Structural change and industrial transformation in Brazil, Chile and Uruguay

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Abstract

Since the second half of the twentieth century, structuralism and other theoretical perspectives have emphasized the decisive role of structural change in order to explain the relative performance of Latin American economies. Recent works have also contributed to the debate over why some regions were able to develop and others were not, through explaining the structural change. The main aim of this research is to study whether structural transformation in manufacturing occurred using a shift-share analysis. The results show that Brazil is one of the three Latin American countries studied which managed to reduce its structural heterogeneity during the industrialization period, measured by the shift-share analysis.

Keywords: manufacturing, productivity, Latin America, technological change

JEL Codes: O14, O47, N16, O33

1. Introduction

In Latin America, as well as in other undeveloped regions, the debate about the role of the productive structure, industrial development and industrial policies has been reopened in the last two decades. This has taken place in the context of a twenty-first century marked by China's strong economic growth, with its significant implications for foreign trade: increased demand for raw materials and food, and the consequent increase in their international prices (ECLAC 2016).

Motivated by favourable international conditions, primary sector activities (agriculture, forestry, mining) have become more important in Latin America. This phenomenon is known as economic reprimarization, which has its counterpart in the loss of weight of the industrial sector (Castillo and Martins 2017). This economic model of growth, which favours less technology-intensive activities and shapes a less diversified productive structure, has

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been the subject of discussion academically, in policy making, and in international organizations.

Since the early 1950s, structuralism and other theoretical perspectives have emphasized the decisive role of the productive structure and structural change to explain the relative performance of Latin American economies. Following these views, economies that were unable to reallocate their labour force from traditional to dynamic sectors were deemed to remain underdeveloped and stuck to structural heterogeneity (Kuznets 1955; Prebisch 1950). Recent works have also contributed to the debate on why some regions were able to develop and others lagged behind, by explaining structural changes for the whole economy or within the manufacturing sector, and supporting the idea that productive structure and policies are key to achieving economic growth and development (Cimoli et al. 2008; Chang 2009; Fagerberg 2000; Fagerberg and Verspagen 2002; Hausmann and Rodrik 2006; McMillan and Rodrik 2011; Naudé and Szirmai 2012; Rodrik 2005; Rodrik 2009; Stiglitz and Lin 2013; Szirmai 2012, Szirmai and Verspagen 2011).[1]

Starting from these dilemmas and the historical challenges faced by the region, this paper aims to contribute to this debate by providing evidence about the only historical period in which Latin America deliberately bet on industrialization (1930s–1980s).[2] Between 1930 and 1980, industrial policies played a key role in shaping manufacturing performance and convergence dynamics in Latin America.[3] A fierce industrial policy debate gained ground, revolving around the link between such policies and economic performance (Bértola and Ocampo 2012; Bulmer Thomas 1994; Cimoli et al. 2009; Fajnzylber 1983; Katz and Kozacoff 2000).[4] Up to this point, studies on productivity levels and growth rates disaggregated by industries in Latin American

1. These issues have long been the subject of research in economic history. While comparative advantages brought about convergence in living standards among OECD countries during the First Globalization (Williamson 1996), scholars have also argued that sustained economic growth in the long run was achieved by countries that introduced some form of protectionism in the early stages of development (O'Rourke 2000; Allen 2011).

2. The literature marks the 1930s as the beginning of the period of industrialization in Latin America, that is, after the Great Depression; and 1980 as the year of completion, the moment in which the region entered the so-called "lost decade" and "premature deindustrialization" (Palma 2005; Rodrik 2016).

3. By the end of the First World War, and particularly after the Great Depression in 1929, Latin American countries were unable to sustain economic growth based on exports of primary goods. Due to the international situation and current account deficits, Latin American governments encouraged industrialization for the domestic market via inward-looking economic policies, especially after the 1940s (Hofman 1998). Despite this important change in policy, there is vast evidence supporting the idea that "early industry" already existed in several countries prior to the 1930s (Bértola and Ocampo 2012; Bulmer-Thomas et al. 2007; Lewis 1986).

4. Briefly, the arguments referred to an excessive protectionism, absence of an adequate innovation system, insufficiency of technological capabilities, absence of an entrepeneurial class with an industrial vocation, among others.

countries have been limited, particularly for the interwar period.[5] To partly close this gap, this paper provides new insights into the debate on structural change and its role in economic growth, focusing on the manufacturing sector during the whole industrialization period 1930–1980, and adopting a comparative perspective that includes three Latin American countries, namely Brazil, Chile and Uruguay.

A new dataset was constructed on value added at current and constant prices and employment and, by doing so, labour productivity at the industry level was estimated. To the best of found knowledge, this disaggregated dataset is a first contribution of this article.[6] Unfortunately, other important countries within Latin America, such as Argentina and Mexico, could not be included in the analysis due to the limitations of the data to construct the same series disaggregated by industry.

The three middle-income Latin American countries analysed in this paper (Brazil, Chile and Uruguay) shared a similar historical periodization: i) infant industries before the 1930s, ii) industrialization from the 1930s onwards with substantial state-led support, and iii) deindustrialization after the 1980s. However, the three selected countries are different in terms of the degree of industrialization. While in both Brazil and Chile the manufacturing share of gross domestic product (GDP) reached its highest point at the beginning of the 1970s (c. 30%), in Uruguay the manufacturing sector reached its highest share of GDP at the end of the 1950s (c. 25%) and then remained stable for two decades at around 23%. After the 1970s, this rate steadily declined in Uruguay to levels lower than those of Brazil and Chile.[7] Since there are also different characteristics related to local institutions, and to the role of the state and policies across Brazil, Chile and Uruguay, they can be analysed in a comparative perspective to shed light on the link connecting public policy, structural change and economic growth. This is the second most important contribution of the paper.

Following the theoretical literature mentioned above, structural differences in the total economy, as well as within manufacturing, contribute to under-

5. Indeed, most of such evidence for Latin America is available after the 1970s thanks to an internationally harmonized database (PADI: Analysis Program of Industrial Dynamics) of the Economic Comission for Latin America and the Caribbean (ECLAC). This database collects detailed statistics from the manufacturing sector taken from national statistical offices in the Latin American countries.

6. Concerning Chile and Uruguay, the series of labour and value added at constant prices are partly my own estimates. For Brazil, the data was kindly provided by Renato Colistete (University of Sao Paulo). The Appendix presents the data for the years involved in this paper and briefly summarizes some methodological issues, while the whole series I constructed is available upon request. A more detailed description can be found in my PhD dissertation (Lara 2019).

7. Industrialization can be measured as manufacturing GDP divided by GDP of the entire economy. Figures were calculated using the MOXLAD database (http://moxlad.ciencias-sociales.edu.uy/en).

standing why some countries follow a successful path of economic growth, while others fail to achieve it. Therefore, sectoral heterogeneity and structural change are key elements included in this paper, which are explored using a shift-share analysis (Fagerberg and Verspagen 1999; Fagerberg 2000). With this method, the impact of structural change on productivity growth in manufacturing is assessed. This is the third contribution of the paper.

The main results show that the manufacturing industry in Brazil achieved substantial changes, which were reflected in a lower structural heterogeneity and structural change. There is evidence of productivity growth in modern industries in Brazil, such as steel, machinery, and transport equipment. On the other hand, structural transformation was weaker in Uruguay and mild in Chile. Both failed to maintain a diversified manufacturing sector in the period, with a greater weight of industries intensive on engineering. The latter must also be linked to the different pace of industrialization in these two countries, especially in Uruguay, where the industrializing impulse was exhausted very early on.

The paper is divided into three sections after this introduction. Section 2 briefly describes the historical context of each country. Section 3 analyses structural change using a shift-share analysis. Section 4 concludes.

2. Historical context

This section is mainly dedicated to reviewing the development of the industrial process in Brazil, Chile and Uruguay.

2.1. Brazil

The early industrialization in Brazil dates back to the late nineteenth and early twentieth century, and relied heavily on foreign technology and income generated by coffee exports (Dean 1969).

Regarding the proper industrialization period, Abreu et al. (1997) distinguish two stages in Brazil: between the 1930s and 1960s, and from the 1960s to 1980s. The first period can be considered a proper import substitution industrialization, while the second stage was characterized by the expansion of the production of more technologically sophisticated goods.

As shown in Table 1, the share of value added in natural resources and labour-intensive manufacturing industries each represented 44% of all manufacturing in 1939, and their labour shares of total employment were 33% and 57% respectively. Although over time these ratios steadily decreased, until the 1950s growth of industrial production was due to the expansion of the production of traditional goods with significant inputs of natural resources

(food, beverages and tobacco) and labour-intensive industries (textiles, apparel, footwear, and leather). On the other hand, up until the 1940s, engineering-intensive industries such as metals, machinery and transport equipment had value added and labour shares of around 15% and 12%, respectively.[8]

Between the 1940s and the early 1980s, Brazil carried out a massive state-promoted effort to modernize its economy and industrialize (Baer and Kerstenetzky 1964; Hofman 1998; Suzigan and Villela 1997). New industries related to durable consumption goods (such as automobiles and household appliances) were supported through public subsidies and the state participated in the generation of energy, construction and transport in order to provide infrastructure to the industrial sector (Thorp 1998). Two government-owned enterprises were also founded in this period: Compañía Siderúrgica Nacional (CSN) in 1946, dedicated to steel production, and Petrobras in 1957, a state-owned monopoly focused on oil, natural gas and derivatives. The National Economic Development Bank (BNDES), founded in 1952, was key to financing infrastructure projects as well as the expansion of selected industrial sectors. Moreover, although industrial protectionist policies had moved toward multiple exchange rates,[9] in 1957 very high ad valorem import duties were established, in some cases reaching 150%.

In this context, changes in the industrial structure should be expected, beginning in the late 1950s. Table 1 confirms this. According to the industrial census of 1959, natural resources and labour-oriented manufacturing saw their shares of manufacturing value added drop, whereas in engineering industries it rose from 13 to 27%.

Starting in 1964, Brazil set in motion a development strategy that consisted of a more open economy, which enabled Brazil to industrialize further. In this new stage, policies were more private sector oriented. Export-oriented firms, many of them multinational enterprises, were exempt from duties on imports of capital goods, which contributed to strengthening the alliance among the state, domestic capitalists and foreign capital (Alarcon and Mcckinley 1992). Incentives for manufacturing exports led to their expansion, especially in heavy industries. In 1969, the government created Embraer, the

8. The classification proposed by Katz and Stumpo (2001) was followed in order to summarize the main results derived from the data available in tables 1, 2, and 3. This classification divides the manufacturing sector into three types of industries according to the production factor used more intensively: natural resources, labour and engineering (ECLAC 2007; Katz and Stumpo 2001; Lavopa and Szirmai 2011). The first group includes food, beverages, tobacco, paper, chemicals, petroleum, rubber and plastics. The second group is comprised of textiles, apparel, leather, wood, furniture, printing, non-metallic minerals and miscellaneous. The third group includes metals, electrical and non-electrical machinery, vehicles and transport equipment.

9. A multiple exchange rate system is the market divided into any number of segments, each with its own exchange rate.

TABLE 1 ▪ *Distribution of total value added (VA) and labour (L), by industry: Brazil*

	1939		1949		1959		1970		1975		1980	
	VA	L	VA	L	VA	L	VA	L	VA	L	VA	L
Food & beverages	27.6	23.3	24.9	20.9	19.3	17.7	15.8	16.4	13.1	14.5	11.3	13.8
Tobacco	2.3	1.7	1.4	1.0	1.3	0.8	1.3	0.6	1.0	0.6	0.7	0.4
Textiles	21.8	28.6	19.6	25.8	12.0	18.7	9.3	13.0	6.1	8.7	6.4	7.7
Apparel Footwear Leather	6.5	7.8	5.6	7.5	4.6	7.0	4.0	7.2	4.3	8.9	5.3	10.2
Rubber & plastic	0.6	0.6	2.1	1.1	3.8	1.7	3.8	2.9	3.9	3.3	3.7	3.6
Wood	3.2	4.6	4.2	5.2	3.2	5.0	2.5	5.2	2.9	5.3	2.7	5.3
Furniture	2.1	3.5	2.2	3.0	2.2	3.6	2.1	4.0	2.0	3.6	1.8	3.6
Paper	1.5	1.5	2.2	1.9	3.0	2.3	2.6	2.5	2.5	2.2	3.0	2.2
Printing	3.5	3.9	4.0	3.8	3.0	3.5	3.7	3.7	3.7	3.3	2.6	2.9
Non-metallic minerals	5.3	7.0	7.1	9.8	6.6	9.3	5.9	9.0	6.2	8.4	5.8	8.9
Chemicals Petroleum	11.6	5.6	9.7	5.6	12.5	6.7	14.9	5.9	15.8	4.7	17.2	4.5
Metals & metal products	7.5	7.5	9.4	7.9	11.8	9.9	11.6	10.1	12.6	11.6	11.5	10.8
Non-electrical machinery			2.1	2.0	3.4	3.5	7.1	6.8	10.3	10.3	10.1	10.9
Mechanical engineering	5.4	3.1	1.6	1.2	4.0	3.3	5.4	4.4	5.8	4.6	6.4	5.0
Transport equipment			2.2	1.5	7.6	4.7	8.0	6.0	6.4	5.8	7.6	5.7
Miscellaneous	1.1	1.3	1.6	1.8	1.8	2.2	2.1	2.4	3.3	4.0	4.0	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Industrial censuses, taken from *Estatisticas historicas do Brasil*.

first national enterprise specialized in aircraft production (Teitel and Thoumi 1986).

Finally, the industrial censuses of 1975 and 1980 confirm the favourable change for engineering industries. In 1980, natural resources and labour-intensive industries represented 36% and 28% in terms of value added respectively, whereas the engineering-intensive industries reached the share of 36%. Despite the achievements obtained, the model was controversial; protectionism and selected subsidies were considered by some authors to be a problem

that caused inefficiency and high-cost industries (Baer 1972; Bulmer-Thomas 1994; Hirschman 1968).

2.2. Chile

In Chile, industrial activity emerged in the middle of the nineteenth century and expanded in the 1880s due to the nitrate boom after the War of the Pacific.[10] The economic prosperity driven by mining, transportation and agriculture, together with demographic changes and the growth of an urban middle class, expanded the scope of possibilities for early industrial development.[11] Moreover, the tariff system of 1897, despite being moderate, can be considered a milestone in the protectionism scheme (Kirsch 1977).

Muñoz (1971) distinguishes between two different periods of industrial growth in Chile: before and after 1940. During the first period, industrial firms were led primarily by the private sector, produced non-durable goods, and absorbed workers from other economic sectors (Mamalakis 1965). Geographically, specific areas in Santiago, Valparaiso and Concepcion were transformed into dynamic centres of manufacturing (Badía-Miró and Yáñez 2015; Mamalakis 1976).

After 1940, high rates of productivity growth were obtained in aggregate manufacturing due to higher capital intensity and less intensive use of labour. During this second period, chemicals, paper, non-metallic minerals and textiles played key roles in the industrialization process. Especially in chemicals and paper, high investment and technical progress increased productivity rates. The paper industry was one of the oldest industries in Chile, and its production capacity grew in response to mechanical and chemical pulp production. The comparative advantages of the paper industry also explain its performance in the domestic and foreign market in this period.

Under the government of Aguirre Cerda (1938–1941), the most prevalent policies were tariff discrimination, import licenses, quotas, prohibitions, exchange controls and multiple exchange rates (Pinto 1959). In 1939, the government created the Production Development Corporation (in Spanish: Corporación de Fomento de la Producción de Chile, henceforth CORFO). CORFO aimed to create a strategy to promote economic growth and development in Chile, and was financed through the imposition of a tax on the copper industry. This organization encouraged private and public investment,

10. The Pacific War, also known as the Salitre War, was an armed conflict between 1879 and 1884 that pitted Chile against its allies Bolivia and Peru.

11. Palma (1984) also supports the idea that the industrial sector existed before the 1930s. The evidence he finds shows that, between 1914 and 1929, domestic production increased whereas imports declined in relative terms. Besides, the industrial policies oriented demand toward local production.

stimulated technological research and supported new industries in strategic fields, namely electricity, oil and steel (Lagos 1966). In so doing, CORFO intended to achieve a more diversified manufacturing structure and faster industrial growth with less external dependence.

In the 1950s, this pattern of development faced several difficulties (Mamalakis 1965). There is a line of research that suggests that domestic factors had a negative effect on the manufacturing sector's performance: excessive protectionism based on tariffs, weak private investment, lack of qualified workers, and inconsistency of industrial policies, among others (CORFO 1967; Lagos 1966; Pinto 1959; Sunkel 2011). However, Ffrench-Davis et al. (2003) argued that the main problems were high inflation and the orthodox plans carried out to control it, and Thorp focused on political problems (Thorp 1998, p. 213).

The structure of value added in 1939 was concentrated mainly in natural resources (60%), followed by labour intensive industries (34%), and engineering industries represented only 8% (Table 2). However, this structure changed over the period: in 1957, the value added shares were 43% in the first group, 36% in the second group and 21% in the last group.

Between 1958 and 1964, under the liberal government of Alessandri, economic development was again led by sustained industrial growth. The National Mining Company (Enami), the National Telecommunications Company (Entel) and the Port Company of Chile (Emporchi) were created in this period.

In 1970, Allende won the elections, and proceeded to deepen the reforms based on state intervention and industrialization, in a highly polarized political context (Ffrench-Davis et al. 2003). The manufacturing sector's share of total value added reached its highest point between 1970 and 1973 (25%), and the share of value added corresponding to engineering industries reached 29% in 1979.

The development strategy oriented toward the domestic market and led by the manufacturing sector ended in 1973 when the democratic regime was disrupted by a military dictatorship. From that moment on, Chile followed the neo-liberal recipes promoted by international financial institutions. This new economic policy dismantled the national manufacturing sector and favoured the natural resource exporters (Ffrench-Davis et al. 2003).

TABLE 2 ▪ *Distribution of total value added (VA) and labour (L), by industry: Chile*

	1939		1947		1957		1967		1979	
	VA	L	VA	L	VA	L	VA	L	VA	L
Food & beverages	27.5	24.7	23.5	20.3	22.6	19.9	21.3	20.5	23.2	25.8
Tobacco	7.0	1.6	5.6	0.9	5.4	0.6	2.6	0.4	3.7	0.3
Textiles	16.4	16.7	18.8	18.4	13.2	17.7	10.2	13.5	5.4	11.4
Apparel	1.8	3.7	3.0	4.1	4.3	7.4	2.9	5.0	2.8	6.3
Footwear	4.0	7.3	3.6	6.3	3.4	6.1	1.8	3.8	1.7	3.0
Leather Rubber & plastic	4.4	3.8	3.1	4.4	2.5	2.5	4.0	4.0	3.8	4.8
Wood	5.7	7.6	5.0	8.3	3.1	5.5	2.9	9.3	3.7	7.7
Furniture					1.6	2.3	1.0	2.3	0.8	2.1
Paper	8.0	8.6	6.2	6.3	1.9	1.6	2.1	1.4	4.4	2.2
Printing					3.7	3.8	2.7	3.2	4.0	3.9
Non-metallic minerals	4.9	8.3	7.4	8.5	5.2	5.9	3.2	4.3	3.6	3.9
Chemicals	11.2	5.7	11.7	7.4	7.8	5.7	7.4	5.1	9.5	5.3
Petroleum					3.2	0.5	1.8	0.7	4.2	0.8
Metal & metal products	8.0	11.5	11.7	14.9	14.9	11.4	21.2	11.8	20.8	12.6
Non-electrical machinery					1.7	2.4	4.4	4.7	2.2	3.2
Mechanical engineering					1.7	1.5	3.2	2.4	2.2	2.4
Transport equipment					2.3	3.3	6.4	6.7	3.4	3.4
Miscellaneous	1.0	0.5	0.4	0.2	1.2	1.7	0.6	1.1	0.5	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Industrial censuses, industrial surveys and statistics yearbooks.

2.3. Uruguay

Before the 1930s, the infant industry in Uruguay was mainly supported by cheap inputs and simple technology, in addition to state protectionism through commercial tariffs. The domestic market benefited from changes in external demand structure and related impacts on domestic production, as well as migration and urbanization, and location advantages for different industries (Bértola 2000; Jacob 1981).

Between the 1930s and the mid 1950s, this model strengthened domestic production oriented toward the local market, which was sustained due to an increase in domestic demand, the expansion of the state and the rise in work-

ers' income. In addition, imports of consumer goods were replaced by domestic production and imports of industrial inputs became cheaper. The state had a greater role in the economic sphere: it provided goods and services, created public jobs and implemented policies (multiple exchange rates, control of the foreign exchange market, tariff restrictions on certain imports) to favour the national industrial sector. This industrial protectionism through subsidies, preferential exchange rates and tax exemptions was characterized by non-selectivity and unconditionality (Bertino et al. 2001; Bértola 1991; García Repetto 2014).

All these policies favoured non-durable consumer goods industries such as food, beverages and textiles. According to the industrial census of 1936, the shares of value added and employment of industries related to natural resources were 53% and 45%, respectively. By 1968, food and beverages represented 24% of total value added. On the other hand, labour intensive industries had a stable share of value added and employment between 1936 and 1968, at around 35% of value added and 45% of employment. Within this group, the textile sector expanded in both absolute and relative terms, accounting for around 15% of total value added and employment. Apparel, leather and footwear, and rubber and plastics, each accounted for around 5% of total value added, and the labour shares were respectively 10%, 6% and 4%. Concerning engineering-intensive industries, their shares of value added and employment increased slightly between 1936 and 1968 (from 13% and 15%, to 15% and 18%), and then remained stable up to 1978, at around 15% in both indicators. The expansion of production in transportation equipment was particularly strong among these industries.

The year 1973 was the beginning of a prolonged dictatorial period, in which the National Development Plan (1973–1977), which was intended to boost the economy, was put into practice. As Notaro (1984) pointed out, the Plan sought to develop a model of "restructuring interventionism", increasing traditional and non-traditional exports with the involvement of foreign capital, higher exchange rates in real terms, and lower wages. The implementation of these policies between 1974–1978 brought about the end of a period of economic stagnation. Industries based on natural resources (dairy products, rice, barley, citrus fruits, oil, textiles, chemicals) were among the main loci of economic recovery. However, Macadar (1982) noted that there was no centrally directed industrial policy, and these industries grew in response to the impulses of the external and internal demand. Regardless, the industrial structure of 1978 did not differ significantly from that of 1968. In the cases of food and beverages and textiles, their shares of value added dropped slightly, while that of petroleum increased from 2% in 1968 to 15% in 1978 (but not its share of employment). Finally, after 1978 in Uruguay, as in Chile, the process of deindustrialization was resumed and deepened. There was a shift in

the economic policy toward an accelerated process of financial opening in the country, removal of incentives for industrial production through a reduction of the tariff protection and elimination of export promotion.

TABLE 3 ▪ *Distribution of total value added (VA) and labour (L), by industry: Uruguay*

	1936		1968		1978	
	VA	L	VA	L	VA	L
Food & beverages	42.2	37.0	27.35	23.35	23.4	27.7
Tobacco	3.8	1.7	5.45	0.53	4.0	0.4
Textiles	7.9	10.7	15.89	14.42	9.3	11.8
Apparel	7.2	6.6	4.99	10.74	4.5	9.7
Footwear Leather	5.4	6.7	4.1	5.7	5.0	9.6
Rubber & plastic	0.8	1.2	4.90	3.85	5.0	4.4
Wood	1.7	1.6	1.34	2.66	1.2	2.5
Furniture	2.1	3.4	0.94	2.56	0.7	1.6
Paper	1.4	1.4	1.47	1.45	1.6	1.9
Printing	4.0	4.4	2.50	3.41	2.6	3.0
Non-metallic minerals	5.0	5.5	5.28	4.87	3.9	4.7
Chemicals	4.6	3.2	7.51	4.61	8.0	5.2
Petroleum			2.41	2.17	15.5	1.1
Metals & metal products	6.6	7.7	4.48	5.40	4.8	6.3
Non-electrical machinery	0.7	0.6	1.23	1.48	1.8	1.9
Mechanical engineering	0.9	0.9	3.44	3.82	3.3	3.4
Transport equipment	4.9	6.2	5.59	7.80	4.6	3.5
Miscellaneous	0.8	1.1	1.13	1.18	0.8	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Industrial censuses.

3. Structural change using the shift-share analysis

The aim of this section is to discuss the structural change in the manufacturing sector using disaggregated data for Brazil, Chile and Uruguay.

At first, the works of Hirschman (1958) and Rosenstein-Rodan (1943) were based on forward and backward linkages and increasing returns to scale in manufacturing, respectively. Later, in 1960 the famous Kaldor's law, which

proposes that the manufacturing sector is the "engine of growth", strengthened the arguments in favor of manufacturing as a way to achieve successful economic performance. Furthermore, as already mentioned, since the 1950s structuralist thought had emphasized the idea that structural transformations should be concentrated on the manufacturing industry.

More recent literature has followed this belief: the industrial sector in a broader sense[12] plays a crucial role in economic development and its performance may help to understand why some countries were able to catch up while others lagged behind the leaders (McMillan and Rodrik 2011; Rodrik 2016; Szirmai 2012).

Kuznets (1955) defines structural change as the reallocation of labour from traditional to modern sectors. Applying this concept to the manufacturing sector would mean that structural change is found when there is a labour shift from industries with lower output-to-worker ratios than average to industries with higher output-to-worker ratios than average. Empirically, structural change can be decomposed into three constituent components following the "shift-share" analysis, which was originally developed by Fabricant (1942) and later proposed by Fagerberg and Verspagen (1999) and Fagerberg (2000).

The periods chosen for the analysis of Chile are 1939–1950, 1950–1960, 1960–1970 and 1970–1980. In the case of Brazil, the first period is 1945–1960, and in the case of Uruguay, the periods differ due to data constraints: 1939–1947, 1947–1955, 1955–1968, 1968–1978. See Appendix for more details.

The shift-share analysis, in one form or another, has been previously applied to Latin American countries by Timmer and Szirmai (2000), Holland and Porcile (2005),[13] Azar and Fleitas (2010),[14] McMillan and Rodrik (2011), Timmer and de Vries (2009), Timmer et al (2015), Aravena et al (2014), Aldrighi and Colistete (2015),[15] López Arnaut (2017). Some of them analyze

12. Recent literature refers to the concept of industrial development, which is a broad set of productive activities that include the manufacturing sector in a key role, as well as scientific-technological laboratories, the production of different energy sources, genetic transformation, nanotechnology, and different areas of information technology (Bértola and Bittencourt 2017).

13. Holland and Porcile (2005) studied structural change in Brazil, Chile, Colombia, Mexico and Uruguay between 1970 and 2002. In all countries and all periods, productivity growth was explained primarily through the increases in labour productivity within industries.

14. Azar and Fleitas (2010) decomposed productivity growth in the manufacturing sector for Argentina, Brazil, Uruguay and the United States for the period 1930 to 1960. Their results show that in all countries the major source of contribution to aggregate productivity was the within-industry effect. They also identify structural change in the United States and in Brazil during 1939–1959. According to these estimates, within the Southern Cone, only Brazil was able to reduce the heterogeneity among sectors and achieve structural change.

15. Aldrighi and Colistete (2015) estimated structural change with a shift-share analysis for the manufacturing sector in Brazil between 1945 and 2009. One of the most remarkable conclusions is that productivity gains within industries were the major source of aggregate productivity growth from early industrialization until the 1980s. Moreover, they suggest that the

structural change at a total economy level. Others, such as this paper, focus on the manufacturing industry. This study has a twofold contribution to the literature: the time period considered covers the entire industrialization stage, and the comparison between Latin American countries is based on the same disaggregation.

Following Fabricant (1942) and Fagerberg (2000), the increase in overall productivity within two moments in time is the result of three specific components:

$$\frac{(P_t - P_0)}{P_0} = \sum_{n=1}^{i} \Big(\underbrace{\frac{P_{i0} * (S_{it} - S_{i0})}{P_0}}_{\text{(I)}} + \underbrace{\frac{(P_{it} - P_{i0}) * (S_{it} - S_{i0})}{P_0}}_{\text{(II)}} + \underbrace{\frac{S_{i0} * (P_{it} - P_{i0})}{P_0}}_{\text{(III)}} \Big)$$

where P is labour productivity, i an individual industry, S_t is the share of labour of industry i in total manufacturing, t is the final period and 0 is the initial time period.

Component (I) of the equation shows the change in the employment structure considering the initial fixed productivity and, ultimately, the whole effect of the change in productivity due to the reallocation of labour between industries (static effect). The static effect will be positive if the share of high productivity industries in total labour increases at the expense of low productivity industries. Component (II) is the result of two effects: the within-industry effect and the static effect. This component will be positive if the industries that increase their productivity more rapidly than average, also increase their share of total labour. On the contrary, when labour increases in industries with lower labour productivity than average, the contribution of this effect is negative. This component is referred to as the dynamic effect. Component (III) of the equation is the contribution of productivity growth within industries, considering the initial weight of these industries in the total labour structure (within-industry effect).

To perform a shift-share analysis it is necessary to gather a value added series at constant prices and a labour series at the industry or sector level for each country. The value added data at constant prices for Brazil is expressed in cruzeiros of 1970, for Uruguay in pesos of 1936, and for Chile, in Chilean pesos of 1953. On the other hand, labour data was gathered from different official sources of each country (see Appendix).

relatively successful learning process and the technological advances made by manufacturing firms petered out after the lost decade in the 1980s.

Table 4 shows total labour productivity growth rates (accumulated) for different sub-periods as well as the shift-share results.[16] The three effects (static, dynamic and within-industry) are expressed as percentage variation rate, which means that the three components together represent the total change in labour productivity growth.

For each sub-period in Brazil, Chile, and Uruguay after 1947, the aggregate productivity growth was dominated by the within-industry-effect. This result is in line with previous evidence found for the Latin American countries (Aldrighi and Colistete 2015; Azar and Fleitas 2010; Holland and Porcile 2005; López Arnaut 2017). This means that the increase in aggregate productivity would have taken place even if the industries size distribution had remained unchanged.

As Aldrighi and Colistete (2015) documented, labour productivity in Brazil rose in the 1950s and in the 1970s. Annual productivity growth rates were around 7% for both sub-periods (Table 4). Deliberate industrial policies contributed to the development of modern sectors (chemicals, metals, electrical and transport equipment) as well as to the improvement of productivity in specific traditional sectors, such as textiles (Abreu et al. 2000). Vargas' governments employed different instruments to promote industrialization, at first based on consumer goods industries and afterwards on capital-intensive goods. Later, at the end of the 1960s and during the 1970s, policies became more oriented toward the private sector and foreign firms, achieving satisfactory results in terms of labour productivity. Contrary to other small Latin American countries, the large domestic market in Brazil allowed firms to reap the benefits of economies of scale, and made it profitable to produce capital goods, durable consumption goods and transport equipment. Teitel and Thoumi (1986) found that capital-intensive industries, such as metallurgy and metalworking, increased their export volume and achieved higher efficiency and productivity rates. This change is reflected in the results of the three effects. Above all, the within-industry effect represented the highest contribution to total labour productivity growth in each sub-period. In addition to the within-industry effect, labour reallocation from low to high productivity industries between 1945 and the 1970s contributed positively to total productivity growth.

Disaggregating by sub-periods, between 1945 and 1960, although labour productivity in food, beverages and textiles grew at the cost of laying off workers, the performance of chemical and engineering-intensive industries resulted in greater relative dynamism in productivity and an expansion of em-

16. Labour productivity growth rates are calculated using industries that are comparable to the different benchmark years. Thus, they do not have to coincide with the calculations shown in Table 4.

TABLE 4 ▪ *Total accumulated labour productivity (LP) growth rate and its component in Brazil, Chile and Uruguay, 1939–1980 (as percentage)*

Chile		Uruguay		Brazil	
LP growth rate (%)		LP growth rate (%)			
1939-1950	17.30	1939-1947	–2.24		
Static	–6.73	Static	–2.14		
Dynamic	–1.27	Dynamic	0.31		
Within	25.30	Within	–0.41		
LP growth rate (%)		LP growth rate (%)		LP growth rate (%)	
1950-1960	31.67	1947-1955	16.16	1945-1960	183.56
Static	–2.84	Static	9.11	Static	10.38
Dynamic	–2.67	Dynamic	–7.93	Dynamic	4.67
Within	37.19	Within	14.97	Within	168.51
LP growth rate (%)		LP growth rate (%)		LP growth rate (%)	
1960-1970	23.54	1955-1968	12.67	1960-1970	34.60
Static	0.67	Static	–4.31	Static	7.03
Dynamic	–2.21	Dynamic	–10.00	Dynamic	–1.11
Within	25.08	Within	26.97	Within	28.68
LP growth rate (%)		LP growth rate (%)		LP growth rate (%)	
1970-1980	2.19	1968-1978	22.45	1970-1980	109.26
Static	2.53	Static	5.35	Static	1.31
Dynamic	–13.20	Dynamic	–4.08	Dynamic	–4.75
Within	12.85	Within	21.18	Within	112.70
LP growth rate (%)		LP growth rate (%)		LP growth rate (%)	
1939-1980	94.97	1939-1978	52.60	1945-1980	698.71
Static	–4.85	Static	–6.01	Static	25.79
Dynamic	–32.44	Dynamic	–20.95	Dynamic	–61.26
Within	132.26	Within	79.56	Within	734.18

Sources: Author's estimates based on industrial surveys, censuses, and yearbooks.

ployment. Again, in the 1960s, engineering-intensive industries, together with paper, leather, and chemicals, offset the negative effects occurred in other industries, which led to the reduction of workers while achieving high productivity (as in the case of textiles). This was reflected in a positive net effect of structural change in the period 1945–1970.[17] In the 1970s, there was an increase in the participation of industries with high productivity and little loss of labour force, which could not be compensated by the greater absorption of employment in more productive high-tech intensive industries. In any case, in terms of overall performance in the period, Brazil managed to partially reduce its structural heterogeneity according to the shift-share analysis.

The evidence reported in Table 4 for Chile shows that the annual growth in aggregate labour productivity was around 2-3% for 30 years (1939–1969),

17. Aldrighi and Colistete (2015) obtained similar results for Brazil in this period. This is an expected result as I used their database with some adjustments.

whereas it remained stagnant in the 1970s. It should be considered that labour productivity was positive until 1973, but then started to decline after the dictatorial government abandoned the industrialization strategy.

Although the manufacturing sector was more diversified during the state-led industrialization period, total labour productivity growth was mainly accomplished through rapid progress within a few specific industries, such as food and beverages, paper, non-metallic minerals, and engineering-intensive industries. Between 1939 and 1950, the industries that positively contributed to total labour productivity growth were mainly textile, chemical and engineering-intensive industries, whereas during the 1950s and 1960s it was food, beverages, and engineering-intensive industries that contributed positively.

Component I, based on labour reallocation, was positive during 1960–1970 and 1970–1980 in Chile. In the first sub-period, the result was explained by engineering-intensive industries, and in the second it was due mainly to food and beverages. However, the net static effect was always negative due to a greater negative dynamic effect.

Particularly, food and beverages, textiles and non-metallic minerals were the industries that showed the highest productivity growth in the 1960s, although accompanied by a loss of labourers. Engineering-intensive industries partially offset this situation, since they combined greater relative dynamism with the incorporation of labourers. The positive role of these industries can also be observed in the 1960s. Between 1970 and 1980, the most productive industries were tobacco, non-metallic minerals, and engineering-intensive; and all of them became so at the cost of expelling workers.

According to the shift-share analysis, the total productivity growth driver in the Chilean manufacturing sector did not come from total structural change. However, some engineering-intensive industries grew and managed to absorb workers over part of the period. This is consistent with the role of these more modern industries described in the historical context of this paper. Industries related to electricity, oil and steel were deliberately encouraged and supported (with ups and downs) until Allende's government.

In Uruguay, the annual labour productivity growth rate was negative between 1939 and 1947, and then rose to 2% between 1947 and 1955. After that, productivity dropped to 1% per annum and recovered in the 1970s to 2%. Therefore, labour productivity performance was very modest during almost the entire period, and lower than that of Brazil and Chile. This result is in line with the fact that industrialization in Uruguay was more limited than that in Brazil and Chile. The within-industry effect explained most of the total productivity growth rate, barring the first sub-period of 1939–1947. Particularly, between 1939 and 1947, there was a decrease in total labour productivity, explained by the fall of important consumer goods industries such as food, apparel and footwear. These industries expelled workers, while the

textile industry improved in terms of productivity and absorbed more employment.

It is also important to illustrate the role played by the static and dynamic effect. The static effect was positive between 1939 and 1955, negative between 1955 and 1968 and positive again between 1968 and 1978. This means that the sectors that increased their participation in employment were those with higher productivity levels than average. Nevertheless, the dynamic effect of structural change always showed a negative contribution. As a result, the net static effect reveals a positive contribution between 1939 and 1955,[18] which disappeared from 1955 to 1968, and became positive again between 1968 and 1978. Therefore, it is important to note that during the proper industrialization period in Uruguay (1939–1955), the results related to structural change were more favourable. During 1947–1955, industrial labour productivity grew, favourably driven by food, metallurgy, and non-metallic minerals. However, those three industries required fewer workers.

Between 1955 and 1968, the manufacturing industry had lost its dynamism in Uruguay, and the more traditional industries (food and beverages) contributed positively to productivity growth at the expense of fewer employed workers. Finally, between 1974 and 1978 the manufacturing industry was boosted and this was reflected in a greater (though moderate) labour productivity growth rate in the 1970s. This can be explained by petroleum, non-metallic minerals, and beverages; all of them with expulsion of employment. In short, the Uruguayan industries did not have the capacity to contribute substantially to productivity growth while expanding employment. Although there are some positive contributions, these were limited in scope and were more concentrated in natural resource-intensive and labour-intensive industries.

Finally, these new results for manufacturing can be contrasted with the previous results for the economy at large (Castillo and Martins 2017; Mc Millan and Rodrik 2011). In both strands of work, Brazil and Chile recorded positive productivity growth rates from 1950 to 1975, accompanied by a favourable structural change. Their performances in the manufacturing sector, as well as at the aggregate level, worsened once they deindustrialized and liberalized their markets in the 1980s (and accelerated in the 1990s). In more recent decades, between 1990 and 2011, structural change in these countries was characterized as growth-reducing.

18. This result is consistent with previous works for Uruguay (Bértola 1991; Arnábal, Bertino and Fleitas 2013).

4. Final remarks

The objective of this paper was to contribute to the analysis and characterization of the performance of the manufacturing sector in Brazil, Chile and Uruguay, during the state-led industrialization period, based on new evidence. The paper offers three main contributions: 1) a new comparative dataset, 2) a description of the productive structure across the above countries, and 3) a shift-share analysis to shed new light on the sources of productivity growth in the manufacturing sector.

The description of the productive structure shows that the degree of industrial transformation was weak and limited in time in the case of Uruguay, followed by the Chilean experience with moderate advances, and finally the Brazilian case that showed profound and sustained changes over the period. In Uruguay, the main changes in the industry occurred before mid 1950s. However, the weight of natural resource-intensive industries was always high, often associated with the production of traditional non-durable consumer goods (food and beverages) and others (paper, chemicals and oil). Food and beverages enjoyed high levels of protection. Unlike Brazil and Chile, there was no strong institutional framework for industrial policies that deliberately supported the production of engineering-intensive goods. The latter group of industries grew very slightly in terms of value added and employment.

The story was different in Chile. Although at the beginning non-durable consumer goods industries were highly protected (food, beverages, tobacco, textiles), the appearance of CORFO in 1939 gave a boost to the industrialization process of capital-intensive industry and technology. In the 1960s, the industrialization project gave greater prominence to the private sector, and changes continued to take place within the industry. Labour-intensive industries continued to diminish their share, while engineering-intensive industries increased their weight in the industry as well as their productivity performance; although they did not surpass the group of natural resource-intensive industries.

In Brazil, between 1930 and 1960 industrialization was based on import substitution, with the majority of the production being goods that were intensive in natural resources and labour, and enjoying a significant level of protection. Between 1960 and 1980, structural change deepened in Brazil, with greater diversification and increased productivity of the most sophisticated industries (mechanical engineering, transport equipment). Engineering-intensive industries became more important in terms of value added and employment than the rest of the industries. On the contrary, labour-intensive industries lost participation, and at the same time ranked as the least productive industries. This took place in a context of greater prominence of the private sector in production, greater presence of transnational companies, and an increase of industrial exports.

From the shift-share analysis, it can be concluded that the labour productivity growth rate in the selected sub-periods is explained largely by the productivity changes within industries. The results of the shift-share analysis for Chile showed no structural change for most of the period beyond the growth of some engineering-intensive industries and the absorption of workers. In Uruguay, although there were some positive contributions, they were limited in scope and more concentrated in natural resource-intensive and labour-intensive industries. The persistence of growth driven mainly by traditional industries and very sparsely by medium-high technology intensive industries was reflected by the absence of structural change. However, this does not mean that the productive structure in Chile and Uruguay remained unchanged, and in future research, a broadened perspective should include the analysis of institutional and technological changes in the medium and long run, among others. Finally, Brazil was the country that advanced more in the industrial policy regimen. It achieved a certain diversification, with the expansion of chemicals, machinery, and other high-tech industries. In the overall performance of the period, Brazil managed to reduce its structural heterogeneity and make more progress in the process of structural change than the other two countries studied.

A future agenda may involve some other points. Firstly, to analyse the link between the results obtained in sub-periods and the industrial policies implemented at country level more thoroughly. Secondly, a long-run view would contribute to understanding, for example, the transition from the period of state-led industrialization to a new development model under the rules of free market and limited state intervention. Thirdly, it could be interesting to exploit the link between the results found and other relevant dimensions such as wages, human capital, and the profile of foreign trade.

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Appendix

BRAZIL

TABLE A1 ▪ *Value added per labour, Brazil, at constant cruzeiros of 1970*

	Food and beverages	Tobacco	Textiles	Wood and furniture	Paper and printing	Leather and rubber and apparel	Chemicals	Non-metallic minerals	Metals	Total
1945	5,735	9,169	3,728	4,508	7,319	5,088	21,755	4,832	10,499	6,453
1949	12,218	14,168	6,117	6,942	11,437	7,600	29,220	6,978	13,983	10,249
1959	22,479	23,055	8,307	7,737	16,938	12,883	53,213	10,950	17,139	16,561
1960	23,484	27,203	9,011	8,828	18,045	12,112	57,091	11,797	22,102	18,297
1970	26,330	56,025	15,827	12,916	25,950	16,508	58,885	17,684	27,357	24,628
1980	36,965	78,742	74,294	17,002	54,805	43,000	80,010	34,450	61,203	51,538

Sources: Data provided from Aldrighi and Colistete.

Note: Metals includes metals and their products, non-electrical machinery, mechanical engineering and transport equipment.

TABLE A2 ▪ *Number of labourers, Brazil*

	Food and beverages	Tobacco	Textiles	Wood and furniture	Paper and printing	Leather and rubber and apparel	Chemicals	Non-metallic minerals	Metals	Total
1945	173,755	11,776	267,743	70,356	45,584	75,317	49,249	76,805	97,151	867,736
1949	207,395	11,539	308,501	87,803	57,027	92,041	61,628	107,372	125,902	1,059,208
1950	199,224	12,180	308,793	90,757	57,789	93,786	61,548	106,339	130,995	1,061,411
1959	221,323	10,832	297,303	118,259	77,229	117,775	85,167	131,705	239,409	1,299,002
1960	215,460	11,627	306,886	117,257	80,069	120,105	85,919	127,870	262,997	1,328,192
1970	305,451	12,483	313,317	178,044	126,517	188,422	151,686	171,066	470,971	1,917,957
1980	480,707	16,032	345,682	328,007	191,795	484,563	275,659	308,663	1,134,630	3,565,738

Sources: data provided from Aldrighi and Colistete.

Note: Metals include metals and their products, non-electrical machinery, mechanical engineering and transport equipment.

CHILE

TABLE A3 ▪ *Value added, Chile, at constant Chilean pesos of 1953*

	Food	Beverages	Tobacco	Textiles	Apparel
1939	3,939,336,172	835,449,526	2,064,495,868	2,148,553,721	467,003,752
1947	5,605,770,242	1,505,256,888	2,775,821,670	4,876,142,214	929,193,952
1950	6,048,381,092	1,710,393,126	2,431,575,744	6,727,459,717	1,437,684,595
1957	9,447,331,624	2,655,379,878	2,416,513,719	6,804,005,919	2,209,743,883
1960	10,114,955,253	3,208,010,751	3,319,541,547	7,002,609,335	2,214,475,310
1967	13,654,275,039	4,888,834,111	4,771,137,681	11,062,945,840	2,902,331,350
1970	14,255,502,126	4,194,693,046	4,249,131,333	10,267,355,267	2,697,757,349
1979	15,142,892,821	6,796,231,543	6,441,109,011	7,743,297,097	2,208,660,119
1980	15,703,179,855	6,578,752,133	6,782,487,789	7,518,741,481	2,718,860,607

TABLE A3 ▪ *(cont). Value added, Chile, at constant Chilean pesos of 1953*

	Wood and furniture	Paper and printing	Leather and rubber and plastics	Chemicals	Petroleum
1939	1,718,427,261	1,004,233,601	1,428,833,531	1,870,674,915	
1947	2,066,983,054	1,896,579,996	2,160,816,231	4,999,817,466	
1950	1,554,494,738	2,106,655,697	2,808,834,751	5,437,088,169	
1957	1,681,875,414	2,188,706,425	2,560,328,494	4,575,239,501	715,659,385
1960	1,941,981,966	2,684,550,652	3,010,357,709	5,128,200,408	1,015,104,453
1967	2,504,076,632	3,859,442,596	3,899,124,438	5,029,896,247	2,290,253,307
1970	2,812,126,553	3,759,359,680	4,131,398,018	6,071,240,418	2,576,264,896
1979	2,068,177,729	4,324,703,514	3,153,695,616	6,267,086,883	3,485,534,860
1980	1,797,575,843	5,787,086,423	2,842,644,679	6,403,570,822	3,238,202,872

TABLE A3 ▪ *(cont). Value added, Chile, at constant Chilean pesos of 1953*

	Non-metallic minerals	Metals	Total
1939	771,408,231	1,407,395,908	15,514,157,687
1947	2,279,420,077	4,176,059,516	30,771,223,149
1950	2,338,674,107	4,739,645,690	37,678,726,530
1957	2,494,205,918	9,376,151,883	50,741,269,188
1960	3,033,935,723	11,119,853,709	57,823,702,554

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	Non-metallic minerals	Metals	Total
1967	4,072,506,712	19,647,867,760	84,552,612,040
1970	4,434,640,878	20,583,516,119	87,682,465,470
1979	4,925,942,200	27,327,435,651	91,560,728,366
1980	6,502,800,550	28,971,172,668	97,512,175,710

Sources: See explanatory notes for Chile.

Note: Metals include metals and their products, non-electrical machinery, mechanical engineering and transport equipment.

TABLE A4 ▪ *Number of labourers, Chile*

	Food	Beverages	Tobacco	Textiles	Apparel
1939	21,763	3,509	1,628	17,085	3,834
1947	27,689	4,421	1,422	29,163	6,459
1950	32,845	4,275	1,436	38,338	11,705
1957	35,765	5,195	1,241	37,194	18,981
1960	34,863	6,087	943	35,327	11,384
1967	39,647	7,473	1,160	43,858	13,097
1970	33,502	7,689	1,299	37,110	9,529
1979	64,935	11,716	1,001	35,106	18,440
1980	62,801	10,815	1,115	28,746	17,308

TABLE A4 ▪ *(cont). Number of labourers, Chile*

	Wood and furniture	Paper and printing	Leather and rubber and plastics	Chemicals	Petroleum
1939	7,812	8,830	11,396	5,789	
1947	13,103	9,989	16,940	11,651	
1950	10,622	9,540	17,781	12,262	
1957	16,174	11,291	17,864	12,063	1,166
1960	13,618	12,973	13,636	11,417	1,282
1967	15,156	13,912	16,653	16,265	1,289
1970	13,329	13,295	19,436	13,800	2,413
1979	28,411	18,182	23,627	16,715	2,455
1980	26,399	17,910	21,862	15,881	2,344

(Continued on next page)

TABLE A4 ▪ *(cont). Number of labourers, Chile*

	Non-metallic minerals	Metals	Total
1939	8,485	11,738	102,414
1947	13,421	23,627	158,206
1950	13,727	31,144	183,985
1957	12,515	39,300	212,196
1960	11,107	48,320	205,978
1967	13,096	70,635	260,530
1970	11,425	79,188	243,521
1971	10,970	84,705	249,050
1979	11,730	66,554	301,164
1980	10,772	64,714	282,490

Sources: See explanatory notes for Chile.

Note: Metals include metals and their products, non-electrical machinery, mechanical engineering and transport equipment.

Explanatory notes: Chile

Value added in current prices 1938–1967:

1939, 1947, 1950: Statistic industrial yearbooks of the Dirección de Estadística y Censos Chile. This data does not come from censuses or surveys, the way of collecting the data is not explicit in the yearbooks. According to the explanations in Muñoz (1971) this data is limited to the industrial modern sector, thus workshops are not included (with less than five employees).

1957: *Census of Manufactures* of the Dirección de Estadística y Censos Chile.

1960, 1967: Data obtained from the publication *Manufacturing industries*, Dirección de Estadística y Censos Chile. Industrial survey includes establishments with 10 employees or more. Survey conducted by the Statistics National Institute, Chile.

1970, 1979, 1980, 1985: Data obtained from manufacturing census and industrial surveys, Dirección de Estadística y Censos Chile. Industrial survey includes establishments with 50 employees or more.

Currency:

- 1938–1959: Chilean pesos.
- 1960–1975: Chilean escudos. Replaced the peso at a rate of 1 escudo = 1000 pesos.
- 1976–2015: Chilean pesos. The current peso was introduced in 1975 by Decree 1.123, replacing the escudo at a rate of 1 peso = 1000 escudos.

Value added in constant prices:

1938–1957: I use the following price indexes to deflate output and value added. Source: *Crecimiento industrial de Chile 1914-1965* (Oscar Muñoz, pp. 176-177).

1957–1979: Series of constant prices are adjusted by the variation of Output Index base 1953=100 and Output Index base 1968=100.

- Between 1957–1959 Output Index by industry 1953=100 obtained from *Estadística chilena 1960 (1963)*, Servicio Nacional de Estadística y Censos.
- Between 1960–1968 Output Index by industry 1953=100 from *Indicadores económicos y sociales de Chile 1960-2000*, Banco Central de Chile.

- Between 1968–1979 Output Index by industry 1968=100 from *Indicadores económicos y sociales de Chile 1960-2000*, Banco Central de Chile.
- Between 1979–1985 Output Index by industry 1979=100 from *Indicadores económicos y sociales de Chile 1960-2000*, Banco Central de Chile.

Employment:

1939, 1947, 1950: Statistic industrial yearbooks of the Dirección de Estadística y Censos Chile. This data does not come from censuses or surveys, the way of collecting the data is not explicit in the yearbooks.

1957: *Census of Manufactures* of the Dirección de Estadística y Censos Chile.

1960, 1967: Data obtained from the publication *Manufacturing industries*, Dirección de Estadística y Censos Chile. Industrial survey includes establishments with 10 employees or more. Survey conducted by the Statistics National Institute, Chile.

1970, 1979, 1980, 1985: Data obtained from manufacturing census and industrial surveys, Dirección de Estadística y Censos Chile. Industrial survey includes establishments with 50 employees or more.

URUGUAY

TABLE A5 ▪ *Value added at constant millions pesos of 1936, Uruguay*

	Food	Beverages	Tobacco	Textile	Paper	Printing	Rubber	Petroleum	Chemicals	Total
1936	26,846	12,017	3,488	7,223	1,252	3,667	686		4,234	91,632
1939	31,200	14,500	3,900	7,900	1,600	4,400	900	10,700	4,900	119,900
1947	32,800	21,200	4,000	20,300	2,000	5,300	1,600	13,200	6,200	161,400
1955	59,056	36,287	7,191	26,746	4,928	11,147	7,731	20,537	14,482	279,980
1958	50,844	34,328	9,381	25,735	6,265	11,270	10,959	11,235	17,644	272,881
1968	115,102	33,315	6,477	21,313	10,935	9,840	4,731	10,277	16,451	270,584

Sources: See explanatory notes for Uruguay.

TABLE A6 ▪ *Number of labourers, Uruguay*

	Food	Beverages	Tobacco	Textile	Paper	Printing	Rubber	Petroleum	Chemicals	Total
1936	20,548	3,890	1,116	7,063	936	2,929	815	15	2,135	65,977
1939	20,728	4,645	994	8,513	1,153	3,542	1,065	1,331	2,571	78,079
1947	28,512	6,117	953	12,232	1,545	4,268	1,974	1,645	3,231	107,434
1955	37,501	10,254	1,012	24,523	2,770	5,864	2,768	3,938	7,016	161,879
1956	38,754	9,901	986	24,056	2,562	5,881	4,882	3,746	7,422	170,969
1958	41,842	10,086	950	25,818	3,013	6,291	3,415	4,211	8,207	191,468
1968	31,828	7,547	891	24,321	2,446	5,746	3,534	3,654	7,771	168,623

Sources: See explanatory notes for Uruguay.

Explanatory notes: Uruguay

Value added at constant prices:

1936–1959: Based on the series of value added in millions of pesos 1936, extracted from the paper: '*Una revisión del desempeño de la industria manufacturera en Uruguay entre 1930 y 1959*', (IECON Arnábal, Bertino and Fleitas 2013).

1968: From 1960 onwards, I extrapolate the series of value added at constant prices 1939–1959 using the variation of the Physical Volume Index (1961=100) elaborated from the Central Bank of Uruguay, extracted from statistical bulletins (Nos. 23 & 25).

Employment:

1936: Industrial Census published by the Ministry of Industry and Labour in 1939.

1939, 1947: Taken from the Masters Thesis of Hernández, M. (2015) where data was taken from employees of Millot, Silva and Silva (1973) and series of workers of Maubrigades (2002).

1955, 1958: Data obtained from *Retrospective Statistics* (1961), General Directorate of Statistics and Censuses of the Ministry of Finance.

1968: Data obtained from the General Directorate of Statistics and Censuses – *DGEyC* – (1968), I National Economic Census. Manufacturing industry sector.

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Canvi estructural i transformació industrial al Brasil, Xile i l'Uruguai

Resum

Des de la segona meitat del segle xx, l'estructuralisme i altres perspectives teòriques han destacat el paper decisiu del canvi estructural per explicar el desenvolupament relatiu de les economies llatinoamericanes. Els treballs més recents també han contribuït al debat sobre per què algunes regions es van poder desenvolupar a través del canvi estructural i d'altres no. L'objectiu principal d'aquesta recerca és estudiar, utilitzant una anàlisi *shift-share*, si en el sector industrial es va produir una transformació estructural. Els resultats principals mostren que el Brasil és l'únic país que va reduir la seva heterogeneïtat estructural durant el període d'industrialització, mesurada a través de l'anàlisi *shift-share*.

Paraules clau: indústria manufacturera, productivitat, Amèrica Llatina, canvi tecnològic

Codis JEL: O14, O47, N16, O33

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Cambio estructural y transformación industrial en Brasil, Chile y Uruguay

Resumen

Desde la segunda mitad del siglo xx, el estructuralismo y otras perspectivas teóricas han destacado el papel decisivo del cambio estructural para explicar el desempeño relativo de las economías latinoamericanas. Los trabajos más recientes también han contribuido al debate sobre por qué algunas regiones pudieron desarrollarse a través del cambio estructural y otras no. El objetivo principal de esta investigación es estudiar si se produjo una transformación estructural en el sector manufacturero, utilizando un análisis *shift-share*. Los principales resultados muestran que Brasil es el único país que redujo su heterogeneidad estructural durante el período de industrialización, medida a través del análisis *shift-share*

Palabras clave: industria manufacturera, productividad, América Latina, cambio tecnológico

Códigos JEL: O14, O47, N16, O33