Journal of Interdisciplinary History, XLIX:1 (Summer, 2018), 117–139.

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Growth and Regional Disparities in South America, 1890–1960

The processes of economic development and economic growth in Latin America show highly diverse patterns across countries and periods. Argentina, for instance, experienced rapid growth until World War I, following an export-led model, and a relative decline afterward, whereas economic growth in Brazil and Mexico was faster in the second half of the twentieth century, in both cases driven by state-led industrialization policies. Several studies at the national level focused on the relationship between the growth of national GDP per capita and the regional growth of subnational units, and emphasize the interaction between the localization of natural resources, trade policies, agglomeration forces, and economic intervention in shaping the regional income inequality of Latin American countries in the nineteenth and twentieth centuries.

This article is based on a newly assembled data set that includes estimates of regional per-capita GDP for three South American countries—Argentina, Chile, and Uruguay—from the mid-nineteenth century to the mid-twentieth century. With this data set, we explore

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the evolution of inequality and the dynamics of regional growth, considering, for the first time, a group of South American countries at both the national and subnational levels, complemented with an international dimension.[1]

Regarding the evolution of regional income disparities, our background assumption is the one advanced by Williamson, which suggests that during the process of economic development, differences in regional incomes exhibited an evolution according to an inverted U-shaped pattern. This phenomenon is the result of increasing inequality in the initial stages the industrialization when the leading regions start to grow and a second period of decreasing inequality (related to convergence) when the initially lagged regions start to grow faster and catch up with the leaders. Our results show that our three South American countries do not conform to this hypothesis. When all of the subnational units are analyzed together, the finding is a U-shaped curve with high inequality at the end of the nineteenth century, a minimum in the 1940s, and another local maximum in the 1960s and the early 1970s after the collapse of the Import Substitution Industrialization (ISI) policies.[2]

1 For México, see José Aguilar-Retureta, "The GDP per Capita of the Mexican Regions (1895–1930): New Estimates," *Revista de Historia Económica*, XXXIII (2015), 387–423; for Chile, Badia-Miró, "The Evolution of the Location of Economic Activity in Chile in the Long Run: A Paradox of Extreme Concentration in Absence of Agglomeration Economies," *Estudios de Economía*, XLII (2015), 143–167; for Uruguay, Pablo Castro and Willebald, "Desigualdad regional del ingreso en Uruguay durante la Primera Globalización: primeras estimaciones y algunas hipótesis," paper presented in V CLADHE, São Paulo, July 2016; Julio Martínez-Galarraga, Adrián Rodríguez Miranda, and Willebald, "Regional Income Inequality in Uruguay in a Century (1908–2008): Did Public Production Policy Contribute to an Equalizing Process?" paper presented in V CLADHE, São Paulo, July 2016; for Argentina, Florencia Aráoz and Nicolini, "Persistence vs. Reversal and Agglomeration Economies vs. Natural Resources: Regional Inequality in Argentina in the First Half of the Twentieth Century," Working Papers in Economic History, 15-05 (Universidad Carlos III, 2015), available at https://e-archivo.uc3m.es/handle/10016/20846; Mauricio Talassino, "Producto Bruto Geográfico de 1946 de las provincias argentinas: Una estimación preliminar," paper presented at the Tercer Foro Bienal Iberoamericano de Estudios del Desarrollo, Montevideo y Tacuarembó, Uruguay, 2016; for Chilean departments, Badia-Miró, "La localización de la actividad económica en Chile, 1890–1973: Su impacto de largo plazo," unpub. Ph.D. diss. (Univ. of Barcelona, 2008); *idem*, "Evolution of the Location of Economic Activity in Chile in the Long Run," 143–167; for the Uruguayan provinces; Martínez-Galarraga, Rodríguez Miranda, and Willebald, "Regional Income Inequality in Uruguay in a Century (1908–2008)."

2 Jeffrey Williamson, "Regional Inequality and the Process of National Development: A Description of Patterns," *Economic Development and Cultural Change*, XIII (1965), 1–84. Reduction in regional inequality and regional convergence are different concepts that represent close processes. The former represents improvements in the distribution of incomes per capita within a territory; the latter identifies a reduction in the income gap between the lagged and the leader regions (a catching-up process).

Our results also show that the evolution of regional inequality is different in each country: Whereas Chile shows a higher inequality and a U-shaped evolution (reduction of inequality before a slight increase in 1960), Uruguay presents a monotonically declining regional inequality, and Argentina, like Chile, exhibits a U-shaped evolution with decreasing disparities until the beginning of the twentieth century and increasing inequality thereafter. Our interpretation of this evidence is that the process was dominated by a slow—and sometimes truncated—structural change and a sustained prevalence of natural resources in domestic production and exports. The upshot is a decreasing regional inequality with short periods of spatial concentration of economic activity (mostly around the administrative capitals led by the service sector). This evolution was mediated by successive waves of technological change, the integration of international markets and globalization (expressed in the reduction of transport costs and price convergence), trade policies, mining cycles, and important institutional changes related to the ownership of natural resources.

The presence of convergence at the national level differs according to periods and countries. Uruguay shows convergence in every analyzed sub-period, but the provinces of Argentina converged only during the period of the first globalization. The provinces of Chile generally converged, but the presence of outliers contravenes the convergence hypothesis during the first globalization. Convergence at a regional level (including all of the subnational units from the three countries in the same analysis) holds true for the period of the first globalization but not afterward. The poorest regions diverged from the richest ones during the central decades of the twentieth century, although the poorest regions converged during the first globalization.

This second set of empirical findings is likely the result of the combined potential of the subnational units to take advantage of agglomeration forces (inducing high growth rates in the main cities and in the administrative capitals, led by the industrial and service sectors). At the same time, other factors also played a key role. On the one hand, abundance and localization, and the "lottery" of natural resources constituted important determinants. On the other hand, the push from technological change, the integration with (or dis-integration from) the international and

domestic market, or the existence of public policies toward industrialization contributed to the evolution of regional disparity.

DATA One important problem in the attempt to assemble a unique data set of subnational GDPs for the three countries is the existence of different benchmarks for the censuses for each country (our main source). Another important problem, observed in all of the countries, is the lack of direct estimations for regional production figures. To compensate for the lack of regional GDP figures for Argentina, Chile, and Uruguay, we borrow multiple methodologies from the recent literature. In general terms, our goal is to obtain distribution keys to disaggregate national-sector GDPs into a territorial division (usually administrative and political). The distribution keys consist of different proxies of labor or land productivity, production, factors affecting production, and population.

The original data from Argentina for the years 1895, 1914, 1946, 1953, and 1960 come from four previous contributions. The estimation for 1895 derives from a modified version of the Geary–Stark methodology, in which the total GDP of each sector is distributed among the twenty-four provinces based on the share of each province in an economic variable that proxies the total value added of the sector. For instance, the national aggregate value added in livestock production is distributed according to the share of each province in the total national value of cattle, as calculated by the formula,

$$Y_i^{LP} = Y_{ARG}^{LP} \frac{GV_i^{LP}}{GV_{ARG}^{LP}}. \qquad (1)$$

Y_i^{LP} is the value added in livestock production in province i; Y_{ARG}^{LP} is the value added in Argentina of livestock production; GV_i^{LP} is the gross value of livestock in province i; and GV_{ARG}^{LP} is the gross value of livestock in the whole country. The main sources are the national GDP and the *Segundo Censo Nacional de la República Argentina*, collected on May 10, 1895.[3]

3 For 1895, see Aráoz and Nicolini, "The Evolution of Regional GDPs in Argentina during the Period of Globalization at the End of the 19th and Beginning of the 20th Century," paper presented at the LI meeting of the AAEP, Tucumán, 2016; for 1914, *idem*, "Persistence vs. Reversal and Agglomeration Economies vs. Natural Resources"; for 1946, Talassino, "Producto Bruto Geográfico de 1946 de las provincias argentinas"; for 1953 and 1960, Víctor J. Elías, "Un informe de la economía de Tucumán, sus determinantes y perspectivas," in *idem* (ed.), *Informe*

The estimate for 1914 is based on the identity between the GDP and the sum of the returns of factors of production (labor, land, and capital). The main source in this approach is the *Tercer Censo Nacional de la República Argentina*, collected on 1914, from which stocks of land, capital, and quantity of workers are available. Bunge's book *Riqueza y renta de la Argentina* provides approximations of the rates of returns for the productive factors, and several reports and publications by the National Department of Labor are the main sources for wages.[4]

The estimation for 1946 is based on a modified Geary–Stark methodology—implemented by distributing the sectoral national GDP taken from Secretaría de Asuntos Económicos and the United Nations Economic Commission for Latin America and the Caribbean (CEPAL)—among provinces. The criteria to choose the variables that proxy sectoral productivity in each province is similar to the one used in the estimation for 1895.[5]

The estimation of provincial GDPs for 1953 and 1960, calculated by the *Consejo Federal de Inversiones*, collected and published by Elías, is based on two complementary methodologies: (1) a direct estimation that relies on provincial data and (2) a distribution of national totals for some sectors using "adequate" weights. Elías provides data about provincial population for every year since 1930; this article uses its population data for the years 1930, 1940, 1950, and 1960. For the

sobre la economía de Tucumán (Tucumán, 1996). An earlier and more indirect approach to generate a proxy for provincial economic size in Argentina was suggested by Lucas Llach, "The Wealth of the Provinces: The Rise and Fall of the Interior in the Political Economy of Argentina, 1880–1910," unpub. Ph.D. diss. (Harvard University, 2007). For the Geary–Stark methodology, see Frank Geary and Tony Stark, "Regional GDP in the UK, 1861–1911: New Estimates," *Economic History Review*, LXVIII (2015), 123–144. "Examining Ireland's Post-Famine Economic Growth Performance," *Economic Journal*, CXII (2002), 919–935; *idem*. For further detail about how to distribute the VA in each sector, see Aráoz and Nicolini, "The Evolution of Regional GDPs in Argentina," 6–8. Data for GDP come from Roberto Cortés-Conde, "Estimaciones del Producto Bruto Interno de Argentina, 1875–1935," Working Paper, 3 (Universidad de San Andres, 1994).

4 Alejandro E. Bunge, *Riqueza y Renta de la Argentina: Su distribución y su capacidad contributiva* (Buenos Aires, 1997). In "Una comparación metodológica de las estimaciones de los PIB provinciales en Argentina en 1914," a paper presented at IV Congreso Latinoamericano de Historia Económica, Bogotá, July 2014, Aráoz and Nicolini estimated the provincial GDPs in 1914 with the Geary–Stark methodology, showing that the results are similar to the ones obtained with the identity between GDP and the retributions to the factors of production.

5 Talassino, "Producto Bruto Geográfico de 1946"; Secretaría de Asuntos Económicos, *Producto e Ingreso de la República Argentina en el período 1935–1954* (Buenos Aires, 1955); CEPAL, *El Desarrollo Económico de la Argentina* (Santiago, 1958).

benchmarks before 1930, population figures derive from interpolations within Maddison's "Historical Statistics."[6]

Regional GDP figures for Chile come from the elaboration in previous works by Badia-Miró, who combined several strategies to distribute the sectoral GDP among the different provinces. National data come from Díaz, Lüders, and Wagner (correcting the industrial figures with new estimations provided by Ducoing and Badia-Miró). For the value added in the agrarian and in the industrial sector, we follow the Geary–Stark methodology. Because the integration of the labor market into the agricultural sector was low, agricultural wages are not a good proxy to obtain productivity differences among provinces. Hence, we consider the contribution of the economically active population (EAP) to the gross production of the most representative products and land productivity as a proxy for regional disparities of productivity. For industry, we use wages to meet the same objective.[7]

For the mining sector, we propose a direct approach that takes into account total provincial exports, because of the enormous predominance of this sector in total exports. We also include mining production destined for domestic consumption. For the other sectors (namely, the public sector and services), we approximate the regional value added with a set of representative variables. The part of the GDP corresponding to the remaining items has been assigned in accord with the provincial percentage for the urban population of the entire country.[8]

6 Consejo Federal de Inversiones, *Relevamiento de la Estructura Regional de la Economía Argentina* (Buenos Aires, 1962), I, 260. There are significant discrepancies in total population between Elías, "Un informe de la economía de Tucumán, sus determinantes y perspectivas," and Angus Maddison, "Historical Statistics: PIB and Population Data" (2010), available as the Maddison-Project, http://www.ggdc.net/maddison/maddison-project/home.htm, 2013 version. For 1930, Elías' figure for population is 10,996,262 and Maddison's 11,896,000; for 1940, Elías' is 13,623,981 and Maddison's 14,169,000; for 1950, Elías' is 16,708,523 and Maddison's 17,150,336.

7 Badia-Miró, "La localización de la actividad económica en Chile, 1890–1973"; *idem*, "The Evolution of the Location of Economic Activity in Chile in the Long Run: A Paradox of Extreme Concentration in Absence of Agglomeration Economies," *Estudios de Economía*, XLII (2015), 143–167; José Díaz, Rolf Lüders, and Gert Wagner, *Chile, 1810–2010: La República en Cifras: Historical Statistics* (Santiago, 2016); Cristián Ducoing and Badia-Miró, "El PIB industrial de Chile durante el ciclo del salitre, 1880–1938," *Revista Uruguaya de Historia económica*, III (2013), 11–32.

8 The results of the robustness test between the figures herein and the official sources were positive. Rank analysis confirms them. We could identify the main differences obtained in Santiago because it is the administrative capital of the country.

The original data from Uruguay come from two previous documents—(1) by Castro and Willebald for 1870, 1884, 1890, and 1900 and (2) by Martínez-Galarraga, Rodríguez Miranda, and Willebald for 1908, 1936, 1955, and 1961. The estimations of Uruguayan regional GDP is based on the Geary–Stark methodology, the use of other criteria that distribute the total value added for certain sectors, and direct estimates for sectors with available data. The estimations for 1870, 1884, 1890, and 1900 follow the same methodology. We consider seven economic activities—agriculture (livestock and crops), manufacturing, construction, commerce, public administration, utilities, and services—and employ data derived from Bonino-Gayoso, Román, and Willebald as sector value added.[9]

We distribute the total sector value added of livestock according to the stock of cattle (expressed in equivalent units to make uniform the different animal species) and, in the case of crops, according to cereal and grape production. For construction, our reference was the total constructed area and for public administration, the income tax levied by provincial governments. Value added corresponding to utilities includes only energy generation. Finally, the distribution of manufacturing, commerce, and services takes as its reference tax production (*patente de giro*).

The estimations for 1908, 1936, 1955, and 1961 are based on more available information, which extends the methodological options. We consider seven economic activities—agriculture (livestock and crops), mining, manufacturing, construction, public administration, utilities, and services. In agriculture, we apply a modified version of the Geary–Stark methodology for the years 1908, 1936, and 1955 according to estimates of land productivity corresponding to six livestock activities and ten crop productions (from the agriculture census). Data for 1961 come from official estimates.[10]

In mining, we use data about the EAP in 1908 and 1963 (the population census) and obtain the intermediate years by (log)

9 For 1870, 1884, 1890, and 1900, see Castro and Willebald, "Desigualdad regional del ingreso en Uruguay durante la Primera Globalización"; Martínez-Galarraga, Rodríguez Miranda, and Willebald "Regional Income Inequality in Uruguay in a Century (1908–2008)." Nicolás Bonino-Gayoso, Carolina Román, and Willebald, "Structural Change and Long-Term Patterns: A Methodological Proposal for Uruguay in the Very Long Run," paper presented at IV Jornadas Académicas y XV Jornadas de Coyuntura Económica, Facultad de Ciencias Económicas y de Administración, Universidad de la República, Montevideo, Uruguay, 2013 (with the updated estimations of the authors).

10 Banco de la República Oriental del Uruguay (BROU), *Cuentas Nacionales* (Montevideo, 1965).

interpolation. In 1908, we use information about wages and, in the other years, we apply the wage gap between mining and the manufacturing industry.

To carry out the estimation of regional industrial (manufacturing and construction) value added in 1908, we use labor and wage information from the population and industrial and commercial census of that year. The Industrial Census of 1936 contains information about industrial value added by province. The *Dirección de Industrias del Ministerio de Industria y Trabajo* (DI-MIT) reports the industrial gross-value output (GV) by province from 1954 to 1960; we adjust these values to obtain an estimation of value added according to the relationship between both measures in 1960. As before, we consider data of 1961 according to available information.

For public utilities, we include electricity, gas, water, and sewage. EAP information by province is available for 1908 and 1963; we estimate the province structure of 1936 and 1955 by interpolation. We assume the same income gap for public utilities between provinces as for industry, considering relative wages in 1936 and relative value added per capita in 1955.

We obtain provincial structure, by benchmark, from governmental budgets, which provide the number of civil servants in provinces; the total number of civil servants comes from Azar et al. The information in governmental budgets about total paid wages also allows us to obtain annual wage rates for Montevideo and the other provinces for certain years. We use the gaps to obtain similar rates in 1955 and 1961.[11]

We estimate the provincial structure of the EAP of the remaining services by interpolating the figures corresponding to 1908 and 1963 to obtain absolute values of the active population for services by deducting the previous estimates from total EAP. An extended strategy of the Geary–Stark methodology is to calculate service-sector wages as a weighted average of the agriculture and industry series in each province. However, this strategy does not seem suitable for Uruguay. Service wages were 10 percent higher than industrial wages in 1908. A comparison between their minimum wages (from the tripartite Wages Councils) in the 1940s and 1950s shows

11 Paola Azar et al., *¿De quiénes, para quiénes y para qué?: las finanzas públicas en el Uruguay del siglo XX* (Montevideo, 2009).

a gap of 7 percent. Therefore, we use this last rate to determine the wages of the other services over the industrial wages.[12]

With this original data set, we face a first challenge related to the important size differences between the Argentine and the Chilean and Uruguayan provinces as it relates to such economic variables as population, surface, and production. To obtain more comparable regions, we re-size the Chilean and the Uruguayan provinces, merging the original regions. In the case of Chile, we group provinces according to the later regional division established in the 1970s: Norte Grande (Tarapaca and Antofagasta), Norte Chico (Atacama and Coquimbo), Región Central (Aconcagua, Valparaíso, O'Higgins, Colchagua, Curicó, Talca, Maule, and Linares), Región Metropolitana (most of Santiago province), Sur (Ñuble, Concepción, Arauco, Bío-Bío, Malleco, Cautín, and Valdivia), Los Lagos (Llanquihue and Chiloé), and large regions of Aysén and Magallanes. In the case of Uruguay, we work with three big regions: Littoral (Artigas, Paysandú, Río Negro, Salto, and Soriano), South (Canelones, Colonia, Flores, Florida, Lavalleja, Maldonado, Montevideo, Rocha, and San José), and North (Cerro Largo, Durazno, Rivera, Tacuarembó, and Treinta y Tres). This re-sizing of regions in Chile and Uruguay does not result in appreciable distortion. The low-density regions (and high GDP per capita) in the south and the north of Chile retain the same characteristics, as do the main, highly diversified economic regions with their prominent service sector. To homogenize the data of the three countries further, we utilize benchmark years—1890, 1900, 1910, 1920, 1940, 1950, and 1960—interpolating the shares from each national benchmark and re-scaling GDP figures from Maddison in 1990 International Geary-Khamis U.S. dollars.[13]

12 Sebastián Fleitas and Carolina Román, "Evolución de la población económicamente activa en el siglo XX: un análisis de la estructura por sexo, edad y generaciones," *Boletín de la Asociación Uruguaya de Historia Económica*, IX (2010), 41–64. The extended Geary–Stark methodology comes from Joan Ramon Rosés, Martínez-Galarraga, and Daniel A. Tirado-Fabregat, "The Upswing of Regional Income Inequality in Spain (1860–1930)," *Explorations in Economic History*, XLVII (2010), 244–257.

13 The median population of the Uruguayan provinces in 1960 was around 70,000, while the Chilean figure was around 175,000 and the Argentinian figure around 370,000 inhabitants. Similar differences appeared with surface size. On average, Uruguayan departments are around 9,000 km^2, Chilean regions around 15,000 km^2, and Argentinian provinces around 100,000 km^2. Other differences between the countries could be a function of political organization. A federal system like Argentina's might allocate resources differently than a centralized government like Chile's and Uruguay's does.

Our methodological choices testify to significant limitations in the data and result in important strategies to compensate for them. First, despite our proposed merging of provinces in Chile and Uruguay to mitigate discrepancies with the size of Argentina's regions, the Argentine market is so large that it probably functioned differently from those in the other countries. Argentina would seem to have benefited more from economies of scale than did Chile and Uruguay. Second, our treatment of the three countries as intrinsically comparable depends on contrasting data derived from different methodologies that entail distinct shortcuts. Nonetheless, given that these same methodologies have seen extensive use in the scholarly literature of Europe and North America for the purpose of international comparison, their application in this article would hardly seem problematical. Third, we consider 1990 International Geary-Khamis U.S. dollars to compare regional GDP for the three countries.[14]

REGIONAL INEQUALITY IN SOUTH AMERICA: A LONG-RUN APPROACH

Some areas of the South American countries studied—particularly in Argentina and Chile—were frontier economies. In these areas, abundant land and natural resources, together with low population density, generated high incomes during the first globalization, though not comparable with the rich districts of the industrialized countries. In our three countries, the ratio between the income of the richest and poorest regions was between 5 and 8 (Argentina 5, Chile 8, Uruguay 2.3); in Europe these ratios were substantially smaller (England 1.3–1.6, Sweden 1.2–2.2, Belgium 1.2–1.4, Portugal 1.6–1.9, Spain 1.8–2.1, and France 3). The modest ratio between average incomes in Uruguay is probably explained by the absence of clearly distinguishable frontier areas during this period. The specialization in livestock production or mining by many of

14 For a more detailed analysis of the methodology used to compare European countries, see Rosés and Nikolaus Wolf, *The Economic Development of Europe's Regions: A Quantitative History since 1900* (New York, 2016). Florencia Correa and Nicolini, "Diferencias regionales en el costo de vida en Argentina a comienzos del siglo XX," *Investigaciones de Historia Económica,* X (2014), 202–212. This methodology does not consider possible differences in relative prices internally or price differences between countries that might not have remained stable in the long run. Previous evidence shows that this oversimplification might hide important variations within Argentina.

Argentina's and Chile's richest, low-density regions implies high incomes per capita.[15]

The data set presented in the previous section permits detailed information about the spatial evolution of economic activity in the long run. The evolution of inequality across regions can be analyzed in the context of Williamson's hypothesis of an inverted U-shaped pattern of economic development with rising income inequality in the early stages and falling inequality (convergence) afterward. First, we obtain a mean-log-deviation (MLD) index to observe dispersion, and then we decompose the inequality into two components—between and within indexes—to understand the drivers of this evolution better. The "within" component incorporates inequality at the interior of each country (without considering average income differences across countries), whereas the "between" component serves as a weighted measure of inequality across average national incomes (without considering the inequality within each country). We define the MLD as

$$MLD = \frac{1}{N}\sum_{i=1}^{n} Ln\left(\frac{\mu}{x_i}\right), \tag{2}$$

where i is the region; n is the total number of regions; x_i is the GDP per capita for each region; and μ is the GDP per capita of the whole unit of analysis. From equation (2), we decompose MLD as

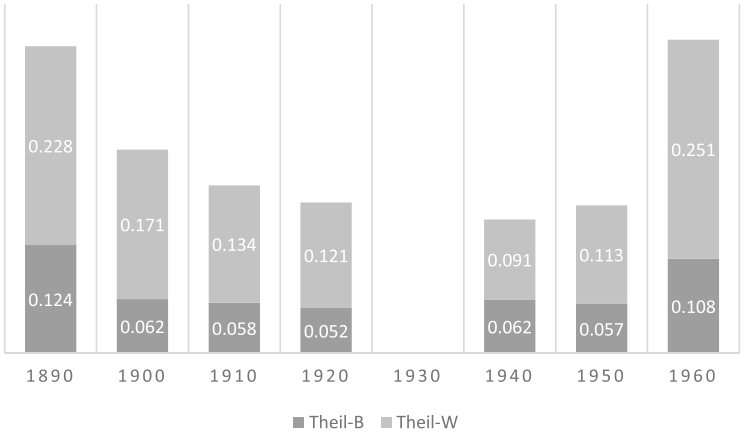
$$\begin{aligned} MLD &= MLD_{Within} + MLD_{Between} \\ &= \sum_{j=1,2,3} \frac{n^j}{N} MLD^j + \sum_{j=1,2,3} \frac{n^j}{N} \ln\left(\frac{\mu}{\mu^j}\right), \end{aligned} \tag{3}$$

where N is the total number of regions; $j=1,2,3,$ tells us whether a province belongs to one country or another; μ is the GDP per capita for our three countries together; and μ^j is the GDP per capita in each country. The results are shown in Figure 1.[16]

15 Willebald and Javier Juambeltz, "Land Frontier Expansion in Settler Economies (1830–1950): Was It a Ricardian Process?" in Pinilla and Willebald (eds.), *Agricultural Development in the World Periphery: A Global Economic History Approach* (New York, 2018).

16 In our case, the unit of analysis comprises the three South American countries studied herein when the total inequality is being measured, or each of the three countries when national inequality is being measured.

Fig. 1 MLD Components in Argentina, Chile, and Uruguay, 1890–1960

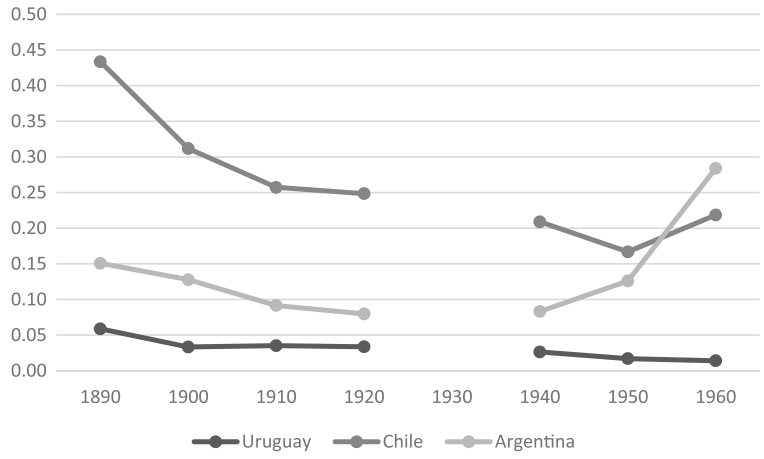


We observe a decline in regional income disparity until 1940, and a strong increase between 1950 and 1960. The export-led growth period, based on the intensive exploitation of natural resources, seems to have caused a major reduction of regional inequality in both the "between" and "within" components. World War I and the Great Depression brought a reduction in inequality, but, in this case, driven only by the reduction in the "within" component. During the 1940s and the 1950s, the "between" component remained stable while the "within" component started a slight increase, strongly reinforced in the 1960s. In 1960, both components increased considerably, pushing total regional inequality to levels resembling the ones observed in 1890. Figure 2 shows that differences by country were notable: Chile shows a slow reduction, which ended because of the expansion of the oil cycle in the south during the 1960s, whereas Uruguay presents a monotonically declining inequality and Argentina a U-shaped evolution with decreasing disparities until the beginning of the twentieth century and increasing inequality afterward.[17]

The fact that traditional analysis of inequality does not consider the geographical dimension or distances between the units

17 Our division of the whole period into two sub-periods—primarily export-led growth during the first globalization until the 1920s and ISI from the Great Depression to the 1960s—is not to neglect the process of early industrialization in our three countries. For a review about this process in the region, see Marcelo Rougier (ed.), *Estudios sobre la industria en América Latina: Interpretaciones y debates* (Buenos Aires, 2016). However, the driver of the economic evolution

Fig. 2 Regional Inequality by Country, 1890–1960

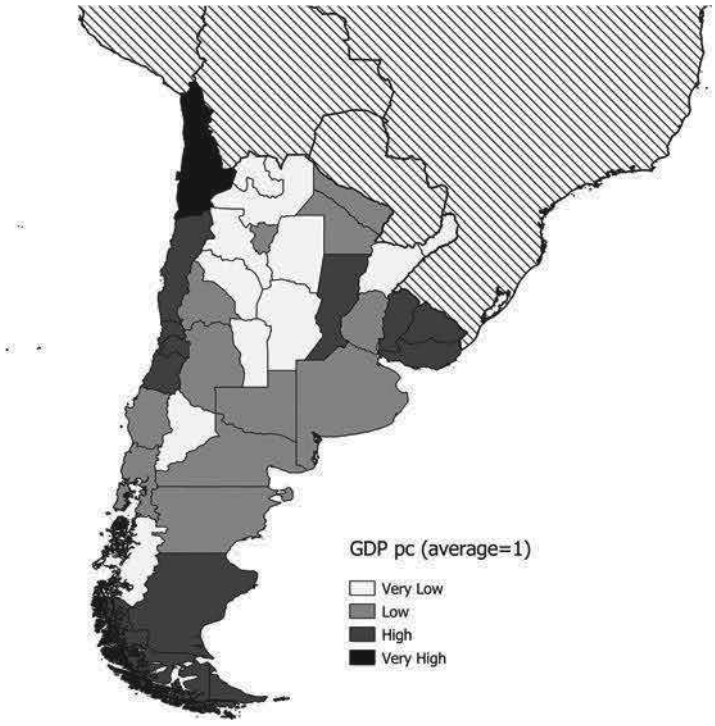


of analysis is particularly unfortunate in the case of regional inequality, because the evolution of income per capita in a region can be strongly influenced by economic activity in the neighboring regions (through trade, migration, technological spillovers, etc.). An inspection of Figures 3 and 4, with the subnational units characterized by their average income, reveals that the regions with the highest average income at the beginning of our study in 1890 are in the geographical extremeties of Chile and its capital of Santiago, in the southern regions of Argentina, and in the three regions of Uruguay. The reasons for these high incomes are the nitrate cycle in northern Chile; the capital effect related to urban economies in Buenos Aires, Santiago, and Montevideo; and the low-density agrarian regions of southern Argentina and Chile. The regions below the average were concentrated around the center and the north of Argentina.

Thirty years later, the copper cycle replaced the nitrate cycle in Chile, but the overall picture remained unchanged: Both the top and bottom of the country and the capital were still the richest areas, as were the southern regions of Argentina and Uruguay. Other rich areas were around Buenos Aires, because of a diffusion

during the first globalization was the exploitation of natural resources (land and nitrates) and the exports of food and raw materials with low degrees of elaboration. Such is the focus of our analysis.

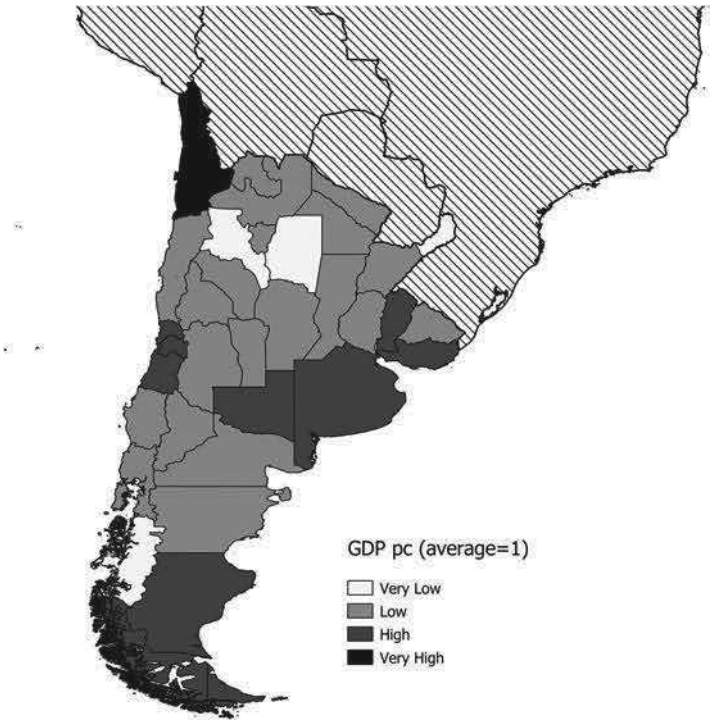
Fig. 3 Regional GDP Per Capita in Argentina, Chile, and Uruguay, 1890



effect. The poorest regions experienced some changes. Some of them converged to the regional average, but others remained poor, specifically those in the northern Argentina. The Great Depression and the ISI process changed the 1960s map in the Argentinean case, while the pattern in Chile and Uruguay remained largely similar. The copper cycle provided a boost to the northern and the central regions in Chile, and in Argentina, a division between coastal and northern interior regions was reinforced (see Figure 5).

To check statistically the appearance of this cluster of rich regions in the south and of poor regions in the north, we run a simple test to obtain local Moran's I coefficient for all the regions. With this test, we can check the existence of a statistical relationship between the regional GDP per capita of any region and the level of GDP per capita in its neighboring regions (Figure 6). Specifically, we are interested in the spatial dimension of this

Fig. 4 Regional GDP Per Capita in Argentina, Chile, and Uruguay, 1920



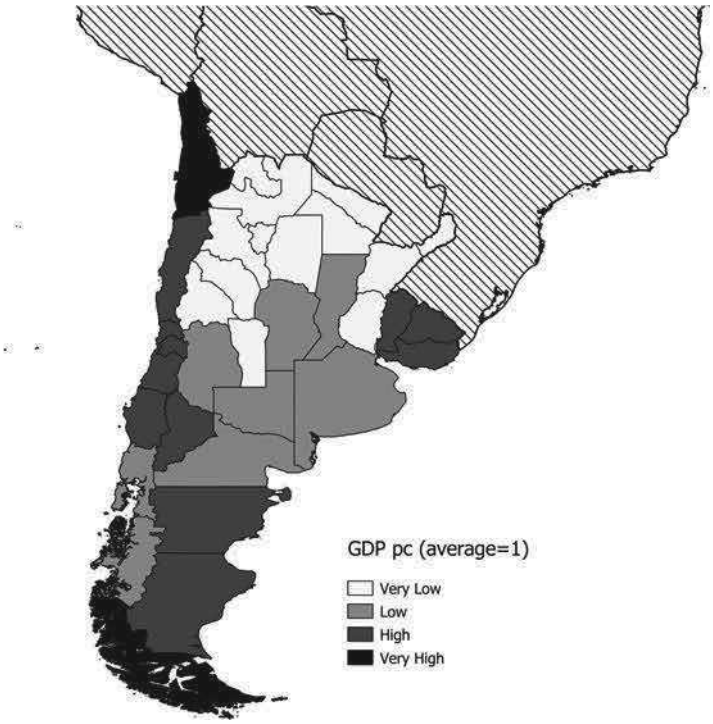
coefficient, to identify the existence of clusters of rich or poor regions inside the three countries or along the borders.[18]

The spatial autocorrelation confirms the existence of two clusters of regions in the Southern Cone. The cluster of richer regions in the south, at both sides of the border, appeared toward 1960, although we could notice the existence of rich regions in the south of Chile and Argentina at the end of the nineteenth century. The other cluster, statistically significant, is a cluster of poorer regions in the inner north of Argentina, which is increasingly expanding toward neighboring regions.

Notably, the fact that the dynamic of Chile—apart from this cluster in the south—does not seem to be influenced by the

18 We considered a distance matrix in which the cells of two contiguous regions take the number one and zero otherwise. For more detail about spatial-autocorrelation analysis, see Luc Anselin, "Local Indicators of Spatial Association-LISA," *Geographical Analysis*, XXVII (2010), 93–115.

Fig. 5 Regional GDP Per Capita in Argentina, Chile, and Uruguay, 1960

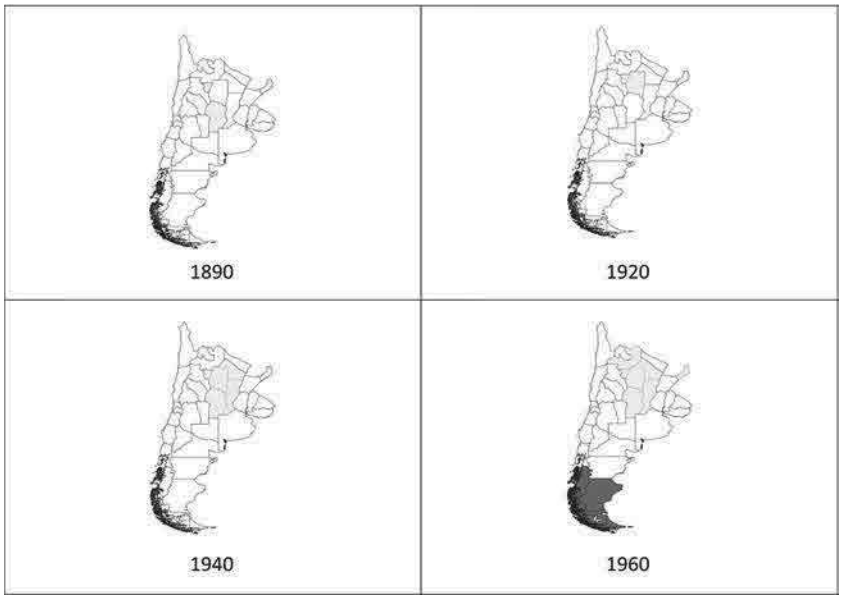


proximity of Argentina, or vice versa, tends to support the hypothesis about the effect of the mountains—*Cordillera de los Andes*—on the social and economic evolution of both countries. Our evidence confirms the idea that the Andes served as "a barrier, almost a defense, and a protective wall."[19]

The dynamics of Uruguay have some similarities with those in Entre Ríos and the province of Buenos Aires (at least in the regions on the eastern frontier), and a diffusion effect might emanate from the agglomeration economies of both capitals, Montevideo and Buenos Aires (we did not observe a statistically significant correlation). Historically, these cities formed a common economic

19 Claudio Maíz, "La cordillera de los Andes: de muro a portal: Visiones del otro a través del espacio," *Revista de Literaturas Modernas*, XXVII (2007), 113–156.

Fig. 6 Local Moran's Spatial-Autocorrelation Indexes for Argentina, Chile, and Uruguay, 1890–1960



NOTES Year benchmarks are 1890, 1920, 1940, and 1960. Light gray indicates high spatial correlation between poor regions. Darker shades of gray indicate higher spatial correlation between poor regions and lighter shades of gray, lower spatial correlation between rich regions.

space, with an important trade via the River Plate and the connection of the Uruguay and Parana Rivers with Brazil, Paraguay, and Bolivia. The consolidation of the national states in the last third of the nineteenth century threatened the development of the interregional trade and promoted a competition between the two cities to become the "exit door" of the River Plate.[20]

In Chile, the causes of the spatial distribution of economic activity were the nitrate cycle and the economic expansion of the northern provinces and its linkages to other regions of the country. The oil cycle in the south had a similar effect, although it

20 The "exit door" refers to the capacity of the ports of Buenos Aires and Montevideo to connect the production of the economic space encompassed by Argentina, Uruguay, Paraguay, Bolivia, and the south of Brazil to the international markets of commodities. Lilia Zanotti, "Un ciclo comercial en la Cuenca del Plata (1852–1920)," *Revista Complutense de Historia de América*, XVIII (1992), 219–239.

was smaller due to its short duration. The copper cycle performed differently due to the dispersion of copper deposits.[21]

An understanding of convergence analysis complements the insights generated by the evolution of regional inequality as presented in the previous paragraphs. This article explores the process of unweighted convergence. Following Rodrik, the empirical model is based on a simple specification in which the growth rate of per capita GDP is a function of the distance between the steady-state level and the initial level of per capita GDP and other characteristics specific to each country. The econometric specification has the form

$$\hat{y}_{it} = \alpha + \beta \ln y_{it} + \gamma D_i + \varepsilon_{it}, \qquad (4)$$

where $\hat{y}_{it}$ is the growth rate of GDP per capita in region i in each time frame (identified by t); y_{it} is the level of GDP per capita at the beginning of the time frame in that region; and D_i is some characteristic of region i (typically in our exercise, belonging to a particular country).[22]

The number of subnational units is reduced to three in Uruguay and eight in Chile. Given that, according to Maddison, Argentina's per capita GDP was clearly higher than that of Chile and Uruguay in 1920, we can evaluate the hypothesis that Argentina's steady state was different in this period. Hence, the national dummy will identify whether the region belongs to Argentina. The main results for the period from 1890 to 1920—corresponding to the first globalization—show strong evidence of convergence; the Argentina dummy (dum_arg) is not significant (Table 1, column 1).[23]

Figure 7 presents a scatter plot indicating the growth rates for all of the regions in the three countries between 1890 and 1920 on

21 Carmen Cariola Sutter and Osvaldo Sunkel, *Un Siglo de historia económica de Chile 1830–1930: dos ensayos y una bibliografía* (Madrid, 1983); Badia-Miró, "La localización de la actividad económica en Chile, 1890–1973"; *idem*, "The Evolution of the Location of Economic Activity in Chile in the Long Run"; *idem* and César Yáñez, "Localization of Industry in Chile, 1895–1967: Mining Cycles and State Policy," *Australian Economic History Review*, LV (2015), 256–276.

22 Branco Milanovic, "Global Inequality Recalculated: The Effect of New 2005 PPP," Policy Research working paper, WPS 5061© World Bank (2009), available at https://openknowledge.worldbank.org/handle/10986/4252 License: CC BY 3.0 IGO; Dani Rodrik, "Unconditional Convergence in Manufacturing," *Quarterly Journal of Economics*, CXXVIII (2013), 165–204.

23 Formally, the dummy variable in this case will be D=1 if the region is in Argentina and D=0 otherwise.

Table 1 Convergence Regression of Regional Growth in Argentina, Chile, and Uruguay (OLS)

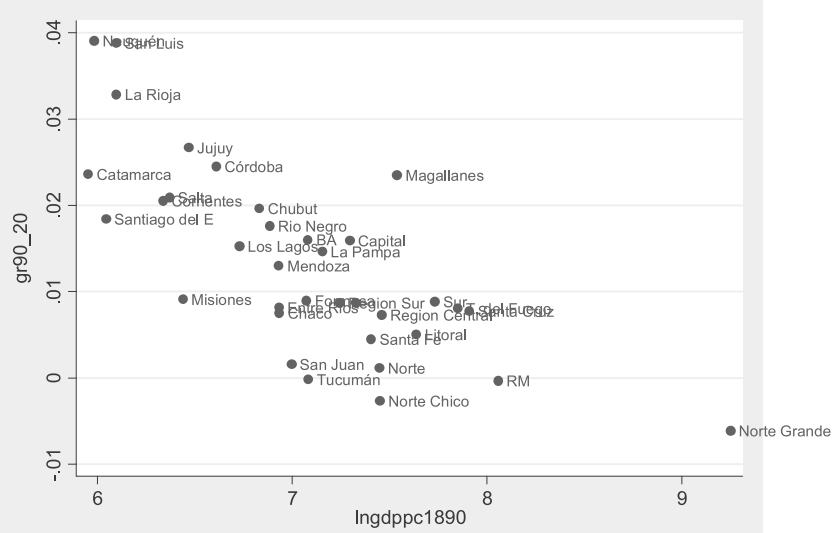
	(1)	(2)	(3)	(4)
REGION	ALL THREE COUNTRIES	ALL THREE COUNTRIES[a]	ARGENTINA	CHILE AND URUGUAY (WITHOUT MAGALLANES)
DEPENDENT VARIABLE	GROWTH 1890–1920		GROWTH 1940–1960	
lngdppc1890	−0.012			
	(5.25)**			
dum_arg	0.000	−0.007		
	(0.09)	(0.79)		
lngdppc1940		0.011	0.028	−0.021
		(1.35)	(3.34)**	(8.98)**
Constant	0.096	−0.069	−0.199	0.182
	(5.57)**	(1.02)	(3.22)**	(9.81)**
R^2	0.57	0.15	0.34	0.90
N	35	36	24	11

*$p<0.10$.
**$p<0.05$.
[a]This specification has thirty-six observations because we include a figure for Aysén (in Chile), which is not available for 1890.
NOTES lngdppc is initial GDP per capita; dum_arg is Argentina dummy.

the vertical axis and the GDPs in 1890 on the horizontal axis. It is consistent with the results presented in Column 1 of Table 1, and it is clear evidence of convergence, showing the regions of the three countries mixed in all the portions of the graph, without significant outliers.

However, in the period of the Import Substitution Industrialization (ISI) (1940 to 1960), we find no evidence of convergence. If we include the three countries in the sample (Column 2 of Table 1), the non-convergence hypothesis cannot be rejected even if we incorporate the possibility of a different steady state for Argentina. The scatter plots in Figure 8—with growth rates between 1940 and 1960 in the vertical axis and GDP per capita in 1940 in the horizontal axis—suggest that the reason for this result is twofold: (1) Argentina (at the top) shows a clear process of divergence (the higher the initial level of per capita GDP in 1940, the higher the growth rates). (2) If we consider Chile and Uruguay together (at the bottom), the region of Magallanes is an outlier exerting a strong influence on the results of the regression.

Fig. 7 Growth Rates between 1890 and 1920 in all of the Regions in Argentina, Chile, and Uruguay

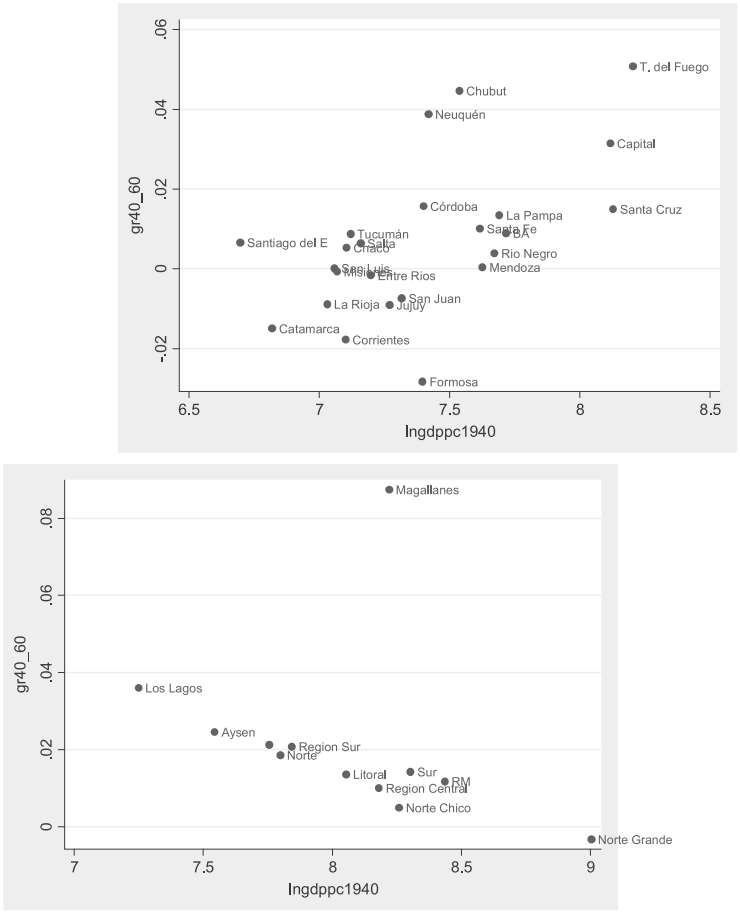


A formal test of the process of divergence in Argentina from 1940 to 1960 is presented in Column 3 of Table 1 where the parameter of initial level of GDP in the regression is significantly positive. Similarly, without the outlier of Magallanes (Table 1, Column 4), the evidence for convergence in Chile and Uruguay is strong and highly significant, even though we have only eleven observations in the sample.

The pattern in the evolution of inequality for the three countries is consistent with the results of the convergence analysis: Argentina and Chile have a U-shaped curve, and Uruguay shows declining inequality in the two sub-periods. We can also confirm the specific pattern for Argentina, when comparing it with the other countries. We can observe convergence from 1890 to 1920 for the three countries, convergence for Chile and Uruguay (after the removal of Magallanes) in the twentieth century, but not for Argentina. The ISI and inward-looking policies had an egalitarian effect in Chile and Uruguay but not for Argentina.

This pattern finds some support in the MLD indices: Whereas Chile and Argentina follow a U-shape consistent with the pattern of first

Fig. 8 Growth Rates between 1940 and 1960 and GDP in 1940 in Argentina (Upper Panel) and Chile and Uruguay (Lower Panel)



convergence and then divergence, Uruguay shows a monotonically decreasing inequality (consistent with an unchanging convergence). The increase in inequality at the end of our period of analysis has different drivers. In Chile, it was the result of an exploitation of natural resources (especially oil in Magallanes) in a few regions, whereas in Argentina, it was the result of expansion in Buenos Aires and certain provinces in Patagonia reaping the benefits of abundant natural resources.

The leading sectors behind the regional economies with higher growth rates differed between countries. For the

Argentinean case, our analysis of the regional divergence in the period from 1920 to 1960 shows that the initially rich and fast-growing provinces (in the context of persistent divergence) were Capital Federal, where agglomeration economies affected the secondary and tertiary sectors, and Tierra del Fuego and Santa Cruz, regions with low-density populations and abundant land. Tierra del Fuego's expansion of the public sector accounts for an important share of its total regional increase. State expansion strongly affected the sparsely populated districts in that certain public investments, even small ones, produced relevant effects in productivity and income per capita.

In the Chilean case, an intense concentration of economic activity occurred around Santiago, the capital, and different mining cycles (nitrate, copper, and oil) affected regional inequality. Natural resources and the dynamics of the capital (the political dimension, high market potential, but small agglomeration economies) determined the location of economic activity in the long run. The mining cycles had different effects on the spatial distribution of economic activity. For nitrates and oil, an increase in disparities in regional GDP per capita polarized the country because the huge expansion of demand in a few regions generated strong linkages to other regions (the oil cycle concentrated in the South, although short, had some similarities with the nitrate cycle in that respect). However, the copper cycle, which was more scattered and capital-intensive, had a smaller impact on spatial concentration.

Economic growth in the three selected South American countries in the nineteenth and the twentieth centuries was not based exclusively on industrial expansion; it was also the result of an exploitation of natural resources in the context of a strong integration into the international markets of goods and production factors. Eventually, Argentina, Chile, and Uruguay showed a complementary process of industrial growth and heavy state intervention after 1930.

Because some of the regions in Argentina and Chile with abundant natural resources (frontier economies) had low population density, regional inequality was unusually pronounced in those countries at the end of the nineteenth century. The level

of regional inequality in Uruguay, a country with considerable land but no frontier economy, was more in line with those of European countries.

The peculiar pattern of growth in these countries has strong implications for the evolution of inequality. From 1890 to 1920, when the process of export-led growth was still dominant in the three countries, inequality was decreasing. Certain regions, strongly favored at first by the international demand for a limited set of commodities in agriculture (Argentina and Uruguay) and mining (Chile), eventually started to experience decreasing marginal returns. In the second period, after the Great Depression and the international recession of the 1930s, the evolution of inequality depended on how each country adapted to a protectionist world, implemented ISI policies, and dealt with the regional dimension of natural-resource exploitation (especially related to the mining cycles). The convergence analysis confirms that although convergence is clear and strong in the three countries between 1890 and 1920, regions in Argentina began to diverge while those in Chile and Uruguay tended to converge (excluding the low-density ones).

In Argentina and, to some extent, Chile, state-led industrialization policies failed to consolidate the reduction of inequality that occurred in previous periods; regional disparities persisted in these countries. In Uruguay, however, economic development included a concerted effort to reduce inequality, and convergence had a noticeable effect until the last decades of the twentieth century.