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The Demographic Consequences of the End of Chile's Nitrate Boom, *c.*1907–1940

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This article deals with the demographic consequences of the end of Chile's nitrate boom following the 1929 crisis. The traditional economic historiography has maintained that this crisis impacted heavily on nitrate production, and that in turn the crisis triggered a permanent exodus from the nitrate districts to other geographical zones. Contrary to this widely held belief, we have shown in this article that: there was no substantial fall in production; there was indeed a fall in nitrate population, but this was limited; this took place in some nitrate areas only; overall, the decline in nitrate population was a short term phenomenon only. The population making a living from nitrate production (or activities directly related to it) did not emigrate in as large numbers as previously thought, since production remained high up to the 1960s.

Keywords: Chile, demography, Great Depression, migration, Nitrate era.

The Great Depression of the 1930s is rightly regarded as the most severe economic downturn in human history. Its causes and consequences, as well as the reasons for its durability, have been extensively researched, despite the lack of agreement on many issues (Eichengreen, 2008; Feinstein, Temin and Toniolo, 2008). The impact of the Great Depression on Latin America specifically has also been analysed by many writers (e.g. Thorp, 1998; Bértola and Ocampo, 2012; Bulmer-Thomas, 2014). These authors highlighted the suspension of debt servicing that followed the crisis, the stoppage of capital flows into Latin America, the large-scale use of exchange controls, the fall in national employment and production, the problems of balance of payments and fiscal accounts, and the collapse of export prices and volumes, amongst other consequences.

The impact on the export sector in particular has attracted considerable attention given the usually high dependency of Latin American export economies on one or two primary products, and the prices of these goods suffered most during the 1930s. Chilean exports in particular were most badly affected since the export prices of nitrate, Chile's primary commodity, fell by a dramatic 84 per cent between 1929 and 1932. Less well known is the demographic impact of the crisis on specific regions within countries (usually those associated with specific industries), or the efforts made by some Latin American governments to sustain production destined for the export market as a means of protecting national employment during this severe economic downturn. Historians have been mainly concerned with policies such as real exchange depreciation and the abandonment of the gold standard, multiple exchange rates, debt moratoria or how to avoid a sharp fall in export prices (Bértola and Ocampo, 2012; Bulmer-Thomas, 2014).

The general economic impact of the 1929 crisis on Chile has been well covered elsewhere (Cariola and Sunkel, 1982; Meller, 1998; Palma, 2000; Castillo, 2016; Badía-Miro and Díaz, 2017). Most economic historians have taken a negative view, arguing that this period marked the end of the nitrate industry in Chile: 'most nitrate offices closed' (Vergara, 2015: 78), it has been claimed. The re-emergence of the copper industry from the 1880s has overshadowed the post-1929 nitrate industry. Moreover, for authors such as Salazar (2014: 169) or Bulmer-Thomas (2014: 216), the performance of the nitrate industry must be assessed in terms of its contribution to fiscal revenues, or export earnings. We believe this is wrong: it must be assessed also in terms of its contribution to national employment.

In the canonical periodisation of Chilean economic history, the nitrate age ended abruptly in 1930. The increase in synthetic nitrate production and the 1929 crisis are widely credited as marking the end of the nitrate era (Brown, 1963; Palma, 2000; Cariola and Sunkel, 1982; Meller, 1998; Badía-Miro and Díaz, 2017). For Gonzalez-Pizarro, 2017: 56), for instance, the events of 1929 triggered 'a terminal crisis for the white gold industry', while González-Miranda, Calderón and Artaza (2016: 83–85) have maintained that the end of the expansive nitrate cycle was in 1919. For O'Brien (1989: 139), the early 1930s crisis 'pushed the Chilean industry to the point of collapse', while for Palma (2000: 222), 1929 represents a crisis 'from which the natural nitrate industry would never recover', adding that 'the 1930s crisis brought about the industry's final collapse'. Finally, for Salazar (2014: 170), the actions taken by the government in the early 1930s to rescue the industry 'could not avoid its definitive collapse'. As part of this apocalyptic narrative, we have been told that the crisis triggered a massive (permanent) migration from the nitrate districts (Pinto, 2007; San Francisco et al., 2008; Arenas, 2009; Goicovic, 2011; Godoy and González-Miranda, 2013; Gonzalez-Pizarro, 2017), but so far there has been no attempt to quantify this phenomenon at a nitrate's *canton* level.

This article seeks to assess the precise demographic consequences of the early 1930s crisis on the northern Chilean provinces, where nitrate production took place, during the 1930s and early 1940s. Our preliminary hypothesis is that since production remained at respectable levels despite the crisis, this factor could not have precipitated a mass and permanent migration from the nitrate districts, as has previously been maintained. Government efforts to keep production high appear to have paid dividends. This article provides a different account of an important event in the demographic and economic history of Chile, but with wider implications for the region. The strategy followed by the Chilean government was different from that followed in other countries. The Chilean government was more concerned with supporting production and employment of its key

export product before the crisis, rather than trying to sustain export prices, or worrying about the profitability of the business. This is an important finding inasmuch as many developing countries' economies still rely on the export of a handful of commodities, whose prices always plummet at times of international crisis.

Nitrate Production in Chilean History

Between 1879 and 1883 Chile fought the Pacific War against Peru and Bolivia, defeating both powers and incorporating some formerly Peruvian and Bolivian provinces into Chilean territory: Tacna (part of which was returned to Peru in 1929), Tarapacá and Antofagasta, a region known as *Norte Grande* or Big North (Brown, 1963; Blakemore, 1974; Ortega, 1984, 2005; Sater, 2007; Salazar, 2014). These were not ordinary provinces: they contained rich nitrate deposits, giving Chile a near world monopoly on this product for several decades (O'Brien, 1989; Miller and Greenhill, 2006; Greenhill, 2019).

Nitrate was widely used as a fertiliser in agricultural world markets, but in particular in Europe, and in the explosives industry (Palma, 2000; Couyoumdjian, 1974; Glaser-Schmidt, 1996; O'Brien, 1989; Brown, 1963). During the so-called First Globalisation (*c.*1870s–1914) it was in high demand in the international economy, to the extent that nitrate became the 'salary' of Chile due to a substantial export duty collected by the government (Brown, 1963; Mamalakis, 1971; Monteón, 1982; Fernández, 1984; O'Brien, 1989; Barton, 2000; Salazar, 2014; Greenhill, 2019).

Nitrate was Chile's primary commodity from the 1880s until the Great Depression of 1929, to the extent that the economic historiography considerers the period *c.*1879–1930 as the nitrate era in Chilean history (Meza, 1958; Brown, 1963; Blakemore, 1974; Monteón, 1979; Cariola and Sunkel, 1982; Meller, 1998; González-Miranda, 2013; Castillo, 2016; Badía-Miro and Díaz, 2017). This was the first time the Chilean economy experienced significant export-led growth. Previously gold/silver/wheat and then copper/silver had dominated the export basket, but never before had the export sector been so relevant to the entire economy (Badía-Miro and Díaz, 2017).

With this nitrate export boom came a substantial growth in the population of the nitrate provinces, mostly associated with company towns (*cantones*, see below). Nitrate production did not require much local processing due to the simplicity of the process of extraction (Palma, 2000), and it was, therefore, a labour intensive industry, using mainly unskilled workers. The population of the whole of the northern provinces increased from around 100,000 in 1835, before Chilean expansion, to nearly 350,000 in 1885. Of these, around 75,000 resided in the nitrate provinces in 1885. By 1929, on the eve of the crisis, the population of the nitrate provinces had increased to nearly 300,000, undoubtedly a substantial increase for one of the less populated countries of the Spanish colonial era (Hurtado, 1966; Cariola and Sunkel, 1982; Pérez, 2010). Nitrate *oficinas* (encampment or plant) were established first in the Chilean coastal areas, where it was easier and cheaper to exploit and load the nitrate into ships. But *oficinas* were also opened in the interior of the Big North, as soon as new capitalists entered the business or previous ones expanded the remit of their activities (Meza, 1958; Bermúdez, 1987).

Nitrate *cantones* (cantons) were gatherings of people that emerged around nitrate fields. They were not classified as central government administrative or political divisions, but their geographic location can be clearly established. Spontaneously, people

Table 1. Number of Localities assigned to each Canton according to Censuses

Cantons	1907	1920	1930	1940
Aguas Blancas	9	20	41	31
Alto San Antonio	15	19	21	19
Central (or Bolivia)	27	56	58	61
Dolores	8	7	4	4
Estación Gallinazo	1	3	2	3
Estación Huemul	1	1	2	1
Huara	13	12	13	16
La Noria	3	2	3	2
Lagunas	7	17	16	16
Negreiros	12	16	16	12
Pintados	5	14	23	19
Pozo Almonte	12	13	16	13
Santa Catalina	17	14	17	15
Taltal	24	43	65	82
Toco	10	21	33	53
Zapiga	7	8	10	8
Average	11	17	21	22

Source: Own elaboration from censuses.

started to talk about these gatherings as cantons, and gave names to them, and this is why we decided to group inhabitants of different localities to estimate the population of these cantons, following these denominations. Cantons were made up of small villages created around the nitrate fields, the nearby nitrate *oficinas*, railway stations and the nitrate ports. Cantons had, thus, a well-defined territory, comprising several nitrate *oficinas* (not necessarily from the same company) and a main associated port which could be used by more than one canton, linked most usually by railways and roads. Nitrate *oficinas* comprised the nitrate fields, the nitrate plants, the workers' camps, the *maestranza* (workshops), and all other premises used by employees (Garcés, 1999; González-Miranda, 2013; Artaza, 2018).

Sixteen cantons in total emerged in Chile during the 1880s–1910s, as seen in Table 1 (González-Miranda, 2013), and were in existence until the end of our period of study and beyond. They contained a variable number of *oficinas*, since many opened or closed during their lives. There were 135 and 166 *oficinas* in 1907 and 1912, respectively, and 178 in 1920 (Meza, 1958 and estimates from census data). The population per nitrate *oficina* varied hugely across *oficinas*. In 1907, they could have as little as 100 inhabitants and as many as 6,000 people, while in the 1930s they had over 10,000 people (Bermúdez, 1987; Meza, 1958). In turn, many workers moved from one *oficina* to others (Recabarren, 2003). Before nitrate production started, with the nitrate deposits located in the most arid deserts on earth, only a handful of people lived in these locations (Bermúdez, 1987). In 1835, for example, less than 5,000 people lived in the entire (then Bolivian) province of Antofagasta (Meza, 1958; Bravo, 2000; Sater, 2007).

However, although both cantons and *oficinas* are known to the scholars of this period, there has been no attempt to limit the analysis of the demographic impact of the crisis only to the localities making a living out of nitrate exploitation. So far all the available information on the demographic impact of the 1930s crisis has been at a (qualitative) general level, but suggesting a significant and long-lasting depopulation

of the nitrate districts (CIREN, 1985; Salazar and Pinto, 2002; Donoso, 2013). It is common to find crude statements in the literature. For instance, for Goicovic (2011: 53–54), after the 1929 crisis, 'thousands of nitrate workers abandoned the nitrate fields in the Big North and moved to the centre and south of the country' (see also Salazar, 2014: 168–169; Vergara, 2015: 78–80). In the same vein, Garcés (1999: 14) noted that, due to the 1929 crisis, 'most nitrate *oficinas* stopped working, becoming looted ruins in the desert'. Likewise, for Meza (1958: 38), after 1930, 'there was a fast downfall in nitrate population', while for Gonzalez-Pizarro, 2017: 118) there was a 'demographic collapse'. Although no numbers are given in these examples, they all suggest a mass exodus. When quantitative evidence is provided, it is given at a provincial level only. For instance, according to Godoy and González-Miranda (2013), over 24,000 people left the region in the late 1920s and early 1930s, while de Ramón (2007) states that over 60,000 people emigrated before 1933 (see also Recabarren, 2003; Gonzalez-Pizarro, 2017). Yet, population by province hides the fact that not all inhabitants of these provinces worked or depended on the nitrate fields.

Sources and Methodology

Apart from a review of the secondary literature relevant to our study, the main sources of information we have used are the national Chilean censuses, available in PDF at the National Institute of Statistics' web site (Chile, 1907, 1920, 1930, 1940). Chile was a pioneer Latin American country in the compilation of national statistics, from the early nineteenth century (Estefane, 2004; McCaa, 1978). The first full national census was taken in 1835, and from then onwards censuses were taken regularly almost every ten years, with a regularity highly unusual for Latin American countries (Sánchez-Albornoz, 2014). Given the time frame of our study, we have worked with the censuses of 1907, 1920, 1930 and 1940.

Despite the usual problems and drawbacks of any census (e.g. under-registration; lack of training for those collecting the data), Chilean demographic data is regarded as high quality, in particular for the purposes of this article. From the second half of the century, for all censuses the government centralised data collection, following the creation of the National Statistics Centre in 1843, which improved the quality and coverage of the data (Pérez, 2010; Rodríguez and Pérez, 2012). From 1907 in particular, further improvements were introduced, which included the creation of a cartographic route for the census officers, better training and more coordination between the government offices involved in the process (Pérez, 2010).

These censuses provide a rich source of information on many variables, and the high level of disaggregation of the data is particularly useful for our purposes. We have recorded the following for the two nitrate provinces: year of census, population (total, male and female) per province, department (the province of Tarapacá contained the following departments: Arica, Iquique and Pisagua, while that of Antofagasta contained Antofagasta, Loa, Taltal and Tocopilla), council, district, locality and type of locality. We did not consider the censuses of 1885 and 1895 because the information available from them was at a less disaggregated level, which did not allow for the estimation of the nitrate population per canton.

Unlike previous studies, this investigation includes population data for the nitrate provinces, at the most disaggregated locality level: from Province, Department, Council, District, down to locality. We also assigned each locality to a canton, whenever a locality

actually belonged to a canton (otherwise it was registered as a non-nitrate locality), enabling us to estimate the population of cantons and non-cantons. On average, there were 21 localities per canton in the 1930's census (Table 1). In all, our primary database contains 3019 rows and 11 columns: over 33,000 records in total.

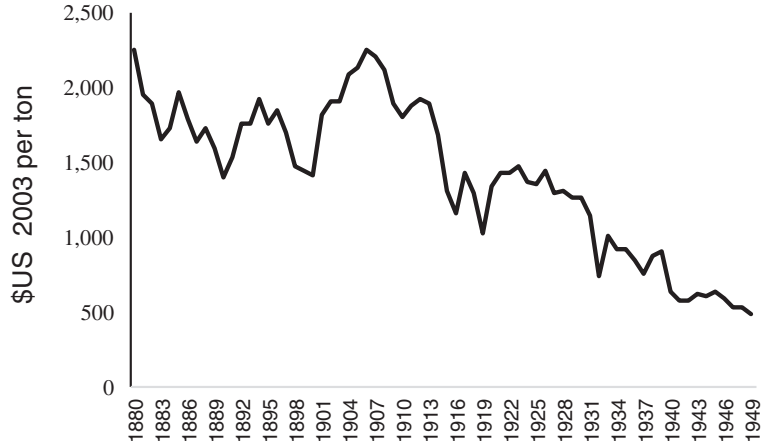
The information regarding the localities of the cantons was obtained from González-Miranda and Artaza, 2013 (also available from Bermúdez, 1987), where the authors define the area related to all nitrate cantons, although González-Miranda and Artaza do not specify all localities related to all cantons. Based on the information from the census, we assigned all localities available to those cantons identified by González-Miranda and Artaza. Neither González-Miranda and Artaza, nor Bermúdez, ever reported population per canton, as we do here: they defined the cantons, but never estimated the population associated with them. Of the sixteen nitrate cantons, twelve were located in Tarapacá and the other four in Antofagasta. To make the data comparable across censuses, we have taken 1930 as the pivotal census, and rearranged all the information from the other three censuses according to the 1930s political division of the country. Any other year could have been selected, but we preferred 1930 given its proximity to the 1929 crisis, and because Tacna had already been returned to Peru.

Our methodology allowed us to assess the full extent of the demographic impact of the 1929 crisis and the supposed end of the nitrate boom in the nitrate districts with precision, and for a long period of time. By nitrate population, we understand the population that, at the time of the census, declared their residence in a locality associated with a canton. This includes not only nitrate workers and their families, but also those working (and their families) in industries serving nitrate production directly, either public or private. This is different from analysing either only those working within nitrate *oficinas* (fewer people), or considering the totality of the population living within the northern provinces (many more inhabitants), which are the most common indicators used so far in the historiography.

The differentiation we are making between nitrate population and the overall population of the northern Chilean provinces is important because many of the nitrate workers that the literature suggests emigrated may have stayed. And, indeed, unemployed workers usually stayed in the zone for a while waiting for some nitrate *oficinas* to re-hire people; may have emigrated to copper districts in the Big North itself; or may have moved to other non-copper or non-nitrate districts within the same provinces (Recabarren, 2003; Gonzalez-Pizarro, 2017), making it difficult to estimate how many people exactly carried on living within the cantons.

Previous studies deserve mention. In a largely ignored but pioneering work, Meza (1958) collected data on nitrate population, but as this was in the era before spreadsheets, Meza's estimates were not as precise as ours, and for some years were substantially different, underestimating the actual nitrate population. Furthermore, Meza added only population registered in the census as 'SL' (*salitrera* or nitrate *oficina*), while, following Artaza, 2018; Bermúdez, 1987; and González-Miranda and Artaza, 2013, we added all the population living within the geographical area of all cantons, which included not only those classified in the census as 'SL', but also those living in any village, town, station, port or any other locality, if they belonged to the canton, as above defined. In all, for 1907–1940, Meza underestimated nitrate population by 29 per cent. Likewise, and more recently, Gonzalez-Pizarro (2017) provided data produced by, the Corporación de Ventas de Salitre yodo de Chile (COVENSA, Salt and Iodine Sales Corporation of Chile) on the population living in the nitrate *oficinas* only (as Meza). For

Figure 1. Chilean Nitrate Production (annual averages per quinquennial), 1880–1973



Source: Own elaboration from Díaz, Luders and Wagner, 2016.

1940, for instance, González-Pizarro's estimates of population was 112,000, while ours (considering all cantons) is around 38 per cent higher.

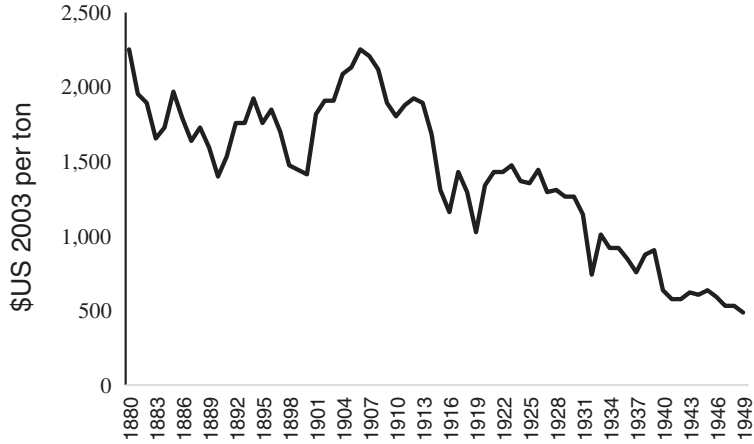
The Demographic Impact of the 1929 Crisis

The nitrate boom of the 1880s–1920s did not last long, at least as far as the hegemony of nitrate within Chilean exports is concerned. Chile was hit as no other Latin American country was by the 1929 Great Depression (Meller, 1998; Ffrench-Davis et al., 2000; Palma, 2000; Bulmer-Thomas, 2014; Salazar, 2014). The export sector collapsed during the early 1930s and nitrate exports never recovered the level reached during the 1910s–1920s (Figure 1), in particular after synthetic nitrate became cheaper and more widely used in world markets, and world prices collapsed (Figure 2). In time, copper replaced nitrate as the main export of the economy, after the emergence of the Great Copper Mining industry, led by US investments, including the Guggenheim group (O'Brien, 1989; Palma, 2000).

Yet despite the resumption of copper mining, it is important to remember that nitrate production did not disappear: it remained the second most important product in the Chilean export basket until the mid-1950s (Valdés, 1976). Active government intervention from the early 1930s to try to rescue the industry (in particular to contain the rate of employment) proved partially successful, and production remained at respectable levels until the 1960s (Figure 1). A contemporary study of the 1940s estimated that there were, at that time, unexploited nitrate reserves sufficient to produce 100 million tons of exportable nitrate (López, 1947).

Government intervention to rescue the industry resulted in 1930 in the creation of COSACH (Chilean Nitrate Company), a private-public joint venture, formed to acquire most nitrate companies in Chile. Indeed, COSACH consolidated 95 per cent of all nitrate producers by volume (Glaser-Schmidt, 1996), and then merged them into a single national company, exploiting only the most profitable *oficinas*,

Figure 2. Chilean Nitrate FAS Price



Source: Own elaboration from Díaz, Luders and Wagner, 2016.

and fixing production quotas across members. It controlled both production and sales, as it was a mixed company, with 50 per cent government capitals and 50 per cent private capitals, mainly from the Guggenheim, the latter managing the industry (O'Brien, 1989; Glaser-Schmidt, 1996; Miller, 2019). The idea was to rescue production from synthetic competition and the impact of the Great Depression, and in so doing the state abandoned the export duty formerly applied to nitrate, but retained 50 per cent of the profits of the industry. Eventually, due to internal conflicts between the members of COSACH, it was liquidated in 1933, and was replaced by COVENSA in 1934.

The new arrangement proved to be more stable. COVENSA was given a monopoly on buying, selling and distributing nitrate (either natural or synthetic) for 35 years, also fixing production quota across companies, and profit shares: 25 per cent for the government, the rest for the private companies, although the Guggenheims controlled 64 per cent of total production (Bermúdez, 1987; Gonzalez-Pizarro, 2017). Likewise, the government banned imports of synthetic nitrate to provide further stability to the industry. All in all, the national industry was highly protected during the COSACH and COVENSA periods (Meza, 1958; Valdés, 1976; Villalobos et al., 2012; Gonzalez-Pizarro, 2017), but the history of the industry during this time has attracted less attention from historians. Although COVENSA may have not been a good business by itself, it did manage to keep production at high levels.

Thanks to our new data we are now in a position to assess the full extent of the 1929 crisis on the population of the nitrate cantons, as opposed to the population of the entire Chilean north (shown in Table 2) or of the nitrate *oficinas* only (a narrow approach). We would expect that if production remained high, population should have remained high too, given that there was no dramatic technological breakthrough during this period to increase labour productivity.

The aggregated provincial census data included in Table 2, which contains the population per the so-called nitrate provinces between 1907 and 1940, shows that although the share of these provinces within the total Chilean population declined from 7 per cent

Table 2. Population of Antofagasta, Tarapacá and total Chile, 1907–1940

Province	1907	1920	1930	1940
Antofagasta	109,150	172,334	178,765	145,048
Tarapacá	117,178	116,789	113,331	104,087
Total Nitrate provinces	226,328	289,123	292,096	249,135
Total Chile	3,249,279	3,753,799	4,287,445	5,021,475
Share Nitrate provinces within total Chile	7.0%	7.7%	6.8%	5.0%
Growth regarding previous census		1920/1907	1930/1920	1940/1930
Antofagasta		57.9%	3.7%	−18.9%
Tarapacá		−0.3%	−3.0%	−8.2%
Total Nitrate provinces		27.7%	1.0%	−14.7%
Total Chile		15.5%	14.2%	17.1%

Source: Own elaboration from censuses.

to 5 per cent (undeniably an important fall), in absolute numbers it declined by around 43,000 people only. This is a fall of less than 15 per cent between 1930 and 1940, less alarming than the historiography suggests, and by no means, a 'collapse', thus supporting the point that production remained high. Nonetheless, we still wanted to separate the demographic impact in the Big North of the 1929 crisis on the population associated with nitrate production from that associated with copper or other activities, to assess the real extent of the fall in the population of the cantons as opposed to the population of the non-cantons.

Based on our new data (Table 3), we estimate that over 120,000 people were making a living out of nitrate in 1907, the first census for which we are able to estimate with precision the population linked to nitrate. This increased to more than 145,000 in 1920, the last census before the 1929 crisis, but which would be near the peak of population, since it was in the 1910s when production reached its maximum historical level (2.5 million tons in annual averages). The total population of the nitrate cantons declined by 10 per cent between 1920 and 1930, and then by another 28 per cent between 1930 and 1940. There was, undoubtedly, a fall in population linked to nitrate production. Indeed, in 1930 the population of the non-cantons was higher than that of the cantons, for the first time since 1907, thus suggesting some permanent emigration, but it was not as catastrophic as we may have thought based on the traditional accounts of most of the Chilean economic historiography. Furthermore, this was the case despite the fact that Chilean nitrate prices never fully recovered, not at least to reach the 1910s levels of production (Figure 1). The fact that production and employment (together with nitrate population) remained at respectable levels despite the dramatic fall in international prices suggests that the rate of profit during the 1900s–1920s was extremely high, as is confirmed by previous works (Greenhill, 2019).

In 1940 there were still 96,000 people living in the nitrate cantons, not far from the 121,000 of 1907 (25 years after the end of the Pacific War), when production was already high, at around 1.85 million tons that year. In 1940 the share of the cantons' population within the entire Big North population was not the 53 per cent recorded in 1907, but it was still a respectable 38 per cent. This is consistent with the idea that many workers (and their families), rather than leaving the Big North in the face of a nitrate crisis, and there were many, even before that of 1929 (Brown, 1963; Couyoumdjian, 1974; O'Brien, 1989), remained temporarily unemployed in the area, while looking for

Table 3. Population of the Nitrate Provinces, Nitrate Cantons Versus non Cantons

Population per zones	1907	1920	1930	1940
Cantons' population in Tarapacá	58,139	53,596	35,438	35,354
Cantons' population in Antofagasta	62,945	92,819	96,915	60,528
Total cantons' population	121,084	146,415	132,353	95,882
Non-cantons population in Tarapacá	59,039	63,193	77,893	68,733
Non-cantons' population in Antofagasta	46,205	79,515	81,850	84,520
Total non-cantons' population	105,244	142,708	159,743	153,253
Share of cantons' population to total population	53%	51%	45%	38%
Rate of variation regarding previous census		1920	1930	1940
Cantons' population in Tarapacá		−7.8%	−33.9%	−0.2%
Cantons' population in Antofagasta		47.5%	4.4%	−37.5%
Total cantons' population		*20.9%*	*−9.6%*	*−27.6%*
Non-cantons population in Tarapacá		7.0%	23.3%	−11.8%
Non-cantons' population in Antofagasta		72.1%	2.9%	3.3%
Total non-cantons' population		*35.6%*	*11.9%*	*−4.1%*

Source: Own elaboration from censuses.

new job opportunities in the nearby copper industry or in the distant agricultural south (Yáñez, 2008).

Disaggregating per province, the population of Tarapacá nitrate cantons declined more sharply in 1930 than in 1940, contrary to what happened in Antofagasta, where the greatest decline was experienced in 1940. Given the fact that most historians working on the nitrate industry have focused their attention on the province of Tarapacá, to the detriment of Antofagasta (Gonzalez-Pizarro, 2017), the higher relative fall of population in Tarapacá linked to the 1929 crisis may have exacerbated a negative view of the impact of the 1929 crisis on the total nitrate population. The nitrate activity of Antofagasta, according to Gonzalez-Pizarro (2017), is little known beyond the region. Furthermore, the quicker fall in Tarapacá's population is explained by many factors. First, Tarapacá had earlier exhausted the rich nitrate deposits (i.e. those easier to exploit), with the ore content halving between the end of the nineteenth century and the 1920s (Palma, 2000; González-Miranda, 2011a; Greenhill, 2019), exploited mainly under the Shanks system. The Shanks system was a steam-heated process for treating *caliche* (the nitrate mineral), introduced in Chile by the engineer James Humberstone during the last quarter of the nineteenth century, which started to be widely used in the country after the Pacific War (Meza, 1958; Bermúdez, 1987; O'Brien, 1989; Gonzalez-Pizarro, 2017; Greenhill, 2019).

Second, Tarapacá's nitrate production started quicker and at a higher level than in Antofagasta, given the fact that the rights to exploit nitrate deposits were awarded by the Chilean government far earlier than in Antofagasta (González-Miranda, 2011a, 2011b; Donoso, 2014). Third, it was in Antofagasta where the Guggenheim system (replacing the Shanks system) was more widely applied, although the Shank system remained in use in many *oficinas* (Bermúdez, 1987; Gonzalez-Pizarro, 2017). The Guggenheim system was introduced in Chile circa 1926, in María Elena *oficina* (formerly Coya Norte), property of the Guggenheim brothers (O'Brien, 1989; Glaser-Schmidt, 1996;Garcés, 1999 ; Gonzalez-Pizarro, 2017), after they acquired Baburizza's *oficinas* (Islas, 2019). It was a system with a more efficient (mechanised) production method that allowed for the exploitation of nitrate at lower costs (saving labour), and which

Table 4. Canton population, 1907-1940

Cantons	Population				Variation regarding previous census		
Tarapacá's cantons	1907	1920	1930	1940	1920	1930	1940
Alto San Antonio	6,251	5,970	1,237	1,878	−4.5%	−79.3%	51.8%
Dolores	3,064	567	177	33	−81.5%	−68.8%	−81.4%
Estación Gallinazo	144	1,619	196	49	1024.3%	−87.9%	−75.0%
Estación Huemul	528	465	489	7	−11.9%	5.2%	−98.6%
Huara	9,400	7,318	8,733	10,148	−22.1%	19.3%	16.2%
La Noria	972	707	502	30	−27.3%	−29.0%	−94.0%
Lagunas	4,525	4,737	1,527	2,538	4.7%	−67.8%	66.2%
Negreiros	8,505	9,553	2,121	160	12.3%	−77.8%	−92.5%
Pintados	3,087	6,187	11,087	11,571	100.4%	79.2%	4.4%
Pozo Almonte	6,510	6,944	4,859	6,743	6.7%	−30.0%	38.8%
Santa Catalina	7,850	5,257	1,599	1,469	−33.0%	−69.6%	−8.1%
Zapiga	7,303	4,272	2,911	728	−41.5%	−31.9%	−75.0%
Antofagasta's cantons	1907	1920	1930	1940	1920	1930	1940
Aguas Blancas	7,516	7,907	2,031	534	5.2%	−74.3%	−73.7%
Central	16,208	43,294	33,926	16,768	167.1%	−21.6%	−50.6%
Taltal	26,459	26,303	17,987	11,664	−0.6%	−31.6%	−35.2%
Toco	12,762	15,315	42,971	31,562	20.0%	180.6%	−26.6%

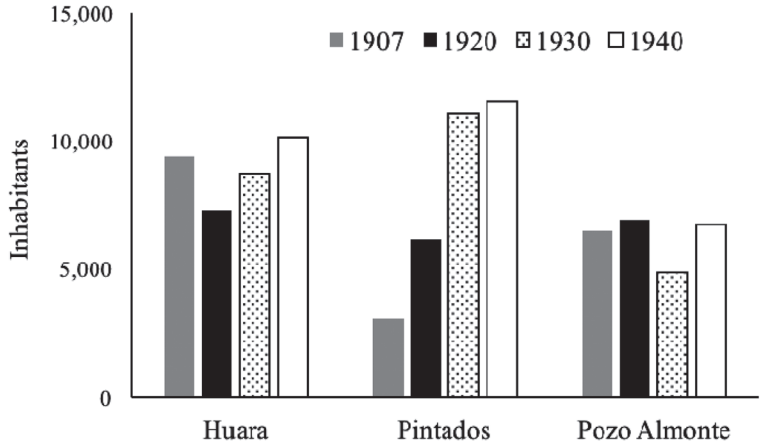
Source: Own elaboration from censuses.

allowed for the exploitation of minerals with lower nitrogen content (Bermúdez, 1987; González-Miranda, 2011a; Gonzalez-Pizarro, 2017; Miller, 2019). And fourth, it was in Antofagasta where the railways had a more important international connection to export the nitrate (González-Miranda, 2011a). In relative terms, there was a substantial southward movement of both nitrate production and population between 1907 and 1940, from Tarapacá to Antofagasta (González-Miranda, 2011a; Meza, 1958; Gonzalez-Pizarro, 2017). If in 1907 the population of Antofagasta was 1.1 times that of Tarapacá, in 1930 it was 2.7 times greater.

At a canton level (Table 4), a more interesting picture emerges. As was to be expected, following the fall of Chilean nitrate exports during the early 1930s, the population of some cantons experienced a sharp (and permanent) fall, and almost disappeared. For example, in Tarapacá the population of Dolores, Estación Huemul and La Noria reached extremely low levels given the closure of their main related *oficinas*. Previously important *oficinas* were closed down, and their workers dismissed or relocated to other *oficinas* of the same company. Something similar happened in one canton of Antofagasta, that of Aguas Blancas, which was badly hit by the crisis, as well as by the construction of the port of Antofagasta, which diverted production to the rest of Antofagasta's cantons (i.e. Central and Toco). Some of Aguas Blancas's *oficinas*, such as Avanzada, Castilla, Cota, Eugenia and San Gregorio y Valparaiso, were wiped off the map (Garcés, 1999). Chacabuco nitrate *oficina* is a good example of population decline. It managed to attract over 4000 people by 1930, but by the early 1940s, fewer than 150 people lived there. Likewise, other major *oficinas* in other cantons that also closed *oficinas* early on, as they were hit by the demise of the Shanks system, were Alemania, Rica Aventura, Calacala and Adriático y Chile (Garcés, 1999; Gonzalez-Pizarro, 2017).

Other cantons experienced a fall in population of some importance, but retained a considerable population in both 1930 and 1940, for example Alto San Antonio,

Figure 3. Population of Selected Nitrate Cantons, 1907–1940



Source: Own elaboration from censuses.

Lagunas, Santa Catalina (all in Tarapacá) and Central (also known as Bolivia), or Taltal in Antofagasta. This second group of cantons was not hit so dramatically by the 1920 crisis. What we witness here is a rationalisation of production, and a perseverance of the Shanks system for longer than expected, given that it was supposedly less efficient than the Guggenheim (Gonzalez-Pizarro, 2017).

Finally, the population of some cantons increased rather than decreased, even during the gloomy 1930s (Figure 3). For instance, the population of some cantons was higher in 1940 than in 1930 or 1920, namely, those of Alto San Antonio, Huara, Pozo Almonte and Pintados. This, as we have explained above, is unsurprising given that production remained high during the second part of the 1930s and during the 1940s–1950s (Figure 1). What is surprising, though, is the fact that some of these cantons belonged to Tarapacá, where production was declining relative to Antofagasta. Huara and Pintados' population reached their highest level in 1940, even higher than in 1920 and 1907. An explanation for this is that production from Tarapacá, formerly distributed amongst many cantons, became now highly concentrated in a few cantons only (i.e. there was a process of rationalisation/amalgamation), while many other cantons nearly disappeared. The case of Huara is interesting: thanks to the intervention of COVENSA, *oficinas* such as Santa Rosa de Huara, which had to close temporarily during the early 1930s, managed to reopen later on, and even flourished during several years until the 1950s (CIREN, 1985; Bermúdez, 1987). Furthermore, during the 1920s there were some new investments in these cantons, in particular by the Gibbs (Greenhill, 2019).

It is worth stressing that a strategy widely used, in response to the crisis, was corporate amalgamation or consolidation, through mergers or acquisitions, a practice that started even before the 1929 crisis, but which was exacerbated thereafter. The fragmentation of nitrate *oficinas*' ownership seen during the 1880s–1900s gave way to a high concentration of the nitrate business groups (Greenhill, 2019). The Guggenheim in particular managed to control much of the Chilean nitrate production, enjoying economies of scale. This is of consequence for our analysis because higher concentration also meant

higher exit costs (Greenhill, 2019), which in part would explain that nitrate population remained high for years to come.

Nitrate production continued at considerable levels during the 1930s–1950s and even thereafter, with a full stoppage only during the 1990s, with production undertaken at bigger establishments, which benefited from economies of scale. With individual nitrate plants producing at levels never seen before, the Guggenheim's María Elena and Pedro de Valdivia deserve further attention, as they were both located in the Province of Antofagasta. María Elena, for instance, could refine around 500,000 tons of nitrate annually (Greenhill, 2019), which was the total level refined by the whole industry during the 1880s. Likewise, Pedro de Valdivia became, by 1932, the largest nitrate plant in the world (Bermúdez, 1987; O'Brien, 1989; Glaser-Schmidt, 1996; San Francisco et al., 2008). In turn, other new *oficinas* were also created, often relying on the infrastructure of abandoned Shanks *oficinas*, such as that of Victoria, created in 1941 (Zolezzi, 1990).

Before the First World War, Great Britain, Germany and the US were far and away the main consumers, as the export market was highly concentrated (Couyoumdjian, 1974; Miller, 2019). However, in the face of competition from German synthetics, as well as the arrival of US investors, there was a radical change in the composition of Chilean export markets with Great Britain and the US gaining more relevance. From then on, in particular from the late 1920s, Chilean nitrate started to be sent mainly to the US, although the US was also producing synthetic nitrate, and at high scales (Gonzalez-Pizarro, 2017). That said, some countries in continental Europe also became important, such as France and Spain. Furthermore, there was an interesting process of market diversification, with Chile sending nitrate directly to most corners of the globe, cutting out the middleman.

Conclusions

The classic accounts of the Chilean economic historiography suggested that the 1929 crisis triggered a large and permanent exodus from the nitrate districts to elsewhere in Chile. Although there was indeed a fall in the population of the nitrate cantons, we cannot label this reduction as either catastrophic or permanent. It is true that after the 1929 crisis the nitrate industry was no longer the star of the export economy, and that copper replaced nitrate quickly. However, our figures suggest that the fall in population was moderate, that the population linked to nitrate production still accounted for 38 per cent of the whole population of the Big North in 1940, and that this is consistent with high levels of nitrate production between the second half of the 1930s and the 1960s. Furthermore, nitrate exports retained a respectable second place within the Chilean export basket. Active government intervention during the 1930s to rearrange and protect the industry proved successful, as it supported nearly 100,000 people making a living from nitrate for years to come. It is unfair to assess the importance of the industry during the 1930s–1950s based solely on the contribution of nitrate export duties to overall fiscal revenues, or to export revenues.

This is of consequence for Latin American economic policy makers because it seems that Chile's approach to deal with its star export product during the Great Depression was different from the policy adopted in other countries. For instance, the Brazilian government's response to the 1929 crisis was to physically destroy coffee stocks and to reach an agreement with Colombia to hold back part of their joint coffee production, as a means of keeping coffee prices at higher levels than otherwise, regardless of the impact on national employment. Likewise, the Cuban government also decided to reduce

its sugar exports and production (Bértola and Ocampo, 2012: 142–143), seemingly more concerned with the profitability of the business than with reducing the negative impact on regional unemployment rates. The Chilean government, instead, put all of its money into trying to keep both nitrate production and employment as high as possible, regardless of export prices. This action avoided a regional demographic catastrophe in the nitrate districts, contrary to widely held beliefs, and had a positive impact on the regional economy. This is the more remarkable given that Chile was the Latin American country most affected by the 1930s international crisis.

As for future research agenda, we are certain that many of our findings will be of interest to business historians concerned with crisis, technology and corporate rationalisation, as well as with corporate and state behaviour in the face of economic crisis.

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