Agrarian functional income distribution in Chile (1870-1915): First Globalization, land frontier expansion and capital formation

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Abstract

The aim of this paper is to contribute with new estimates of income distribution in Chile during the First Globalization. Recent literature stays three stylized facts of the period for natural resources abundant economies: productive expansion, worsening in the income distribution and de-industrialization. Our research offers new estimates in terms of the second issue with the objective to discuss the usual interpretations and propose new views about the topic. Afterwards to discuss methodologically our indicators and decisions, we present original estimates of functional distribution in the agrarian sector (shares of wages, rents and profits on total sectoral income). Finally, we discuss briefly the results and propose some conjectures that constitute new hypotheses to advance in our current research.

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Introduction and motivation

Literature about the First Globalization and the expansion of the Atlantic economy from the mid-19th century to the 1910s stays that the three main stylized facts of the peripheral and abundant natural resources economies are: (i) economic expansion based on a model of export-led productive growth; (ii) worsening in the income distribution; (iii) and a de-industrialization process (higher intensity of primary production).

Recent studies have reviewed these results in the light of new evidence and the application of different theoretical frameworks. More detailed statistics and renewed ways of looking old issues have confirmed, discussed and rejected several of the more common assertions to enrich the analysis and improvement our comprehension of different historical realities.

Our research offers new estimates in terms of the second issue with the objective to discuss the usual interpretations and propose new views about the topic. We focus our analyses on the economic evolution of Chile, an economy that combined an initial agrarian expansion (which was the pattern in the settler economies) with the mining exploitation in large scale (copper and nitrates). Several atypical characteristics make the Chilean economy a very attractive case study.

Our main concern is about methodological issues and is oriented to the elaboration of adequate indicators to study some dimensions of the income distribution process during the period. We present original estimates of functional income distribution in the agrarian activity –shares of wages, rents and profits on total sectoral income– and discuss briefly the results to propose some conjectures about the evolution of the inequality in the sector. These conjectures will constitute new hypotheses to advance in our current research.

After this introduction, we present the debate about the First Globalization and the economic performance of the natural resources abundant economies (Section 1) in terms of stylized facts and the main interpretations. Then, we present the new estimates of the functional income distribution in the agrarian sector (Section 2) including a conceptual presentation, methodological issues and the results in terms of three scenarios (according to three assumptions about the evolution of the land prices). The comments are present as highlights that will constitute new hypothesis in next steps of the research (Section 3). Finally, we conclude and propose our research agenda.

1. First Globalization and natural resources abundant economies: the debate

1.1. Stylized facts

The period 1870-1914 was a real “golden age” for the natural resources-abundant economies. Industrial Revolution was at the root of the expansion as a technological revolution that changed

social and economic relationships on a world scale. The Industrial Revolution started during the second half of the 18th century in Great Britain and spread slowly to the continent during the next hundred years, transmitting technological growth impulses from the core to the peripheral areas. However, by the middle of the 19th century only France and Belgium had adopted some of the main features of modern manufacturing

The integration of world markets for commodities and factors during the first great globalization boom was one of the most important processes for the world economy in the last two centuries. The liberal dismantling of mercantilism and the transport revolution together generated global markets during the 19th century. After the 1870s anti-globalization policies arose, but they were not large enough to cause a return to the 1820 levels of economic isolation. Mass migration remained unrestricted until the end of the century (although the immigrant subsidies disappeared) and global capital markets became steadily more integrated as European investors perceived important growth prospects overseas.

Recent studies by Lindert, O'Rourke, Taylor, and Williamson on globalization, growth, and inequality provide a prolific line of research and generate a debate about topics that are of great importance to better understand the expansion of the Atlantic economy during the period (Lindert & Williamson, 2001; O'Rourke, Taylor & Williamson, 1996; O'Rourke & Williamson, 1994, 1999; Taylor & Williamson, 1997; Williamson, 1995, 1996, 1999, 2000, 2002). The authors argue that the template regions with scarce population, exposed to the effects of the First Globalization, took advantage of being abundant in natural resources.

Their economies grew quickly from the last decades of the 19th century to the WWI encouraged by international conditions of dynamic demands and flows of factors of production (labor and capital). However, *"the blessing* [of their natural capital] *was diabolical"*[1] as it was associated with a persistent worsening of the income distribution. Economic growth and evolution of inequality were characterized by a combination of technological and institutional factors that showed several differences within the "club" of the economies of recent settlement.

1.2. Interpretations: contributions and limitations

Within the Factor Proportions approach, the Stolper-Samuelson theorem from the Heckscher-Ohlin trade theory predicts that free trade increases incomes of the abundant factor economies and reduces incomes of the scarce factor regions. Given a situation where labor works the land and each economy takes prices of commodities as given by world markets, movements towards globalization –through trade and commodity price convergence– favour incomes of workers (in relation to

[1] Barran y Nahum (1978):189 (own translation).

landowners) in places where labor is abundant and land is scarce, whereas in places where labor is scarce and land is abundant relative incomes of landowners are favoured. Considering that the labor retributions in labor-abundant and land-scarce economies were initially lower than labor retributions in labor-scarce and land-abundant ones, and that the contrary happens to landowners, globalization in a pre-industrial environment leads to a levelling of world income (O'Rourke & Williamson, 1999).

"The inequality-globalization connection in the nineteenth century can be summarised this way: globalization seems to have had an inegalitarian effect in (initially) land-abundant countries, a force raising inequality by rewarding landowners more than workers; and globalization seems to have had an egalitarian effect in (initially) land-scarce countries, especially in those that stuck with free trade and resisted pleas for protection. These two effects might appear at first glance to cancel each other out when aggregating up to the Atlantic economy as a whole. But a longer look tips the scales in favor of net egalitarian effects when we note that European landlords at the top of the Atlantic income distribution lost the most while European unskilled workers at the bottom gained the most. A lot of the rest was simply New World 'churning' in the middle." (Lindert & Williamson, 2001:13).

The impact of mass migration reinforced this trend. Real wages and living standards converged across the Atlantic economy from the mid-19th century to the WWI. This process was driven by the reduction of the wage gap between the New and the Old World. Besides, many European nations, particularly the poor, were catching up with the economic leaders in Europe (industrial countries). Migration affected long-run equilibrium output and wages through changes in aggregate labor supply, increasing wages in countries with high emigration rates and reducing them in migration recipient countries.[2]

Capital flows introduced an anti-convergence force (in the sense of the Lucas Paradox) because they moved towards rich countries, instead of poor ones, in pursuit of abundant natural resources, young populations, and the (potential) abundance of human capital (Clemens & Williamson, 2004).

The research about inequality trends within countries that participated in the global economy looks at two kinds of empirical evidence. On the one hand, it considers trends in the ratio of farm rents per unit of acre to the unskilled wage rate (*R/W*), an index that may be understood as a measure of how many days an employee has to work to pay the rent of one unit of land. This is an adequate index of inequality in a world with an important agricultural sector, where land is a critical

[2] Emigration raised real wages by 8.6% in the Old World and immigration lowered them by 12.4% in the New World. The effect was stronger in countries with high migration rates. Emigration increased Irish real wages by 32%, Italian by 28% and Norwegian by 10%, and immigration reduced real wages in Argentina, Australia, Canada, and the US by 22%, 15%, 16%, and 8%, respectively (Taylor & Williamson, 1997, Table 3.4; O'Rourke & Williamson 1999, Table 8.1).

component of total wealth and a decisive factor in the income generation and where the landowning class is a minority. The other inequality evidence from factor prices uses trends in the ratio of GDP per worker to the unskilled wage rate (*Y/W*), an index that informs us how far the recipient of the average income is from the typical unskilled worker near to the bottom of the income distribution.

In order to make historical and long run comparisons of globalization and inequality, it is important to take into account two shortcomings of this approach.

First, from an empirical point of view, the fact that consistent data, even for a single country, is scarce and fragile implies a key obstacle for obtaining satisfactory results. Data have often been compiled from diverse sources –implying all the difficulties resulting from working with different methodologies– and have been used to create distinct types of series for: real wage rates (for urban unskilled workers, usually taken from the construction sector), land prices (in rural zones), trade (the exchange of goods and international prices of commodities), migration (distinguishing regions of origin and destination), and capital movements (financial and foreign direct investment). In particular, when we work with rental-wage ratios (or income-wage ratios), the changes in the active population structure are excluded. In this sense, the ratios can be interpreted as indicators of income polarization rather than overall inequality.

Secondly, from a conceptual point of view, the framework to understand this issue has been based on the neoclassical approach of the theory of international trade and specialization. Heckscher-Ohlin theory applying the Stolper-Samueslon theorem is a useful framework to think about and interpret several features of the process, but others seem to be hidden behind prices and their comparative evolutions. Particularly, the productivity gains, the possibility to advance towards unoccupied regions or to change the specialization of inhabited zones, as well as the changes in the economic structure have consequences that are difficult to incorporate into the neoclassical approach.

Recent studies are addressing the first point in two ways. On the one hand, they are trying to improve the quality and quantity of the data by elaborating new series (Arroyo, 2008, for Argentina, Mexico, Venezuela and Uruguay in the 19th century; Bértola y Colab., 2000, and Bértola, *et al*, 1999, for Argentina, Brazil, and Uruguay; Bohlin & Larsson, 2007, for Sweden; Greasley & Oxley, 2005, for New Zealand) or by considering the evidence admitting regional diversities (Emery, *et al*, 2007, for Canada; Shanahan & Wilson, 2007, for Australia). On the other hand, these new studies are estimating inequality and poverty in the long run using diverse indices (Prados de la Escosura, 2005 and 2007, for Latin America) or in a direct way using data from population and economic census and assigning income to active individuals depending on their economic activity, profession, gender, and region (Álvarez & Nicolini, 2010, for Tucumán, Argentina; Bértola, *et al*, 2007, and

Bértola, *et al*, 2009b, for Brazil; Rodriguez, 2009, and Bértola and Rodríguez, 2009, for Chile; Bértola, *et al*, 2008, 2009a, and 2009c, 2010 for the Southern Cone).

Other authors are addressing the second shortcoming, by emphasizing the relationship between growth and inequality in pre-industrial economies. The basic idea is that the level of possible inequality depends on the level of per capita income, the subsistence level of the majority of the population, and the size of the elite that may appropriate the eventual surplus (Lindert, *et al*, 2007). Others consider the evolution of productivity as a central concept, being a process that depends on the interaction of technical progress, changes in the productive structure, and modifications in the demand pattern with consequences for the trajectory of international trade (Bértola y Colab., 2000; Porcile and Bértola, 2007).

In a recent article, Knick Harley argues that: *"Applying the Stopler-Samuelson paradigm from Heckscher-Ohlin trade theory, the result is an approach that sees price convergence as pivotal in defining, identifying, and measuring globalisation. This focus, however, obscures the implications of frontier incorporation and other insights achieved by viewing nineteenth-century globalisation as a mechanism whereby peripheral economies were incorporated into the core of organized economic activity.* (Harley, 2007:238). The integration of a frontier in the Atlantic economy contemplates the discovery of export staples, a process of learning how to best exploit them, and the mobilization of capital and labor for production, use and distribution.

Bértola *et ál.* (2010) propose a compatible framework with this vision to explain the evolution of the inequality in the South America Southern Cone (Argentina, Chile, Brazil and Uruguay) during the First Globalization. According to this analysis, the effect of globalization on inequality depended on the expansion of the frontier and institutional persistence (from the colonial heritage) and changed in old and new areas.[3]

From this perspective, the focus on frontiers –that is, the incorporation of regions that were primarily scarcely occupied and outside European economic influence– adds to the mainstream approach another viewpoint and helps to explain new issues on this matter. Land frontier expansion constitutes a pivotal concept that allows to articulate considerations about technological progress and institutional configuration in a different way. It is based on the combination of endogenous growth in the use of the productive factors and can include regional (and local) perspectives.

This paper is part of the literature that tries to understand the effects of the First Globalization on economic growth and income distribution during the last decades of the 19th century and the first decades of the 20th century. Our proposal is to contribute in the empirical field with new and

[3] Rodriguez Weber (2009) proposes an argument in the same conceptual line.

original estimates of functional distribution in the Chilean agrarian sector to discuss, in conjectural terms, the results and propose some hypotheses to advance in next steps in the research.

2. Income distribution in Chile: new estimates

2.1 Functional distribution in the agrarian sector

The functional income distribution is a depiction of how the income (in the national or sectoral level) is distributed between different groups involved in the production. As a result, it represents how the incomes earned by the owners of the various productive factors (labor, land and capital) are shared in terms of remunerations (or wages), land rents and profits (dividends or interests). Therefore, in these terms, not only it is important to consider the evolution of the different earn-rates (as the recent literature concerned working with *R/W* and a *Y/W*) but the changes in the quantities of the factors applied to the production is a relevant issue too.

Considering that agricultural production was one of the main productive activities of the Chilean economy in the mid-19th century and it experienced the competition of the mining sector during the First Globalization (Rodriguez Weber, 2009), studying the evolution of the income distribution within this sector will give us interesting insights.

2.2 Estimates: methodological considerations

We estimate the functional income distribution of the agrarian sector during the First Globalization –from 1870 to the First War World (WWI)– in Chile considering benchmark years by decades. [4] We choose years of each decade of the almost 50-year period of our analysis. The selection responds basically to the availability of census information and population data, although we consult many additional sources to complete and determine the better statistics in each case. We propose the following benchmarks: 1875, 1885, 1895, 1907 and 1915.

The available information is varied, both in quantity and quality terms, and we need to make several assumptions and particular calculations to obtain compatible estimates. The objective of this section is to describe the estimation method and the different decisions adopted.

We survey and estimate the agrarian product, wages and the total land rents in the agrarian sector. Profits were obtained as a residual in all the cases. In general, the evolution of the value of the different variables in current prices has irregular movements that result in significant changes year by year. As far as possible, we smooth the series calculating 3-year averages to reduce the risk to take an abnormal year as benchmark, assigning the mid-year as reference of the period.

[4] Álvarez & Willebald (2009) and Willebald (2010a) include similar exercises to the "club" of the settler economies (Argentina, Australia, New Zealand and Uruguay in the first case and the same four countries plus Chile and Canada in the second one).

In general terms, we work in inverse chronological order starting with a benchmark year of the first decade of the 20th century. Our decision to take some year close to the WWI as main reference is related to the data availability of all components of the aggregated variables. The information is disperser and scarcer for the previous decades and it is usually necessary to use indirect indicators.

Agrarian product

To measure the agrarian income, we consider the gross output or gross domestic product (GDP) of the agrarian activity according to official data and the best available estimates.

Rodriguez Weber (2009) proposes an estimate of the income distribution in Chile for the years 1860-1930 that constitutes the main recent contribution on the field.[5] He estimates the generation of income by industry and occupational class considering four benchmarks (1875, 1885, 1907 and 1930) and annual income indicators (for the period 1860-1930). Therefore, he obtains estimates of the total and sectoral (agrarian, industry and services) income.

However, to avoid dealing with the intersectoral and the international income transfers (associated with the different sectoral price evolutions and the external property of assets, respectively), we focus our analysis on the income generated within the sector (with the productive factors that produce for the economic activity). Therefore, we work with the agrarian product. It was calculated inflated the series from Díaz, Lüders & Wagner (1998) (1908-1910 constant prices) with the Agrarian Price Index presented in Wagner (1992).[6]

During the period when product and income series coincide (1860-1930), the lineal correlation is high (0.98) and the agrarian product represents almost the 90 per cent of the agrarian income. During our period of analysis, 1870-1915, the lineal correlation descends slightly (0.96) and the gap is larger (75 per cent).

Rents or land incomes

In previous and with other objectives articles (Álvarez & Willebald, 2009; Willebald, 2010b) we had followed Dwyer (2003) and Gaffney (1970) to measure the land income. In general, when land values are stable, the land income is the annual rental for the land. However, when the land value increases, it means that the future rentals for the land are expected to be higher. Therefore, the land presents two types of yields or returns; one of them directly associated with the productive activity and, the other, with the land value appreciation (as in the case of an investment).[7] Reliable historical data on this issue are rarely available so scholars adopting a conservative 5% fixed rental yield plus a representative percentage of the accrual of future rentals.

[5] A previous advance had been presented in Bértola & Rodríguez Weber (2009).
[6] Agrarian Price Index called "*Índice de Precios Agrícolas Latorre Extendido*" (*IPALS*) from Wagner (1992).
[7] See Carmona & Rosés (2009) for a discussion.

It is common in the literature to use the evolution of the land price to approximate the movement of the rental rates (Austin, 2007; Bértola, *et al*, 1999; Bohlin & Larsson, 2007; Emery, *et al*, 2007; Greasley & Oxley, 2005; Shanahan & Wilson, 2007; Williamson, 2000 and 2002) and we employ a similar notion. However, from a conceptual point of view is not enough to apply the movement in the land price to estimate the rental rate because it is necessary to correct by the interest rate.

According to our conceptual framework (see Findlay, 1995; Willebald, 2009, and Mednik & Willebald, 2010) our key relation –as a decision rule– is the following:

$$[p\, a'(n)] / \phi'(N) = \rho* \qquad (1)$$

In the long run, the rate of return on clearing land –the relation between the marginal income [$pa'(n)$] and the marginal cost [$\phi'(N)$] on clearing land– must be equal to the interest rate ρ (that represents the opportunity cost of the economy).

The marginal income of clearing land is the value (considering the relative price of the land output or agricultural good, p) of the marginal physical productivity of the land ($a'(n)$), and this relation equals the land rent (q) in the equilibrium. The marginal cost on clearing –that is, the cost of one unit of land– is the land price (p_N). Therefore, we can rewrite the relation *(1)* as:

$$q = p_N . \rho \qquad (2)$$

Therefore, if we want to deduce the evolution of the rental rate (q) in the long run, we need consider the joint movement of land prices and interest rate.

Williamson (2007):204 stays the same warning when analyzes the recent literature about the issue and Arroyo (2008) proposes empirically this correction for four Latin-American countries during the 19th century.[8] Data about interest rates is scarce but some partial information indicates a downward trend in settler economies interrupted by sudden increases during the period (see Willebald, 2009, for a survey). A proxy of the local interest rates is the yield of the government bonds, a homogenous measure that allows an initial quantification of the financing opportunity cost of the economies. We use data from Obstfeld & Taylor (2003) and work with triennial averages centred in the mid-year.

We present the different components of the estimate methodology according to the successive steps of approximation to the object.

- ***Land prices 1917-1921, 1875 and 1907***

The information about land prices in Chile for the 19th century is scarce and incomplete. Even during the 20th century, systematic studies for all country are rare and do not cover long periods. The study of Hurtado, Bustos and Galmez (1979) represents one exception although they present information just from the second half of the 1910s and covering a pair of specific regions.

[8] Their conceptual reference is Jorgenson (1963) who proposes a theoretical explanation of capital accumulation within the neoclassical theory.

For Coquimbo and Curicó (Regions IV and VII, north and central zones, respectively) and Talca and Bío Bío (Regions VII and VIII, central and south zones, respectively), they register land prices for agriculture land with irrigation (with fruit trees and vineyards and with out them) and dry land. Figures are expressed in constant dollars of December, 1978, and presented as 5-year averages (beginning in 1917-1921).

We convert the data in national currency (with the exchange rate) and inflated them with the Price Consumer Index (from Braun *ét al.*, 2000) to obtain land prices in *pesos chilenos "nuevos"*. However, our estimates corresponding to values in *pesos chilenos "antiguos"* and we transform those figures with the relationship 1 *peso "nuevo"* = 1,000,000 *pesos "antiguos"*.[9] In the rest of this section, we symbolize *"pesos antiguos"* as $.

As fruit trees and vineyards are improvements closer to the idea of physical capital (that renders profits), we calculate an average land price that excluded them, considering the prices of irrigation (without trees and vineyards) and dry lands, weighted by the participation of both types of territories in the total agrarian area of 1936. The *Segundo Censo Agropecuario de Chile (1935-1936)* (thereafter *SCACh1936*) presents information about agrarian area with irrigation and dry lands considering four zones: north, central, south and austral. For our calculations, south and austral zones are considered as the south region. As we have land prices for two regions –Coquimbo and Curicó; Talca and Bío-Bío–, we rearrange the data of the Census in two large regions, North-central and South-central zones, dividing by 2 the Central region and adding the areas to North and South, respectively.

Therefore, we have shares to weight the land prices: North-central with irrigation (3%) and dry land (29%); South-central with irrigation (2%) and dry lands (66%). We assign the average price of 1917-1921 to each year of the period ($ 109 per hectare).

Correa (1938) comments a document written in the 19th century called *"Ensayos sobre el estado económico de la agricultura de Chile"* that presents diverse information corresponding to 1875. The value of the total land, including arable land with irrigation and dry territories, meadow and wood, was equivalent to $ 233.3 million, considering a total area of 11.4 million hectares and representing an average price $ 20 per hectare.[10] However, in the time, the irrigation meant very relevant investments and, as the trees and vineyards in the 20th century, was closer to the generation of profits than rents. Therefore, we exclude them considering 11 million hectares and an average price of $ 11 per ha.

[9] From the 19th century to the nowadays, Chile presented three legal currencies: (i) 1830-Dec/1959: *peso chileno* or *"peso antiguo"*; (ii) 1960-Sep/1975: *escudo*; (iii) Oct/1975 to the present: *peso chileno* or *"peso nuevo"*. The relation is: 1 *peso nuevo*=1,000 *escudos*=1,000,000 *pesos antiguos*. See Braun *ét al* (2000): 88-89 for an explanation.

[10] Figures are presented in *pesos de 6 peniques* and, from the text, we deduce that the relation is 1 *peso antiguo* = 4 *pesos de 6 peniques*.

- ***Land prices 1885, 1895 and 1907***

In a previous paper (Willebald, 2010a), we complete several series of land prices using lineal interpolations. However, this case is different. On the one hand, the period (1875-1917) is extremely long and our underestimation of the fluctuations would be excessive. On the other hand, Chile experienced an important inflationary process from the beginning of the 20th century that would induce relevant distortions in the estimation (see Millar Carvacho, 1994).

Considering that the agrarian prices represent a weighted average of the retribution to the different productive factors that participate in the agrarian production, they can give some clues.[11]

Theoretically, the rentals would have increased in real terms during the First Globalization (see the literature based on the H-O-S approach or Mednik and Willebald, 2010) and their evolution would have go over the prices of the sector (even corrected by interest rates).

Therefore, estimating the evolution of the land prices by lineal interpolation would exaggerate the intermediate points but, doing it with agrarian prices, would cause the contrary effect. Considering that we have not arguments to approximate the movement of land prices close to one or another evolution our option is to average the values of both trajectories. Graph 1 illustrates our three scenarios.

Land prices of 1885, 1895 and 1907 are estimated according to the average trajectory.

[Insert Graph 1]

- ***Land area 1917, 1907, 1875, 1885 and 1895***

According to the *SCACh1936*, the land dedicated to agricultural activities in 1919 was 18,2 million hectares and we assign this area to the period referred in the prices subsection (1917-1922). Comparing this value with the number of rural properties, the average size by establishment is 188 hectares and, considering that this number was 69,988 in 1907 (Salazar, 1985), we estimate the total area in 13.2 million hectares (we assume that the average size of the establishment did not change significantly). The area of 1875 was taken from Correa (1938) (see previous sub-section) and the figures of 1885 and 1895 were obtained by interpolation.

- ***Total rents 1907***

To calculate the total rents of 1907, we follow the methodology of Dwyer (2003). Reliable historical data about land rent rates are not commonly available and it is usually to adopt a conservative 5 per cent fixed rental yield plus a representative percentage of the accrual of future rentals.

[11] Considering Y as the gross domestic product of agrarian activity, we can express it as the sum of the total retribution of productive factors: $Y \equiv w\,L + \rho\,K + q\,N$. Where L, K and N represent the volume of labor, capital an land used in the production and w, ρ and q the respective earn-rates (wage, land rents and profit). As $Y=y.p_A$ –the multiplication of the volume produced in the agrarian activity and the prices of the sector– p_A may be represent as an weighted average of w, ρ and q.

In the case of Chile, this rate is a reasonable percentage. Bengoa (1990):38 comments that a conservative calculation for that time is a rental ratio of 5 per cent on the capital. Correa (1938):252 presents data about rents for 1834, 1854 and 1875 –probably derived from fiscal information– that, for the last year, represent almost 5 per cent of the land value (considering the total value of the land, including investments). We calculate the accrual yield computing the internal rate of return of an investment equivalent to the land value in 1875 (the same value used to estimate the price) that was recovery in 1907. The resultant accrual factor for this period is 5.1 per cent.

Therefore, we calculate the total rents as the 10.1% of land value in 1907, a figure equivalent to the 49 per cent of the total agrarian product.

- ***Total rents 1875, 1885, 1895, and 1915***

We actualized the total rents estimated for 1907 by the movement in the land prices –corrected by the change in interest rates– and multiply by the area of the farm holdings (see Willebald, 2010, for an application of the methodology for settler economies).

Wages

- ***Wage rates 1907***

Rodriguez Weber (2009) presents information about wage rates for each benchmark (1875, 1885, 1907 and 1930) but we introduce some changes in 1907 to consider the regional disparity. Bengoa (1990) presents daily wages[12] for several provinces around 1911 that we classified by regions[13] and actualized to 1907 with an Agrarian Wage Nominal Index (Matus, 2009). Rodriguez Weber (2009) discusses the number of days of work per year of the agrarian workers and assumes that the number increases from 200 days in 1875 to 260 in 1930.[14] We adjust our daily wages to transform them in an annual income of 227 working days in 1907. Table 1 present our assumptions and the data.

[Insert Table 1]

- ***Agrarian workers 1875, 1885, 1907, 1930***

We consider as agrarian wage-earners the income category identified with the *"gañanes"* in Rodriguez Weber (2009). He provides information about number of earners for each benchmark (1875, 1885, 1907 and 1930) that we use as reference.

- ***Total wages in 1907, 1875, 1885, 1895 and 1915***

Using agrarian workers and wages rates, we calculate the total wages of 1907, which represent the 29 per cent of the total agrarian income of Rodriguez Weber (2009). This ratio was applied to

[12] We use *"forastero/día"* because it is the category similar to *"gañán"*.
[13] Rodriguez (2009):44 and Willebald (2009) discuss proposals of regionalization in Chile to facilitate the analysis.
[14] See Rodriguez Weber (2009), pp. 42, 45, 54 and 231.

the agrarian product (triennial average centered in 1907) and we estimate the proportions of the other benchmarks considering 1907 as reference.[15]

We project the total wages to 1875 and 1885 by the movement in the wage rates and number of workers from Rodriguez Weber (2009) and considering his benchmark data. For both years, it was not possible to distinguish among regions and we consider the same wage for all the country.

Finally, we project the total wages of 1907 backwards to 1895 and forwards to 1915 by the movement in the wage rates represented by the Wage Nominal Index of Matus (2009) and the annual series of *"gañanes"* of Rodriguez Weber (2009).

2.3 Results

Table 2 presents our estimates according to three scenarios that correspond with the different assumptions relative to the land price evolutions. We propose three hypotheses about the movement of land prices between 1875 and 1917: (i) they moved equal to the agrarian prices; (ii) lineal interpolation; (iii) the intermediate value of both trajectories.

[Insert Table 2]

First scenario offers excessively low levels of land rents and a "picture" of capitalist relationships in the agrarian activity which is very hard to justify. Lineal interpolation offers a scenario with very high levels of land rents that cause negative profits in 1895 and 1907 (a situation that is not credible). Our favorite scenario is the third one, where levels and evolution are coherent with additional evidence and the income distribution story that presents the recent literature.

3. Highlights

During the period 1850-1873, Chile experienced an export-led economic growth based on the expansion of the wheat production (Cariola & Sunkel, 1982; Bauer, 1970, 1994). Previous to the insertion of Argentina into the crops international markets –as the result of the transport revolution of the last decades of the 19th century– Chile exported wheat and flour to California, Australia and even United Kingdom. Those years were a very good period for the agrarian elite and, as the historian Alfred Bauer stayed, it was the first time that was possible to build a fortune in the agriculture. That growth cycle was characterized for the incorporation of unproductive lands within the *Haciendas*, and the use of abundant unskilled labor. However, there was almost no use of capital goods.[16] The functional income distribution estimated for 1875, with a clear predominate participation of land rents and the important share of wages, is the result of the wheat cycle, which was intensive in land and labor, both abundant factors.

[15] We repeat our estimates for 1907 with the journal of the agrarian worker of Matus (2009) and the result is practically the same. Instead of obtaining a wage share of 29 per cent, we obtain a ratio of 28 per cent.
[16] Excepting a minority of "*hacendados progresistas*" (Salazar, 1985).

In 1885, the wage share fell and the profit rose. This was consequence of the high inflation of the period –associated with the end of the golden standard– and the adverse effects of the Pacific War (1879-1883). In 1878, when Chile abandoned the golden standard, the exchange rate was 44d for 1 *peso* and, ten years after, it was 25d for each *peso* (Braun *ét. al*., 2000, Table 4.6), denoting a sharp currency depreciation. At the same time, the Consumer Price Index raised from 100 in 1875 to 179 in 1885. Nevertheless, the wage of the *gañanes* remained unchanged or, depending on the sources, it had a little increase close to 10 per cent (Bauer, 1994). From 1875 to 1885, the agrarian product expands just 22 per cent (triennial averages) and probably this low dynamism explains the changes in the income shares of the other components. The increment of land supply (within the *Haciendas*), which was a consequence of the expansion of frontier, induced changes in the relative factors endowments and the land become more abundant and capital more scarce.

With the military victories over Peru and Bolivia in the North, and the *araucanos* in the South during the first years of the 1880s, Chilean territory almost duplicated. This process impacted on the agrarian sector in two ways. In the first place, a new market opened in the North. It was because of the nitrate fields, which attracted thousands of workers who won a salary and needed to spend it in food, clothes and different consume goods.

In the second place, the fertile and virgins soils of the South where disposable to the wheat production. New lands were most fertile than those of the Central Valley and quickly the new provinces of Malleco and Cautin became wheat producers.

The increase in the wage and land rents shares in 1895 was the consequence of the changes originated in the expansion of the frontier. On the one hand, agrarian labor became scarcer because of the emigration to the North, where the wage-premium of the nitrate region implied pressures on other regional markets.[17] As a consequence, wage rates increased and the wage share was larger than 1885 although the agrarian labor force was smaller (see Rodríguez Weber, 2010, for a detailed account of this process). On the other hand, the production of the frontier was almost without capital investments. It was based on the natural characteristic of a soil which was never used for agriculture before. As a result, the land rents increased its participation in the total agrarian GDP.

The estimate of 1907 is the result of two different trends. One is the same that led to the wage share increase in 1895. The emigration of the agrarian labor force –which in that year was almost the same than twenty years before– caused the rise of rural wages. This process was so strong that personal income inequality fell (Rodríguez Weber, 2009, 2010). However, the increasing evolution of profit share is a novel issue. Our conjecture is that this process was the consequence of the capital biased transformation of the agriculture in the Central Valley. Cariola & Sunkel (1982: 108-

[17] Harley (2007) proposes similar reflections about agrarian labor markets in Canada during the First Globalization.

114) stay that the traditional region, unable to compete with the South in grain production, transformed and diversified its production. The expansion of vineyard and wines in Central Valley are the best example of this transformation (Cariola & Sunkel 1982, Cuadro 41).

Briefly, the expansion of the frontier benefited the wages, because labor become scarce and workers had more opportunities. The grain production moved to the fertile south, and the traditional region reacted with investment in new products. By 1907, that capital was profitable, and profit share increased while land rents share fell.

The latter trend was still present in 1915, so profit share continued increasing. Now, after thirty years of their incorporation to the production, there were investments in the lands of the South, where irrigation was, basically, the main capital formation in the region.[18] The effect of frontier expansion on wages, in the other hand, was finished near 1907. The opportunities opened by the frontier on labor force practically disappeared (in an increasing process of integration of the national labor market), and the inflation –which re-started at the beginning of the 20th century – led to a decrease of real wages. As a result, the estimation of 1915 shows the fall of wage share, and the increase of profit share while land rents maintained in similar levels than 1907.

4. Final comments

The aim of this paper is to propose new estimates of income distribution in Chile during the First Globalization with the objective to discuss the usual interpretations and propose new views about the topic.

Initially, we review the debate about the First Globalization and the economic performance of the natural resources abundant economies in terms of stylized facts and the main interpretations of the process. We present the new estimates of the functional income distribution in the agrarian sector including a conceptual presentation of the issue, a methodological discussion of the elaboration of the indicators, and the results in terms of three scenarios (according to three assumptions about the evolution of the land prices).

We comment our results in terms of the evolution of the factor endowments and the relative prices and obtain a coherent story of the process. Land frontier expansion, the regional segmentation of labor market and the different investment cycles in the agrarian activity offer an interesting conjecture picture and working hypotheses.

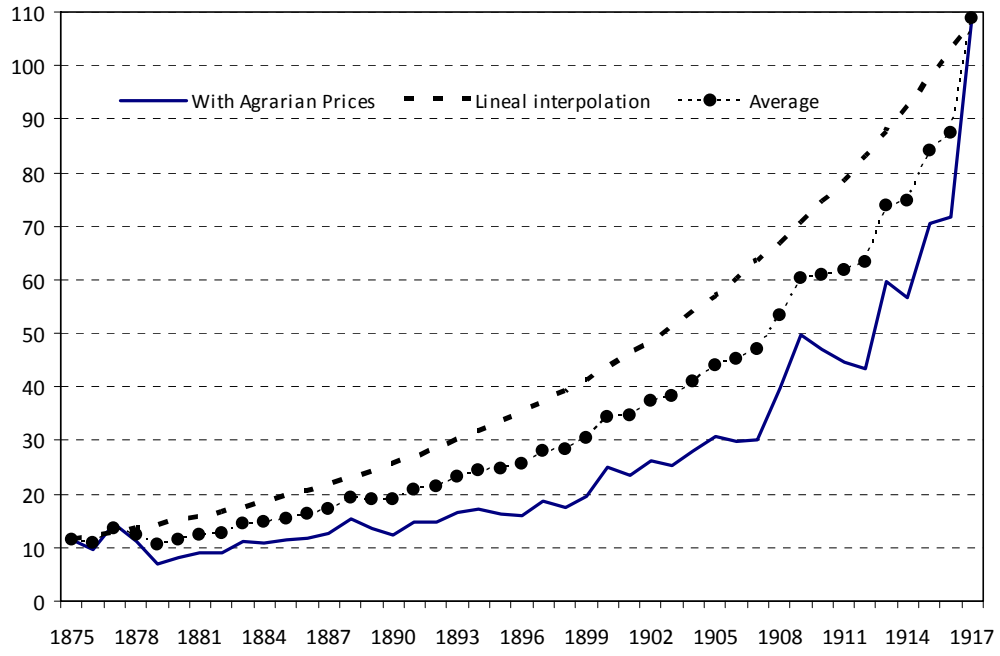
Each argument suggests interesting analytical lines in the future. Our proposal is to work into three issues:

[18] The Census of 1936 for the agriculture shows that were irrigated lands in the South. It is reasonable to think that this process existed by 1900, twenty years after the conquest of that territory.

- Improving our evidence about factor productive prices. The availability of wages by regions is scarce and it constitutes a specific limitation to demonstrate our conjecture about the low integration of labor market and the existence of wage-premiums. However, our main weakness is the almost inexistence of good information about land prices, a point that lead us to do assumptions some times hard to sustain.
- We need more precise indicators of land frontier expansion to determine the dynamic of the process and their specific incidence in the evolution of the wages and land rents.
- Studying the capital formation of the agrarian activity and productive capacity associated with each investment cycle, a process articulated with the new land incorporated in the production.

Graphs and tables

Graph 1
LAND PRICES EVOLUTION: ASSUMPTIONS AND SCENARIOS
$/Ha



Source: Braun *ét al.* (2000); Correa (1938); Dirección General de Estadística - Chile (1938). Hurtado, Bustos & Galmez (1979); Wagner, (1992).

Table 1
WAGE RATES BY PROVINCE IN 1907
$ by day and $ by year

Year	Province	Region	$/day	$/year	1907, $/year
1910	Santiago	Central	1.0	227	204
1910	Curicó	Central	0.7	159	143
1910	Parral	Central	0.6	136	122
1910	Macul	Central	1.4	318	285
1911	San Javier	Central	1.0	227	174
1911	Malloco	Central	2.0	454	349
1912	Rancagua	Central	1.5	341	244
1912	Chillán	Central	1.2	272	195
1912	San Felipe	Central	1.5	341	244
1913	Maule	Central	0.8	182	125
		Average			***208***
1911	Copiapó	North	2.0	454	349
		Average			***349***
1907	Osorno	South	1.5	341	341
1910	Temuco	South	1.3	295	265
		Average			***303***

Sources: Bengoa (1990):18 and 196. Rodriguez Weber (2009).

Table 2

FUNCTIONAL INCOME DISTRIBUTION

Shares on the Agriculture GDP

Three scenarios according to the evolution of land prices

	WAGE	RENT	PROFIT
(i) Equal to the agrarian prices			
1875	24	53	23
1885	19	36	45
1895	24	35	41
1907	29	27	44
1915	17	34	50
(ii) Lineal interpolation			
1875	24	64	12
1885	19	79	2
1895	24	92	-16
1907	29	74	-3
1915	17	60	23
(iii) Intermediate values of previous trajectories			
1875	24	61	14
1885	19	57	24
1895	24	62	14
1907	29	49	22
1915	17	47	36

Source: own estimations.

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(1) Agrarian product

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(2) Rents or land income

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(3) Wages

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