sector in Chile, one of the main producers of this product, shows that the conversion to pure copper through its grade, as a shortcut, causes significant biases. When we compare the prices of different copper products in this country (i. e. bars, axes and ore copper), we realize that prices remain diferent, even after considering the conversion to fine copper through the content of pure copper in each product as shares measured in its grade. In that sense, it seems that low processing products had a price penalty due to the fact that low grade products have lower prices than the ones expected (see table 5). That makes sense as extracting the non-mineral content is not a cost-less task, meaning that the more pure types of copper should have a higher price or which is the same, the more crude types should have a lower price.

Table 5 – Copper prices by product in Chile, 1908-1909

	1908		1909		
	Quantities (Kg)	Values ($)	Quantities (Kg)	Values ($)	Grade
Bar copper	20,486,632	14,690,625	19,229,064	12,762,389	100%
Copper axes	9,052,603	2,868,743	8,349,640	2,147,128	50%
Ore copper	64,684,579	7,037,233	77,878,903	6,942,940	19%
Fine Copper (kg)	1908	1909			
Bar copper	20,486,632	19,229,064			
Copper axes	4,526,302	4,174,820			
Ore copper	12,290,070	14,796,992			
Price ($/Kg)	1908	1909		1908	1909
Bar copper	0.717	0.664		1.000	1.000
Copper axes	0.634	0.514		0.884	0.775
Ore copper	0.573	0.469		0.799	0.707
Average	0.641	0.549		0.894	0.827
Weighted average	0.666	0.587		0.929	0.885

Source: Estadística Minería y Metalurgia. 1909.

Our example of table 5, shows that even correcting by the grade of the product, the price of each copper type varies among different processing levels. In that sense, the price of products with less processing were between 20% and 30% lower than prices of higher processing products (namely the international prices reported).

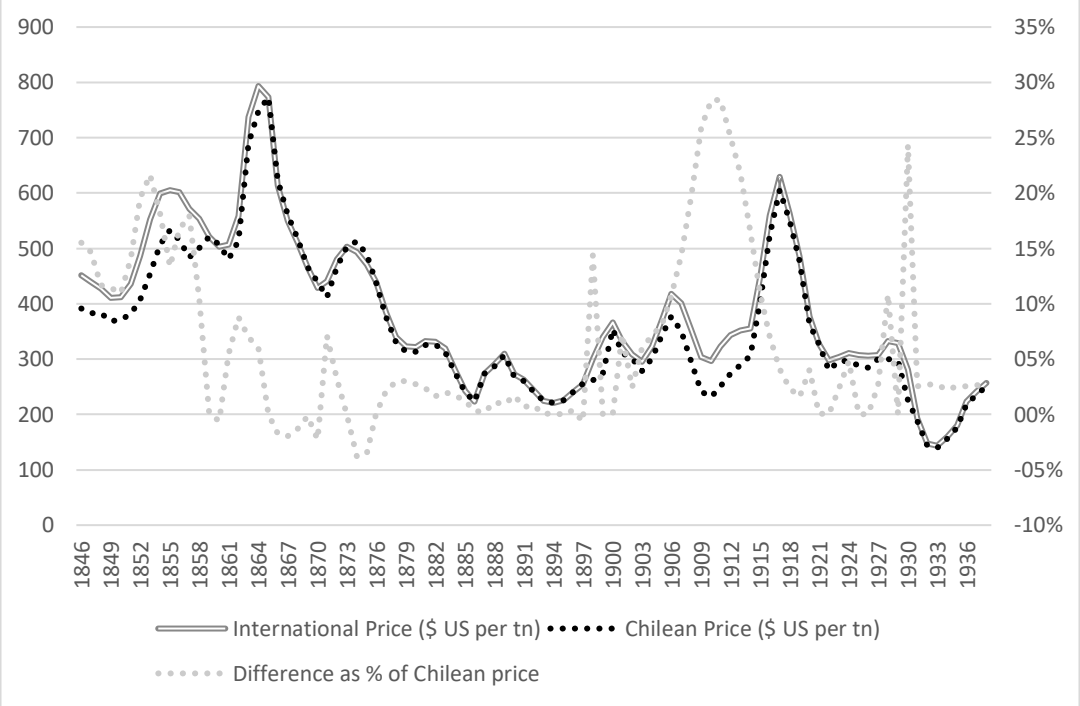
Considering this bias, our contribution here is the construction of a corrected price series for Chile, considering the level of processing of the products produced in this country, as a case study. To do that we consider the figures reported by the Chilean foreign trade statistics for three products: ore copper, copper fine bars and copper axes for the period 1844-1950 (in values and weight). In each

year we have built copper prices by product and a unique copper price considering the three products, wheighted by the share of each product over the total and the price premium for each product, from foreing trade sources. That is:

$$Chilean\ Copper\ Price = Cu_{US} \cdot \left[\frac{\%\ Fine\ Copper\ in\ Bars}{Fine\ Copper} + \frac{\%\ Fine\ Copper\ in\ Axes}{Fine\ Copper} \cdot Premium_{Axes} + \frac{\%\ Fine\ Copper\ in\ Ore}{Fine\ Copper} \cdot Premium_{Ore}\right]$$

At the beginning of the period, when the share of bars was small, the "Chilean" price was below the international price. But we observe a reduction in the difference between both prices during the First Globalization, and huge oscilations during the First Wold War and the Great Depression. (see figure 3). We have also plot the share of the differences in order to highlight its importance on specific periods of time.

Figure 3 – International Price for Copper and Chilean price for copper corrected by stagel of processing ($US per ton)

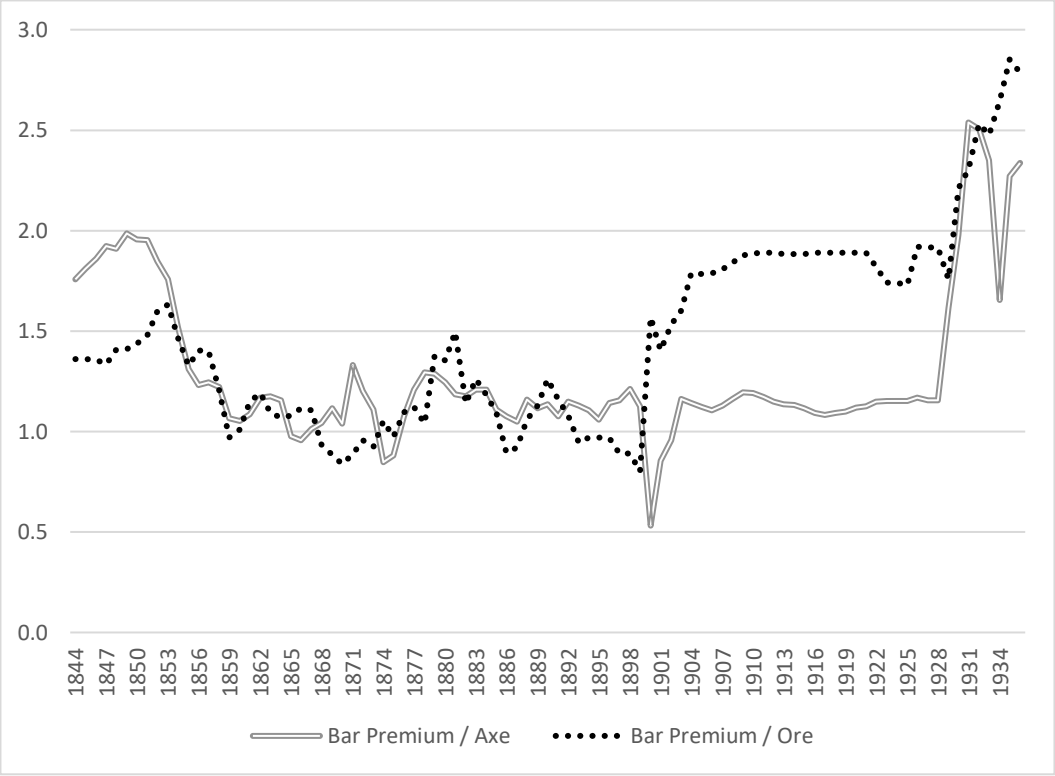


Source: Diaz et al (1998) and Estadística Minera y Metalurgia (1909).

The next step has been to built a new Chilean copper price considering the total value of exports from Bars, Axes and Ore to compare it with official copper prices and, as a result, to check the importance of transport costs in the analysis of copper prices in the long run.

Moreover, we have also built an index of price premium comparing copper bar prices with ore prices. This is important because althought those products have been considered related products, they are not equal products, even considering the correction of the grade. And this is related with the creation of value chains in the long run. We consider Chilean Foreing Trade statistics to obtain our serie in the long run.We can clearly see in the figure that the differences on both prices are not significant between 1856 and 1900, but the contrary is true for the previous as well as the later period.

Figure 4 – Price premium for Bars over Axes and Ores in Chile, 1844-1938

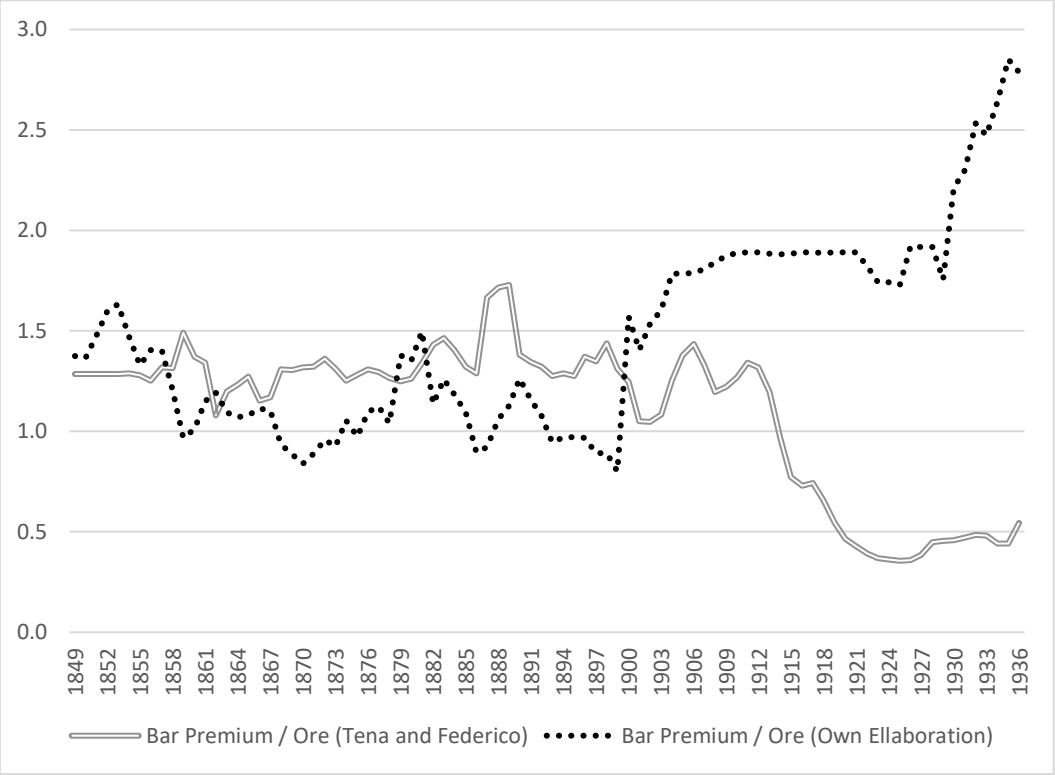


Source: Official Trade Statistics

To check the robustness of this results, we use an alternative methodology to check the reliability of using international prices as a proxy. We have considered the prices of products of different levels of processing, proposed by Tena and Federico (2017), that is English Tough Cake (for highly

processed copper) and Copper Ore (for low processed copper) to obtain the price premium and we compare it with our own figures. We have corrected the Copper Ore price with the grade of copper of this product, obtained from Chilean sources, and we have compared it with the Chilean Bars Figures (see figure 5).

Figure 5 – Price ratio between English Tough Cake (highly processed copper) and Copper Ore (low processed copper), both corrected with the content of pure copper or its grade.



Interestingly, the price premium remained quite stable until 1900, as it was expected due to the high costs of processing at that period. After 1918, the premium increased due to the shock of the war, the existence of cartels wich affected international prices, and also the adoption of tariffs to higly processed products in the industrial countries. If we assume the copper product composition for Chile, we can obtain an international price for this country correcting the price by the share of high quality cooper and by the share of the low processing cooper and its penalty. Interestingly the two series, not having evolve exactly the same for the first decades, do not follow the same path after 1900 showing a divergent evolution. Meanwhile the serie constructed with Chilean information show an increase of the premium price for bars (an incentive to improve the value-added of exportation) the serie built from international prices show the opposite path (a

reprimarization incentive). When comparing it with the real evolution of the composition of the Chilean copper exportation, showed in a previous section, the first serie fits better (see for instance table 4)

Conclusions

The long run evolution of the prices of raw materials is the core for crucial development theories and historical interpretations as the Prebisch-Singer Hypothesis, the scarcity theory or the law of one price during globlalization periods. At the very base of the empirical evidence used on the series to check those different theoretical frameworks a strong assumption has been broadly imposed: the homogeneity of commodities. We arise some fundamental doubts to this assumption based on copper exportation prices from the Chilean Official Trade Statistics. The main question we have posit here is about when we refer to an international copper price on the long run, what type of copper we are refering to. Chilean data shows important differences in terms of quality of the mineral, stages of processing or additional costs as transports costs or tariffs. Taking into considerations the heterogeneity of the Chilean copper exportation we propose a way to measure the price premium of exporting more valued-added types of copper (or the price penalty of exporting crude copper). Comparing those price premiums with the international price series available significant differences arise that can change our understanding of the evolution of paticular time periods or specific country cases.

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