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Regional income inequality in Mexico, 1895-2010

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Esta tesis está dedicada a ti, *flaca*.

Chapter 1

Introduction

1.1 Motivation and research objectives

The motivation of this dissertation is multi-fold. Firstly, regional income disparity is widely considered to be a central concern among economists and policy makers. This responds to many facts. Usually, when regional specialisation takes place, only a few regions are able to attract modern industrial activity and high value-added services, causing an increase in regional inequality over the long term, as these activities generally enjoy increasing returns (which, in turn, makes this pattern very difficult to be reversed). Moreover, regional inequality is, all things being equal, highly correlated to inequality among individuals, which is also a very relevant issue for economists and policy makers. Lastly, regional inequality has high political relevance because it may be a source of political instability, which can result in social and economic crisis. Therefore, there is a great deal of scientific literature concerned with the evolution and causes of regional inequality.

The interest in regional inequality is shared by the Economic History literature, especially by that based on quantitative methods, which has developed a number of innovative research strategies to analyse the main forces behind the long-term evolution of regional inequality. However, this line of research has mainly focused on high-income industrialised economies, such as the US and some Western European countries, and there is still a significant gap in our knowledge of the long-term trends of regional inequality in low and middle-income economies. This leads to the second motivation of this project.

Even though there has been some recent work on long-term regional inequality in middle and low-income economies, this is still a rather understudied field, where new hypotheses and interpretations –different from those developed for the industrialised countries– need to be developed. For instance, in developing countries, industrial location and agglomeration economies may not have had such a central role as drivers of regional income disparities. On the contrary, the influence of institutions and the location of natural resources may be much stronger. Likewise, dual economic structures (i.e., the coexistence of modern and traditional economic sectors) are much more common in developing countries than in industrialized economies. All this may make it necessary to adopt different research strategies in the analysis of regional disparities in developing countries.

The study of Mexican regional inequality is representative of middle-income economies, where economic growth has had different roots and dynamics than in industrialised countries. In addition, Mexico has some characteristics that make it a particularly interesting case study. While the northern regions in Mexico share a huge border with the biggest world market, the US, the southern ones limit with one of the poorest region in the world, Central America. Also, it is a case in which very different forces have affected the long-term evolution of regional income inequality, such as factor endowments, factor mobility, natural resources, structural change, market potential and regional and development policies, which have affected regional disparities with varying intensity across the different periods of the late modern history of Mexico.

Finally, the last motivation of this research lies beyond the Economic History frontiers. Mexico is living a period of increasing regional divergence, according to different indicators. Although this problem has been object of harsh public debate between the mid 20th century and the present (actually, the current federal government has announced a huge program to encourage economic growth in the poorest regions) almost no progress has been reached. According to the National Institute of Statistics and Geography (INEGI), in 2010 the *GDP per capita* of the richest state was 5.2 times as high as in the poorest state. The National Council for Evaluation of Social Development Policy (CONEVAL) estimates that 43 per cent of the total population living in extreme poverty in 2010 were located in 4 southern states. These figures stand out globally, not only in comparison to high-income countries but also to most middle and low-incomes economies. In fact, the ECLAC (2014: 73) has recently pointed out that Mexico has the second highest income ratio between the richest and the poorest regions among Latin American countries, only surpassed by Ecuador. In this regard, although the Mexican economy has a deep-rooted and historically persistent high regional inequality, the literature on regional disparities has focused mainly on the period from the 1980s and the end of ISI policies. By contrast, very little research has been done for the State-led industrialisation period (1930-1980), and none for the previous years of the First Globalisation.

This dissertation aims to provide new quantitative evidence on the long-term evolution of Mexican regional income inequality, covering the period from 1895 to 2010. With this research, we hope to contribute both to the literature on Mexico and to the international debate on the main forces that explain the historical evolution of regional inequality.

1.2 Economic theory on regional inequality

The main theoretical hypotheses on regional inequality come mainly from the economic growth and international trade literature. Traditional approaches were based on the assumptions of perfect competition and diminishing returns to capital (Solow, 1956). However, more recent theoretical contributions have also introduced the possibility of increasing returns and imperfect market. The following lines present the main predictions of the theoretical models on the evolution of regional disparities.

To start with, both the Growth and Trade neoclassical models predict an intrinsic 'self-correcting' process of regional disparities in the long run. The neoclassical growth model (Solow, 1965) assumes that initial disparities in regional income (associated to differentials of capital-labour ratios across regions), tend to disappear over time as a consequence of economic integration and the subsequent factor mobility. Because of diminishing returns to capital, capital flows from regions with high capital-labour ratio to those with low capital-labour ratios, provoking convergence in capital-labour ratios and in labour productivity.

In the case of international trade theory, the Heckscher-Ohlin model predicts regional convergence through the equalisation of factor prices among regions. Assuming initial regional disparities in factor endowments and their prices, economic integration provokes factor price equalization through movements of good and factors. This would provoke convergence in most cases, although not always. According to Slaughter (1997), "… even if trade is leading to convergence of factor prices according to the FPC theorem, per capita income can still diverge if endowments across countries are becoming sufficiently dissimilar" (Slaughter, 1997: 196).

Unlike the previous models, both the endogenous growth models and the New Economic Geography (NEG) assume increasing returns to capital. In both cases, regional income convergence is not a necessary result of economic integration. Actually, several of these models predict divergence, at least initially, as a result of integration. The endogenous growth theory, developed in the 1980s (see Romer, 1986), suggests that, due to increasing returns, those regions with higher initial capital-labour ratio (and the associated technological advantages) could have a constantly faster rate of growth in comparison to those regions with low capital-labour ratio. Similarly, the NEG, trying to identify the main explanatory forces of the location of economic activity (Krugman, 1991), assumes imperfect competition and increasing returns to scale in manufacturing, and explores the interaction between transport cost decreases, increasing return to scale, and market potential. Broadly speaking, an initial reduction in transport costs would lead to spatial concentration, as the industrial activity benefits from agglomeration externalities in the presence of increasing returns (Marshall, 1920). This would cause a first stage of regional income divergence. However, Puga (1999) argues that, with high levels of agglomeration, firms become sensitive to congestion costs. This, together with additional falls in transport costs and deeper market integration, would encourage regional convergence, producing an inverted-U trend of regional inequality.

Last but not least, some models consider structural change as one of the main determinants of regional income inequality. This literature argues that some regions experience an earlier and faster structural change than others, and this boosts their specialisation in activities with high productivity levels. In this regard, convergence would occur when the rate of structural change is faster in the poorest regions than in the richest regions, something that could happen in a context of factor mobility and low costs of resources' reallocation from low-productivity to high-productivity economic sectors (Williamson, 1965; Caselli and Coleman, 2001).

In addition to the previous proposals, some authors have suggested specific hypotheses for the evolution of regional inequality in low and middle-income economies. To start with, Arthur Lewis' (1954) seminal work stressed the existence of within-country productivity gaps in underdeveloped economies and described their consequences on the process of economic development. The main idea in Lewis' model is the persistence of a dualism in developing countries, in which "capitalist" and "subsistence" sectors coexist over the entire economy. This author emphasises that poor countries are not uniformly poor, because they have economic activities with both high and low productivity levels. In developing countries, "… few industries are highly capitalized, such as mining or electric power, side by side with the most primitive techniques…" (Lewis, 1954: 408). According to this author, economic development should be associated to the movement of factors from "capitalist" to "subsistence" sectors, in order to gradually reduce the importance of dualism.

The distinction between "capitalist" and "subsistence" sectors is not easy and has often been questioned. According to Lewis, these two categories do neither correspond to industry and agriculture (due to the existence of modern agriculture activities), nor to urban and rural (because of the presence of very low productivity activities in urban areas, such as nontradable services). Instead, as Lewis states, "[t]he capitalist sector is that part of the economy which uses reproducible capital, and pays capitalists for the use thereof (…) The subsistence sector is by difference all that part of the economy which is not using reproducible capital." (Lewis, 1954: 407). Thus, probably the most clearly defining feature of "subsistence" sectors is the prevalence of subsistence wages. Despite those definition difficulties, as many scholars have pointed out, Lewis' dualism remains a very useful abstraction to explain the economic evolution of developing countries (Gollin, 2014). And the concept of dualism could be roughly linked to spatial disparities and regional income inequality, through advances in regional specialisation.[1]

On the other hand, in the case of Latin America, the Economic Commission for Latin America and the Caribbean (ECLAC) has often stressed the spatial disparities in economic structure within countries (see, for instance, Prebisch, 1949 and Pinto, 1970). Such structural heterogeneity is reflected in the existence of large labour productivity differentials between sectors and regions. In contrast with Lewis' dualistic model, the ECLAC approach introduces a higher complexity, with several activities with different labour productivity levels that are constantly interacting. According to Pinto (1970), among others, structural heterogeneity is the result of uneven rates of technological progress across sectors, which generate productivity asymmetries that are much greater than in high-income economies.

[1] Lewis briefly mentioned the spatial dimension of economic dualism, as in the following fragment: "There are one or two modern towns, with the finest architecture, water supplies, communications and the like, into which people drift from other towns and villages which might almost belong to another planet" (Lewis, 1954: 408).

1.3 The long-run evolution of regional inequality: historical evidence

1.3.1 Western Europe and the US

In the early 1990s, R. Barro and X. Sala-i-Martín offered some empirical evidence on a general historical trend to regional income convergence (see, for instance, Barro and Sala-i-Martín 1990, 1991, 1992). These authors, using the traditional neoclassical growth model with a closed economy and diminishing returns to scale, documented the existence of β-convergence among the US states since 1963 at a yearly rate of around 2 per cent (i.e., the gap between the poor and rich regions tended to decreased by 2 per cent a year). Similar patterns of convergence could be seen, according to these authors, among 73 regions of Western Europe (Barro and Sala-i-Martín, 1991). These results strongly supported the predictions of neoclassical growth theory on regional convergence. However, their research has received significant theoretical and empirical criticisms, which stress that this kind of analysis provides a highly simplified view of the historical evolution of regional income distribution.[2] As Quah (1996) has pointed out:

> *"Convergence concerns poor economies catching up with rich ones. What one wants to know here is, what happens to the entire cross sectional distribution of economies, not whether a single economy is tending towards its own, individual steady state. However, it is the latter that has preoccupied the traditional approach. Proposes fixed to that approach (e.g., the increased emphasis on σ-convergence in Sala-i-Martin (1995)) continue to miss the principal important features of economic growth and convergence."* (Quah, 1996: 1053)

Quah has argued that distribution dynamics, such as stratification, the formation of convergence clubs, and "twin-peaks" polarization trends, should be considered in the analysis of regional disparities. This claim has been addressed by further studies. For instance, Yamamoto (2008) presents an analysis of the US regions from 1955 to 2003, approaching regional distribution "…not solely as the matter of β- and σ-convergence, but as a multi-faced concept whose dimensions also include modality churning and spatial clustering." (Yamamoto, 2008:80). Besides,

[2] Some of the theoretical problems of the β-convergence analysis are the use of Cobb-Douglas production functions (Temple, 1999) or parametric assumptions (Quah, 1996), among others.

this author argues that the study of regional income disparities must take into account the units of study (i.e. scales of regionalisation), as the results can be fairly dissimilar when different units are used. He points out that US state-scale probability density curves shows little evidence of polarisation or stratification of regional income distribution. Using the Shorrocks index and Kendall's τ-statistic, he also calculates the degree of state movements from one income class to another and ranking mobility, finding that the maximum level of mobility took place during the 1970s and 1980s. Finally, the Moran's I spatial autocorrelation index, using both contiguity and distance matrices, shows that US state income distribution has always been spatially clustered.

As mentioned above, the Economic History literature has recently provided new evidence on the trends and forces behind regional income inequality for several countries since the middle of the 19th century. In the European case, over the past 10 years, several scholars have estimated new regional GDP per capita figures, under the framework of the European Science Foundation project: "Historical Economic Geography of Europe, 1900-200", coordinated by J. Rosés and N. Wolf. So far, regional GDP *per capita* estimates have been provided for 7 European countries: Austria-Hungary, Belgium, Britain, Italy, Portugal, Spain, and Sweden (Schulze, 2007; Buyst, 2009; Crafts, 2005; Felice, 2009; Badia-Miró et al., 2012; Rosés et al., 2012; Enflo et al., 2010). For most of these cases, scholars have been able to identify not only the trends of regional income inequality over the long term, but also the main determinants driving them.[3]

In general terms, this literature suggests that there is neither one general pattern nor one theoretical framework able to explain the patterns of regional inequality in all those countries over the long run. However, globally speaking, the hypothesis that best suits those European cases is the inverted U curve proposed by Williamson (1965). According to Williamson, regional inequality is expected to increase during the earliest phases of economic development, due to the initial process of regional specialisation (spatially uneven structural change). However, as structural change continues, a trend towards convergence gradually emerges, reducing regional disparities in a second phase. Therefore, regional inequality is expected to follow an inverted-U trend in the long term:

[3] The main results of this literature have been recently compiled in Wolf and Rosés (2016).

> "…*the early stages of national development generate increasingly large North-South income differentials. Somewhere during the course of the development, some or all of the disequilibrating tendencies diminish, causing a reversal in the pattern of interregional inequality. Instead of divergence in interregional levels of development, convergence becomes the rule, with the backward regions closing the development gap between themselves and the already industrialized areas. The expected result is that a statistic describing regional inequality will trace out an inverted "U" over the national growth path; the historical timing of the peak level of spatial income differentials is left somewhat vague and may vary with the resource endowment and institutional environment of each developing nation*" (Williamson, 1965: 9).

This pattern has been well documented for the US and several European countries, such as Britain, France, Portugal and Spain (Kim, 1998; Crafts and Mulatu, 2005; Combes et al., 2011; Klein and Crafts, 2012; Badía-Miró et al., 2012; Martínez-Galarraga et al., 2013). In all of these cases, the location of the industrial activity has been the main factor explaining the evolution of regional income disparities.

In parallel with historical pc GDP estimates, scholars have researched on the determinants of regional inequality and, more specifically, on the reasons for long-term changes in industrial location. For the US, Kim's (1999) pioneer paper concludes that neoclassical trade forces (factor endowments) were the main determinants driving the geographical distribution of industry from 1880 to 1987. This author estimated an equation based on Rybczynski's theorem, using ordinary least squares, where labour, capital and natural resources (agriculture, tobacco, timber, petroleum and minerals) represented factor endowments.[4] The relatively high fit of Kim's equation (high R^2 in all benchmark years) was interpreted by this author

[4] The Rybczynski theorem states that "… at constant commodity prices, an increase in the supply of a factor will lead to an increase in the production of the commodity that uses that factor intensely and a reduction in the production of the other commodities" (Kim, 1999: 4). This theorem is one of the core theorems of the general equilibrium trade theory, together with the factor price equalisation, the Stolper-Samuelson, and the Heckscher-Ohlin theorems. All these are based on the following assumptions: the number of goods and factors are equal, factors of production move costless within region but are completely immobile across regions, commodities are freely mobile across regions, both commodity and factor markets clear competitively, regions have access to identical technologies, factor endowments are relatively similar, and consumers have identical preferences. (Kim, 1999: 4).

as proof of the explanatory power of factor endowments, excluding a formal analysis of other potential forces.

The absence of additional explanatory variables in Kim's analysis, such as the industrial location determinants proposed by the NEG, has been criticised by further research (Combes et al., 2008; Klein and Crafts, 2012). Recently, Klein and Crafts (2012) have incorporated both factor endowment and market access determinants in the analysis of US manufacturing location between 1880 and 1920, using a modified version of a model developed by Midelfart-Knarvik et al. (2000).[5] These authors conclude that market potential largely explains industrial location in the US during that period. Natural resources, by contrast, were only relevant in industrial location decisions in the late 19th century, but its influence tended to decrease thereafter.

Midelfart-Knarvik et al.'s (2000) work, which inspired Klein and Crafts (2012), provided an explanation of industrial activity location in the European Union between the 1970s and the 1990s. Their model took into account both Heckscher-Ohlin forces (factor endowments) and New Economy Geography factors (mainly market potential). They concluded that, depending on the year and the industrial sector, both Heckscher-Ohlin (HO) and New Economy Geography (NEG) forces were relevant to explain industrial location decisions across European countries. Thus, while the supply of skilled labour became progressively more important to explain industrial location, the centrality effect caused by increasing returns was also significant, but decreased over time due to the movement of industries with high shares of intermediate goods towards regions with good access to markets. The methodology proposed by Midelfart-Knarvik et al. (2000, 2002) has been preferred by the most recent literature on this topic because it considers a large number of explanatory variables, including region and industry characteristics and, more importantly, the interaction between them (arguing that industrial location theories focus on this interaction). Moreover, this approach allows testing directly the impact of market potential (a key element of the NEG framework) on industrial location decisions. Thus, this model suggests that neoclassical trade and NEG forces are not exclusive, but rather represent different aspects that influence firms' location choices

[5] The version of the Midelfart-Knarvik model applied by Klein and Crafts (2012) is similar to that proposed in Wolf (2007). Particularly, "… the dependent variable is measured in terms of shares of employment rather than shares of output. This suggests estimation using region and industry dummies to control for the effects that productivity differences might have on the employment-based location quotient." (Crafts and Klein, 2012: 780).

(Wolf, 2007: 23).

Midelfart-Knarvik et al.'s (2000) approach has been applied several times in recent Economic History research. Crafts and Mulatu (2005, 2006) studied industrial location in Britain between 1871 and 1931, and argue that factor endowments and natural resources were among the main location determinants, being also reinforced by *scale economies* (a NEG force). Wolf (2007), also used this model to explain industrial reallocation in interwar Poland between 1926 and 1934, concluding that it was determined by both neoclassical trade forces (particularly, the interaction between skill-intensive industries and regional skilled labour endowments) and NEG forces (forward linkages). This author concludes that: "Poland's industry adjusted to the dramatic border changes in the wake of the First World War in a manner which was surprisingly similar to the dynamics of the modern European Union" (Wolf, 2007:39). Martínez-Galarraga (2012) has also applied the empirical strategy developed by Midelfart-Knarvik et al. (2002) to analyse the main forces behind industrial location decisions in Spain between 1856 and 1929. This corresponds to the period when domestic market integration was completed and the spatial concentration of manufacturing tended to increase (Martínez-Galarraga, 2012:256). Also in this case, both neoclassical trade and NEG forces were joint determinants of the spatial distribution of industrial activity. In the early years of the period, factor endowments (particularly land endowment, measured through agricultural production) drove the location of industry (as Spanish industry was dominated by foodstuffs). However, as regional specialisation and industrial concentration moved forward, during the second half of the 19th century, NEG forces (scale effects, through the interaction between market potential and economies of scale) increased their relevance. At the same time, factor endowments during this period were still significant (through labour abundance), due to the high labour intensity of industry, but without reaching the explanatory power of the NEG forces. In fact, scale effects remained the main force driving industrial location in Spain from the late 19th century up to 1929.

For Latin American, Sanguinetti and Volpe (2009), and Badia-Miró and Yáñez (2015) have also applied Midelfart-Knarvik et al.'s (2000) method. Sanguinetti and Volpe (2009) show that in Argentina, from 1985 to 1994, those industrial sectors that received lower tariff protection tended to be located at a larger distance from the main domestic market (Buenos Aires). Thus, when tariffs were low, the authors conclude, agglomeration economies (demand and cost linkages) were weak, and agglomeration diseconomies (such as congestion costs, commuting costs, land rents) led to the dispersion of economic activities. For the Chilean case, Badia-Miró and Yáñez (2015) argue that, while during the nitrate cycle the location of industry was determined by natural resource endowments, the main drivers of industrial concentration during the ISI period were market access and increasing returns to scale.

Even though all these papers have used the same methodological framework, in some cases they have applied different research strategies. This is particularly clear in the measurement of regional market potential. In Crafts and Mulatu (2005, 2006), market potential estimation is based on the measure used by Keeble et al. (1982), where market potential depends on a distance-deflated sum of the neighbouring regions' GDP and the region's own GDP (Crafts and Mulatu, 2005: 505). By contrast, Wolf (2007) measures market potential by using a gravity model, which considers the importing region's economic size, the impact of distance, and changes in political borders (Wolf, 2007:34). Finally, Martínez-Galarraga (2012) and Klein and Crafts (2012) uses the traditional method proposed by Harris (1954) to calculate domestic market potential, which, in general terms, increases with all locations' purchasing power, but decreases with distance. In the case of Martínez-Galarraga (2012), a gravity equation is used to measure external market potential.

Other papers have analysed the trends and determinants of regional inequality over the long term using different research strategies. For the Spanish case, Rosés (2003) has also quantified the role played by factor endowments and market potential in industrial location from the late 18th century to the early 20th century. This author used a model developed by Davis and Weinstein (1999), which nests an IRS model within an HO model (Rosés, 2003:1007). Similar to Martínez-Galarraga (2012), the author shows that both home-market effects (especially, from the emergence of modern industries) and factor endowments (in most of the period) were crucial in industrial location decisions during the early phase of the Spanish industrialisation. Martínez-Galarraga et al. (2013) have also studied the evolution of regional income inequality in Spain, albeit for a longer period (1860-2000). These authors argued that regional inequality in Spain has followed an inverted-U pattern over the long term. The period of increasing inequality was caused by an initial process of industrial concentration in a limited number of regions. In a second stage, the decrease in regional income disparities was the result of factor mobility and regional convergence in economic structures. Regional inequality has also followed an inverted-U in the case of Portugal (Badia-Miró et al., 2012), which had its maximum peak during the 1970s, relatively late in comparison to other European countries.

Four industrialised economies have not followed the inverted-U pattern of regional disparity in the long run: Belgium (Buyst, 2011), Italy (Felice, 2011), Sweden (Henning et al., 2011; Enflo and Rosés, 2015) and Japan (Paprzyki et al., 2013). Buyst (2011), based on new regional GDP estimates for Belgium from 1896 to 2000, shows that regional inequality constantly decreased from 1896 to 1970 and increased thereafter, reaching in 2000 the same levels as in 1896. Felice (2011) has found sustained convergence between the northern and central regions of Italy, together with a clear north/south income division for the period from 1891 to 2001. This author argues that the north/south division started during the years 1911-1951, as labour productivity diverged between these regions. During the 1950s and 1960s the south converged with the north, due to the growth of labour productivity, which in turn was caused by the massive regional policies applied in Italy in those years. However, this period of convergence ended in the 1970s, due to the decrease in the southern regions' activity rates relative to the national levels. Likewise, Enflo and Rosés (2015) have found sustained convergence among the Swedish regions from 1860 to 1980, and the beginning of a divergence period from 1980 onwards. These authors apply a methodology firstly proposed by Caselli and Tenreyro (2004:492), which uses one region as benchmark for the rest of the regions to converge. This methodology allows total convergence to be decomposed into three components: the "within–sector" component, which captures the labour productivity convergence of each sector with the corresponding one at the benchmark region; the "labour reallocation" component, which measures the share of convergence due to inter-sectoral workforce movements; and finally the "between-sector" component, which measures the contribution to convergence of inter-sectoral labour productivity growth differences. The authors find that regional convergence in Sweden from 1860 to 1980 could be mainly attributed to within-sector forces from 1860 to 1910, and to structural change (through labour reallocation and between-sector components) from 1940 to 1980, while the main force behind the recent regional divergence (1980-2000) was the within-sector component. Finally, Paprzyki et al. (2013) have analysed the regional income inequality trends of Japan during the initial phase of its industrialisation (1890-1940). They find that regional inequality in Japan slowly declined during this entire period (largely driven by internal migrations), being another case of an industrialised economy where the inverted-U trend did not develops.

1.3.2 Evidence from peripheral economies

In contrast to the recent literature for industrialised economies, historical evidence on regional income disparities in poor and developing countries is rather sparse. In these cases, industrial location may not be the key explanation of regional inequality. Instead, a combination of factors such as primary activities, structural heterogeneity, natural resources and the evolution of international markets should be considered. By contrast, in many developing countries, scale economies have not been strong enough to contribute significantly to regional disparities.

More specifically, the influence of sector productivity differentials in low and middle-income countries on regional inequality, through differences in productive structure across regions, may be substantial. In this regard, Caselli (2005) has shown that the average labour productivity in the non-agriculture sector in low-income countries is relatively close to the average labour productivity in the same sector in high-income countries. By contrast, differences in the case of agriculture are much larger. As the author states, “labour productivity is generally higher outside than inside agriculture, and this is much more true for developing countries” (Caselli, 2005:724). Similarly, Gollin et al. (2014) have pointed out that differences in average labour productivity between agriculture and non-agriculture sectors are much more pronounced in poor economies, and average labour productivity in agriculture tends to be less than half than in non-agriculture sectors.

Similarly, Bértola (2005) shows that industrialisation was accompanied by a reduction in personal income inequality in Uruguay. This was the consequence of two main forces: the decreasing share of agriculture in national output (since this share was positively related with inequality), and economic policy, which encouraged the transfer of resources from the agro-export sector towards the rest of the economy. At the same time, the industrial and public sectors experienced a strong within sector reduction of income inequality during this period. As the author points out, this contradicts the traditional view first proposed by Kuznets, according to which industrialisation is expected to increase personal income disparities. These contrasts between developed and developing countries could also be expected in the spatial dimension of inequality.

Hence, the analysis of regional disparities in low and middle-income countries requires new hypotheses. This has been the objective of recent literature focused on peripheral economies, especially from Latin America (Badia-Miró and Yáñez, 2015; Aráoz and Nicolini, 2015; Badia-Miró, 2015; García et al., 2014; Reis, 2014) and Asia (Caruana-Galizia and Ma, 2015; Caruana-Galizia, 2013; Roy, 2012).

Within Latin America, Chile has probably been the case in which long-term regional inequality has been analysed in more depth. Badia-Miró (2015) shows that regional inequality trends in Chile are closely correlated to the exploitation of natural resources, which, in turn, are linked to international market demand. In this context, the extreme concentration of economic activity in the capital city was mainly due to its political role, not by agglomeration economies (as in many industrialised economies). The author shows that the impact of natural resources on regional income inequality varied depending on the specific resource in question and the degree of modernisation of its production process. In the same vein, Badia-Miró and Yáñez (2015) analyse the relation between mining resources and industrial activity location in Chile and indicate that, whereas the high labour-intensity of the nitrate sector encouraged industrial activity in the regions where it was located, the copper sector, which was capital-intensive, was not strong enough to generate local industrial activity. Instead, policies of industrialisation during the copper cycle transformed Santiago (the capital) into the main industrial centre.

In a recent publication, Aráoz and Nicolini (2015) have estimated the regional GDP *per capita* of Argentina's regions in 1914, and have compared it to the available figures for 1953. These authors confirm the persistence of the leading role of the Buenos Aires region between those two dates, thanks to agglomeration effects, and suggest that comparative advantages in primary activities (cattle and agriculture) played instead an important role in the next three richest regions after Buenos Aires. This result suggests strong persistence in spatial patterns, regardless of changes in development, relative prices and economic policies. A similar result has been found in the Uruguayan case. García et al. (2014) show the persistent leading position of Montevideo in income per capita over the long term, although combined with a sustained process of regional GDP *per capita* convergence between 1908 and 1961, driven by industrial decentralisation under the State-led industrialisation model. Finally, Reis (2014) also shows the secular persistence of regional income *per capita* and labour productivity in Brazil from 1872 to 2000. In this country, regional convergence over the entire period was very slow compared to high-income economies, being hindered during phases of export-led growth and encouraged during the State-led industrialisation period.

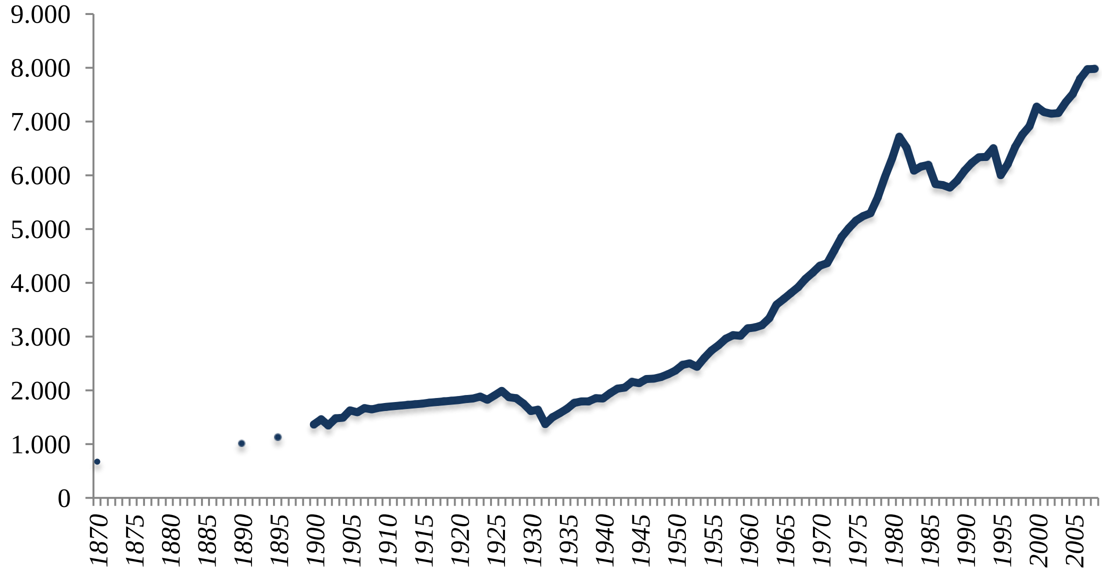
In the case of Asia, Caruana-Galizia (2013), has recently estimated the GDP *per capita* of Indian regions during the First globalisation (1875-1911). During these years, the author has found a sustained process of regional income convergence. More recently, Caruana-Galizia and Ma (2015) have offered estimates of the Chinese regions' GDP *per capita* during the First Globalisation (1873-1918), finding a U-form trend in regional income disparity, and suggesting, as an initial hypothesis, that it was the result of both institutional and geographical forces.

1.4 The Mexican case: regional inequality in the long term

1.4.1 Historiographical background

In his seminal work: "Modern Economic Growth: Rate, Structure, and Spread", Simon Kuznets (1966) defined modern economic growth as a sustained growth of GDP *per capita*. This process, the author argued, is accompanied by changes in each sector's weight in GDP over the long term and, in particular, by the decrease of the GDP share of the primary sector (mainly agriculture). In Mexico, structural change was intensified in the late 19th and early 20th century (see Table 1.1).

Graph 1.1 Mexican GDP per capita, 1870-2010
(1990 Int. G-K$)



Source: Maddison (2010) .

Table 1.1 Sectoral composition of Mexican GDP, 1895-1929 (%)

	1895	**1910**	**1921**	**1929**
Agriculture	23.8	19.9	17.9	13.9
Farming	9.6	7.5	7.4	6.7
Mining	4.9	7.5	4.2	9.5
Oil	-	0.1	6.9	2.0
Manufacturing	9.1	12.3	10.4	13.2
Transport	2.3	2.2	2.8	4.3
Others	50.3	50.5	50.4	50.4

Source: Pérez López (1960:585)

This was followed by a phase of sustained economic growth from 1930 to 1980, associated to the general modernisation of the Mexican economy. Mexican growth slowed down since the mid-1980s, coinciding with deep institutional change and the opening of the economy (Graph 1.1). These different growth periods can be clearly seen in international comparisons. Table 1.2 compares Mexican GDP *per capita* with those of other economies of Latin America and the rest of the world. Compared with other countries, and specially with the US, Mexican relative GDP *per capita* tended to be higher in 1950-1980 that thereafter. In fact, from 1990 to 2000, Mexico diverged from all other countries in the table, with the only exception of Brazil. Before 1980, by contrast, Mexico growth rate was higher than in the US, Argentina and Chile, although lower than in Spain, South Korea (two growth "miracles" of the period) and Brazil.

Table 1.2 Mexican GDP per capita as a percentage of other countries' GDP per capita (1950–2000)

	1950	**1960**	**1970**	**1980**	**1990**	**2000**
US	24.3	28.4	29.3	33.2	25.3	23.5
Spain	90.8	74.4	54.8	59.7	44.7	41.4
South Korea	n.d.	239.3	194.9	158.0	71.7	51.5
Argentina	39.2	47.0	52.5	66.6	83.6	71.3
Brazil	157.1	138.4	128.5	108.0	100.6	112.4
Chile	66.9	73.6	82.9	115.7	96.3	70.7

Source: Márquez (2010:565)

During the late 19th century, Mexico's economy went through an unprecedented process of economic growth led by primary exports. In this period, the country experienced several changes that boosted the transition to a modern capitalist economy. Firstly, it was during these years that important institutional reforms were established. One of the most important changes was applied in the mining sector, where limited liability companies were allowed since 1884. Important measures of protection of private property were established in 1892 (Kuntz, 2010: 314) and, what is more relevant from the viewpoint of economic integration, taxes on domestic trade (*alcabalas*) were also abolished at the end of the 19th century.[6] This reform largely encouraged the integration of national markets by simplifying (in terms of costs and safety) the domestic movement of goods across the national territory.[7] All these transformations encouraged the incorporation of traditional sectors into the market economy and therefore contributed to their modernisation. At the regional level, those changes had an uneven impact, boosting the performance of some particular regions and, in particular, those with comparative advantages in primary exports.

Together with institutional changes, the revolution in the transport system, and particularly the expansion of the railway network, played a central role in the

[6] Even though this reform was formally approved in the middle of the 19th century, it was only applied at the end of the century.

[7] There is some debate on the actual effects of institutional change. For instance, Haber, Razo and Maurer (2003) argue that it was biased towards a national elite (entrepreneurs and politicians), which needed the new institutions in order to preserve the authoritarian regime of the period.

modernization of the Mexican economy. In addition, the integration of markets boosted by the transport revolution was crucial for regional specialization, largely based on the location of natural resources.[8] John Coatsworth (1979, 1984, 1990) estimated that the social savings of the Mexican railways represented 24.6 to 38.5 per cent of total GDP by 1910. This is a remarkable result, compared with both the developed and the Latin American economies (Leunig, 2010: 791; Herranz-Loncán, 2013), and can be explained by the precarious condition of the transport system in Mexico before the introduction of the railroad.

As mentioned before, economic growth during the late 19th and early 20th centuries was mainly led by primary exports (mainly agricultural and mining products). The value of Mexican exports grew at a yearly 7% on average from 1870 to 1925 (Kuntz, 2010: 324). Haber (2010) considers that the first wave of Mexican industrialisation, that took place during the last 19th and early 20th century, was mainly a consequence of export activity, since a large share of export revenues were used to import inputs (such as machinery) that boosted industrialisation. Foreign investment was also crucial in this period, contributing directly to the extension of the railroad network and the modernisation of the mining sector.[9]

As has been indicated, as a consequence of the central role of primary export in growth, natural resources endowments were among the main determinants behind the location of economic activity. Thanks to the export boom, some regions could substantially increase their capital-labour ratio, while others stagnated and lagged behind. The result was a process of spatially uneven structural change and regional divergence, with some regions being able to reallocate labour force towards high productivity sectors.

The 1910 Revolution and the subsequent civil war did neither cause a general collapse in the economy nor moved it out from the growth trend initiated by the First Globalization. The most important effects of the war were concentrated between 1913 and 1916 and were different across regions and sectors, with some areas and activities remaining barely unaffected. For instance, oil production grew at a yearly rate of 36% from 1910 to 1921.

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[8] See Dobado and Marrero (2005) for commodity market integration and Kuntz and Speckman (2011) for labour market integration.

[9] The financial system was also modernized in this period, thanks to its integration in the international capital markets, and the presence in Mexico of the Guggenheim, the Rothschild and Mirabaud bankers, among others.

In contrast, the 1929 Great Depression had a great impact on the Mexican economy. The international context forced a move towards an inward-looking strategy of economic growth largely based on domestic industrialisation. This shift was common in Latin American economies from the 1930s to the 1980s, decades that are usually known as the State-led Industrialisation or Import-Substitution Industrialization (ISI) period. According to Bértola and Ocampo (2013), this model had two main features: industrialisation and the increasing participation of the State in the economy and society. Taking Latin American as a whole, these authors identify two phases within the model. The first one, corresponding to the period between the Great Depression and WWII, is a transition phase of low growth, whereas the second one, from 1945 to the 1980s, is the period in which Latin America achieved its highest growth rates in history.

During the State-led industrialisation period, Mexico had the highest economic growth in its history (see Graph 1.1), and the second highest growth rate in Latin American. From 1950 to 1980 Mexico grew at a yearly rate of 6.6%, only after Brazil. The growth rate of labour productivity (3.4%) was also remarkable, not only in comparison with Latin America but also to the US (2.8%), being quite close to the equivalent figure in the industrialised European economies (3.9%) (Bértola and Ocampo, 2013: 213).

During that period, commercial policy played a central role in the national development strategy. Even though protectionist policies started to be implemented in the late 19th century in order to promote industrial activity and import substitution, they were substantially altered after WWII.[10] In contrast to the strategy that had been adopted in previous years, in 1947 ad valorem rates and quantitative controls were introduced as key instruments for the promotion of industrialisation. With this policy, the Mexican economy became much more closed than it had been previously (Esquivel and Márquez, 2007: 344). In addition, from the 1950s onwards, industrial activity was promoted not only by trade policy, but also by fiscal stimuli, such as subsidies and fiscal exemptions, aimed at encouraging the reinvestment of the available surplus. Thanks to this policy, industrial sectors producing consumption goods could grow substantially on the basis of domestic demand, and the industrial

[10] WWII was an exceptional period in which industrial growth was not based on protection but on external demand (which explains 79% of manufacturing expansion), especially from the US (Cárdenas, 2010: 515)

sector accounted for 40% of total GDP growth from 1962 to 1970 (Cárdenas, 2010: 517).

Mexican growth was strongly affected by the discovery of very rich oil fields in the country in the late 1970s. Public and private investment in the sector boomed, and this accelerated GDP growth, which reached an average yearly rate of 7.8% between 1977 and 1981. Although, due to the specific locations of the fields, the effects of the expansion of the oil sector were regionally uneven, the government partially made up for this concentration by using oil revenues to finance many public investment projects across the entire country. At the same time, however, a large share of those projects focused on activities with very low levels of efficiency.

By the late 1970s, the economy was totally oil dependent. Around 75% of exports and 38% of fiscal revenues came from oil activity (Cárdenas, 2010: 525). As a consequence, the Mexican economy was seriously affected by the drop of oil prices in 1981. The simultaneous increase in international interest rates gave rise to the so-called debt crisis. By 1982, the country had to pay around 14 billion dollars of debt interests, which represented almost half of the total value of Mexican exports at this time. This situation led to a drastic change in the relationship between the State and the economy, based on openness and a very limited participation of the State in economic development. The government carried out massive privatization and public budget cuts, and liberalized the financial sector. According to Moreno-Brid and Ros (2009), the variable that was most highly affected by the macroeconomic adjustments derived from the debt crisis was public investment.

Trade liberalization and international integration were a persistent feature of the last decades of the 20th century. In 1986, Mexico joined the General Agreement on Tariffs and Trade (GATT), and by 1994 the North American Free Trade Agreement (NAFTA) came into effect, which had huge effects on Mexican international trade. According to the National Institute of Statistics and Geography (INEGI), 77.6% of the total exports of the country were destined to the US market in 2012. On the other hand, in spite of the economic stability achieved during this period (controlled inflation rates and healthy public finances), economic growth has been, to say the least, disappointing. The average GDP growth rate from 1981 to 2007 was 2.3%, representing the lowest rate in the entire 20th century (Márquez, 2010: 553).

1.4.2 Regional inequality in Mexico

Regional inequality has been a constant concern of the Mexican government, especially since WWII. During the ISI 'miracle' years, economic activity became increasingly concentrated in Mexico City and the surrounding areas and, by 1980 Mexico City and the State of Mexico represented 36.14% of the country's total GDP (Germán-Soto, 2005). The central government established several regional policy programmes, aimed at dispersing economic activity across the country, and especially out of rich states, such as Mexico City, Nuevo León and Jalisco. However, these programmes had practically no effects (Aguilar, 1993). For instance, the creation of new industrial zones, which were intended to disperse industrial activity across the country, did not achieve its purpose. The companies that settled in the industrial zones were of local origin, and the few companies from Mexico City that decided to move, did so, in most cases, to Mexico City's metropolitan areas (mostly to the State of Mexico and Morelos). Regional policy also tried to control domestic migration flows, which were reaching unprecedented levels, especially towards Mexico City and Baja California, through the establishment of the National Population Council (CONAPO). Once again, this effort had very limited results.

Aguilar (1993) points out that the main causes of this failure were the constant inconsistencies between the government's declared objectives and regional policies and the measures that were actually implemented in other areas of economic policy. For example, manufacturing activity in the Mexico City Metropolitan Area received, until 1986, special fiscal stimulus. Thus, one of the author's conclusions is that Mexican economic strategy "… could be understood as a process of additional concentration to the metropolitan region, not as a successful form of decentralisation" (Aguilar, 1993: 241). In the last analysis, it seems clear that, in the Mexican case, market forces were much stronger than regional policy in shaping the economic geography of the country.

Concerns on Mexican regional inequality were reflected in a relatively early attention to the topic by scholars and institutions. The first systematic analyses of regional inequality in Mexico were carried out during the 1960s and 1970s. The earliest study was Yates (1965), published by the Bank of Mexico, which was followed by Unikel and Victoria (1970); Appendini, Murayama and Domínguez (1972); Leimone (1973), and Hernández (1984). Most of this literature measured regional inequality by disparities in GDP per capita, sectoral structure of the labour force, poverty indices (composed by mortality levels, minimum wages, quality of food consumption, and education levels, among others), and industrial value added. Broadly speaking, these authors found a period of increasing regional inequality from 1900 to 1960, and supported the idea that the richest regions, and especially Mexico City, had grown at the expense of the poorest ones. This idea was already present in Yates' (1965) seminal work, which explained the increase in regional productivity differences from 1940 to 1960 on the basis of the location of industrial activity in Mexico City and, to a lesser degree, the north bordering states. According to this author, Mexico City enjoyed significant capital effects during this period, having the highest rates of public investment, the biggest market in the country, and the most highly skilled labour force.

In the early 1970s, Unikel and Victoria (1970), and Appendini et al. (1972), obtained very similar results. Unikel and Victoria (1970) used a socio-economic indicator of development at the state level, made up by 12 components, including not only parameters of productivity, as GDP per capita, but also social parameters, such as mortality index and literacy rates. These authors found very low rank mobility among states from 1940 to 1960 and a high persistence of the richest and poorest regions. They explain such low mobility by the rich regions' capacity of to diversify their economies, while poor regions remained specialized in primary activities. Appendini et al. (1972) extended their study to the period 1900-1960, providing, for the first time, with their 1900 estimates, GDP per capita figures at the state level for an earlier date than 1940.[11] Once again, these authors used a socio-economic index (including both economic and social variables) to test regional inequality, and argued that those regions which took the highest advantage of the agro-export-led growth model (Mexico City and the northern states), were also the richest regions in 1960, while the less developed regions (mainly the southern states) remained poor all over the period. The consequence was a significant regional income divergence between 1900 and 1960. As in Unikel and Victoria (1970), divergence was attributed to the differences between rich regions' dynamic economic structure, and poor regions structural stagnation in low productivity activities. Along the same lines, Leimone

[11] Their study was only based on the 1900 and 1960 benchmarks. The 1900 figures have been used in several further research projects, as they were so far the only available GDP per capita figures at the state level before 1940.

(1973) described a 'cumulative causation' process that contributed to the persistence of the richest regions' position from 1900 to 1960. This process was stimulated by industrial activity concentration, urbanization, and accumulation of skilled labour and public infrastructure. Such process also contributed to keep the poorest regions in an underdeveloped situation.

Hernández (1984) extended the regional GDP per capita database up to 1980, and was the first author to suggest that Mexican regional inequality trend followed an inverted-U trend. According to him, regional income inequality in Mexico increased from 1900 to 1940, stayed constant between 1940 and 1970, and then decreased from 1970 to 1980. He considered the oil boom of the late 1970s as one of the main explanatory variables for the most recent convergence process.

In the 1990s the surge of the NEG made Mexico an interesting case study, due to its quick move from a closed to a very open economy during the 1980s. Several studies inspired by the NEG have tried to explain the changes in industrial location (specially from the Mexico City area to the North) associated to the shift in trade policy. In this regard, the Krugman and Livas' (1996) pioneer work suggested that the spatial concentration of manufacturing in Mexico City was the consequence of strong forward and backward linkages that emerged under a closed economy, in order to satisfy the biggest domestic market. However, trade liberalisation policies internationalized those linkages, encouraging a process of manufacturing dispersion from Mexico City to the states closest to the US border.

This hypothesis has been tested, among others, by Hanson (1996, 1997b, 1998a, 1998b, 2001). Taking the NAFTA agreement as reference, this author has shown that economic openness has moved several manufacturing activities in both the US and Mexico towards their common border. The reduction in centralization is also visible in manufacturing employment (Hanson, 1996, 1998a, 1998b, 2001). The author has also shown that most inputs used in the *maquiladora* industry (which is highly concentrated in north bordering states) come from the US. Hanson (1997a) also argues that nominal wages tend to be higher near industrial centres, and that wage gradients are associated with distance. This explains that relative wages increased in the North in the late 1980s, as a consequence of the reallocation of industry.

Further empirical research inspired by NEG has shown that inequality in industrial structure across states (or, in other words, the specialization of each state's industry) has recently decreased, thanks to the spread of industry from Mexico City to the rest of the country (specially the north), (Dávila, 2004; Mendoza, 2002; Mendoza and Pérez, 2007). Hernández (2009) also shows that, after the signature of NAFTA, regional specialisation of the industrial sector in the northern states has substantially increased. This author identifies scale economies and the intensity in the use of national intermediate inputs as the key determinants of industrial location in Mexico from 1981 to 2004, and indicates that the relationship between the use of national intermediate inputs and industrial location has shifted from positive to negative as a result of increasing openness.

Finally, a large number of β- and σ-convergence analyses were carried out in the late 1990s (Juan-Ramón and Rivera-Batiz 1996; Esquivel, 1999; Sánchez-Reaza and Rodríguez-Pose, 2002; Chiquiar, 2005; Rodríguez-Oreggia, 2005; Carrion-i-Silvestre and German-Soto, 2007; Ruiz, 2010). This literature has mostly been limited to the most recent decades and to the analysis of disparities in pc GDP and, as pointed out by Rodríguez-Pose and Villarreal (2015), has not gone beyond the discussion of regional convergence versus divergence. Broadly speaking, this literature describes the ISI period (from the 1940s to the 1980s) as characterized by strong regional convergence, which was replaced by regional divergence after the trade reform of the 1980s. In the recent divergence, southern regions have fallen behind, whereas the northern border states and Mexico City have grown more than the national average (Rodríguez-Oreggia, 2005). Among the main explanatory factors for regional divergence, this literature mentions the location of FDI and economies of agglomeration (Jordaan and Rodríguez-Oreggia, 2012), factor endowments, such as human and physical capital (Sánchez-Reaza and Rodríguez-Pose, 2002; Rodríguez-Oreggia, 2005; Chiquiar, 2005), and distance from the US border (Aguayo-Tellez, 2006). By contrast, Mallick and Carayannis (1994) show that, against expectations, pre-1980s convergence was not associated to manufacturing activity and its determinants but to the location of services (tourism and transport).

In a very recent paper, Rodríguez-Pose and Villarreal (2015) have studied some of the possible factors explaining regional growth in Mexico from 2000 to 2010, paying special attention to innovation policies (R&D). These authors stress the influence on regional growth of direct investment in research and development, socio-economic conditions that boost innovation, and different indicators of spillovers. Thus, those states with a higher presence of R&D investment, with socio-economic conditions that enhance innovation, or with higher knowledge endowment have done relatively better. The authors point out that both a better geographical distribution of innovation efforts and an increase of the GDP share allocated to R&D would be conducive to higher growth and regional convergence in the country.

1.5 Thesis structure

1.5.1 Chapter 2. The GDP per capita of the Mexican regions (1895-1930): New estimates

Despite the crucial transformations experienced in the late 19th century by the Mexican economy, such as domestic market integration and the start of modern economic growth, no regional GDP estimate were available for this period so far, with the exception of Appendini's one for 1900. This absence was an obstacle for the systematic study of regional income disparities in Mexico over the long term. Chapter 2 aims to fill this gap by providing new estimates of Mexican regional GDPs *per capita* for the benchmark years 1895, 1900, 1919, 1921 and 1930. This allows making the first steps towards an adequate understanding of Mexican regional inequality in the long term.

The methodology applied to estimate the new GDPs *per capita* is based on a modification of the method first proposed by Geary and Stark (2002). Broadly speaking, national GDP figures for each sector are distributed among the regions under the assumption of perfect factor mobility and domestic market integration. For those sector for which data were available, I based the distribution of national GDP on direct indicators of regional production. In those cases for which direct information was unavailable, I applied the Geary and Stark's (2002) methodology. This uses data on relative wages and labour force by sector, and assumes that each region's productivity in each sector is reflected in that sector wage, expressed as a ratio of the national sectoral wage. Thus, a region's sectoral output is sector labour force multiplied by sector labour productivity. This methodology has been applied before to several Western Europe countries and also to some middle and low-income economies (including Latin American ones).

Map 1.1
Mexican administrative division

Source: Own elaboration, using QGIS. The map was taken from: www.divas-gis.org

GDP *per capita* and labour productivity (GDP *per worker*) are used as indicators of regional income, not only in this chapter but also along the entire thesis. The regional units of study are the states, which correspond to the NUTS 2 according the European regional classification (see Map 1.1). At present, Mexico has 31 states and 1 Federal District (Mexico City). This territorial division was slightly different during the early years of the period analysed in this thesis, and these differences are addressed in detail in the chapter. The database presented in Chapter 2 is the basis for the analyses carried out in the following chapters of the dissertation.

1.5.2 Chapter 3. Regional income distribution in Mexico: new long-term evidence, 1895-2010

In Chapter 3, I use the regional GDP *per capita* database presented in Chapter 2 to analyse the long run evolution of Mexican regional income disparities. This is the first systematic analysis of Mexican regional inequality that takes into account the whole period since the First Globalization to the present.

In this chapter I provide indicators of several dimensions of the evolution of regional inequality, in order to complement the highly simplified evidence provided by β-convergence and σ-convergence analyses. To start with, I present a few conventional indicators of regional inequality, such as the Coefficient of Variation (CV), the Gini coefficient, the Theil index, the Williamson index and finally the Herfindahl-Hirschman index of concentration. Secondly, I estimate Kernel distributions in order to provide the shape and modality of spatial distribution in the long run. As the issue of rank mobility is not covered by the previous indicators, I also calculate the Spearman rank and the Kendall's τ-statistic. Finally, I estimate the Moran's I coefficient in order to measure the intensity of spatial autocorrelation among Mexican states.

The results are very illustrative. First of all, a long-standing north-south division has characterised the Mexican regional inequality. Secondly, regional income disparities have followed an N-shape trend over the long run, whose phases globally coincide with the different stages of Mexican economic growth. During the agro-export led-growth period (1895-1930), Mexico experienced a strong phase of regional divergence. This was replaced by substantial convergence during the ISI period. Finally, a new period of regional divergence started in the 1980s, coinciding with the beginning of trade reforms.

Beyond its fluctuations, Mexican regional inequality has always been relatively high, compared with other countries. Moreover, rank mobility across states has been very low. This means that the poor regions have been always poor, and the same applies to the rich ones. Such persistence is also confirmed by the Moran's I statistic of spatial correlation. The results show one persistent statistically significant income cluster of poor southern states over the entire period. By contrast, there has not been a persistent cluster for rich regions (not even for the northern states). This also suggests that Mexico City's high level of development has not benefitted its neighbouring states, indicating a strong capital effect that persists over the long run.

1.5.3 Chapter 4. Explaining regional inequality from the periphery: the Mexican case, 1900-2000

This chapter aims at providing new evidence on the determinants of regional income disparities in Mexico over the long term (1900–2000). To this purpose, I estimate a new labour productivity database for the Mexican states at the sectoral level. This database has been constructed by using the regional GDPs estimated in Chapter 2, and new labour force figures based on the data provided in the Population Censuses (various years). The main forces driving regional inequality trends are identified through a convergence decomposition analysis, firstly proposed by Caselli and Tenreyro (2004). Broadly speaking, this analysis decomposes convergence into three components: within-sector, labour reallocation, and between-sector. “Within–sector” captures the labour productivity convergence of each sector with the corresponding one in benchmark region, and is a component that is usually associated to neoclassical forces. The “labour reallocation” component measures the share of convergence due to inter-sectoral workforce movements. It is worth noticing that labour reallocation contributes to convergence if and only if region *i* transfers a larger share of its labour force than the benchmark region towards high-productivity sectors. If there are within-industry labour productivity gaps, this effect may be diminished. In this sense, if sector *j* in the benchmark region is much more productive than in region *i*, labour reallocation may lead to divergence even if the benchmark region is moving fewer workers towards this sector. Last but not least, the “between-sector” component measures the contribution to convergence of inter-sectoral labour productivity convergence. Then, if labour productivity of sector *j*, in which region *i* had a disproportionate share of the labour force, converges to the overall productivity of the benchmark region, between-sector convergence will take place. The last two components are generally related to structural change forces.

Our results indicate that the forces driving regional inequality have been different in each historical period. During the primary-export-led growth period (1900-1930), divergence was associated with a spatially uneven process of structural change, and especially with the differential impact of labour-reallocation. Later on, during the State-led industrialisation period (1930-1980), both the within-sector and between-sector components (largely linked to intense domestic migration) contributed to regional labour productivity convergence. Lastly, from the mid-1980s onwards, regional divergence was mainly the result of neoclassical forces (the within-sector component).

To sum up, the evidence provided in this research for the Mexican case supports the idea that no theoretical prediction can be taken as a general law to explain the long-term evolution of regional disparities. Indeed, history and institutions are absolutely essential to explain regional inequality trends. This stresses the importance of providing historical information on additional country experiences, as a way to enrich the crucial debate of the dynamics of regional inequality in developing countries.

Chapter 2

The GDP per capita of the Mexican regions (1895-1930): New estimates[12]

[12] This chapter has been published in *Revista de Historia Económica – Journal of Iberian and Latin American Economic History* (Aguilar-Retureta, 2015). I wish to thank the participants at the "First meeting of regional GDPs reconstruction in Latin America, 1890-2010", held at the Universidad de la República (Montevideo), as well as the participants at the "4th Southern Hemisphere Economic History Summer School", the "PhD students' Seminar" at the University of Barcelona, and the "Seminario Permanente de Historia e Instituciones Económicas" at the Colegio de México. I am very grateful to Graciela Márquez for her attention and multiple comments on this work during my research stay at the Colegio de Mexico. Finally, I would like to thank Sandra Kuntz and Carlos Marichal for their useful suggestions.

Abstract

So far, apart from Appendini (1972) for 1900, there were no Mexican regional GDP estimates for the period before 1930. The aim of this chapter is to fill this gap by presenting new Mexican regional GDP pc estimates for several benchmark years between 1895 and 1930. The chapter presents the methodology and sources used to estimate the new series, compares them with the previous estimates, and offers a first long-term picture of Mexican regional pc GDPs (1895-2010).

2.1 Introduction

One of the most persistent characteristics of Latin America Economic History is the long-standing regional inequality within countries. As has been indicated in the Introduction of this thesis, the Mexican case is not an exception, since the country has been characterized by high regional inequality at least since the take-off of modern economic growth during the *Porfiriato*. However, although regional disparities have been well studied for recent years, there is very few evidence about the evolution of aggregate regional inequality in the very long term, in spite of the increasing amount of studies about the Mexican economic performance during the period in which the national market was integrated and modern economic growth emerged (1876-1930). In most cases, investigations for this period with a regional scope are either descriptions of particular industries in particular regions, or studies of a specific economic sector across the country. This could respond, to some extent, to the lack of some of the most common indicators of regional economic activity, such as regional GDPs, an absence that has limited our understanding about the reasons for the persistent regional inequality in the country.

This chapter seeks to fill this gap by providing a new estimation of the Mexican regional GDPs *per capita* for the benchmark years 1895, 1900, 1910, 1921 and 1930. For this purpose, I have disaggregated the national GDP across the Mexican states by adopting, depending on source availability, two different strategies. First, I have given priority to regional direct production sources and, second, in those cases for which production data was unavailable, I have applied the Geary and Stark (2002) methodology. Thus, this new database aims to set up the basis for this dissertation and further investigations, seeking to include the Mexican case into the international literature on the patterns and causes of regional inequality in the very long run.[13]

This is a period of great interest since it was during the ago-export era (1870-1929) when the Mexican economy, as other Latin American countries, took the first steps towards modern economic growth. The primary export activity, led by the mining and agro-exporter sectors, was the main force behind the relatively good economic performance experienced in those years (Kuntz, 2014). In fact, as

[13] See the introductory chapter for a review of this literature.

mentioned in the previous chapter, the first industrialisation wave that took place in the late years of this period is commonly recognised as an endogenous outcome driven by export-led growth (Haber, 2010). Several institutional changes (such as the elimination of domestic trade taxes), together with railroad expansion, encouraged domestic market integration (Dobado and Marrero, 2005). This, in turn, intensified regional economic specialization, which explain to a large extent the performance of the different regional economies over the entire period. The new series show that, with the exception of Mexico City, the states with better economic performance were those which had a greater participation in the export activity. Thus, the regional GDP *per capita* estimates presented in this chapter might contribute to a better understanding of both regional and national economic evolution during this historical period.

The structure of this chapter is as follows. The next section presents in detail the methodology and sources used to estimate the new regional pc GDPs. Section 2.3 presents the new estimates, and a comparison with the previously available figures for 1900 (Appendini, 1978), and 1930 (Ruiz, 2007). Finally, Section 2.4 concludes. The Mexican states, which are the reference unit of the estimation, are shown in Map 1.1.

2.2 Methodology and sources

The *Instituto Nacional de Estadística y Geografía (INEGI)*, the Mexican official national institute of statistics, does not have any estimates of the states' GDP for the years before 1970 (INEGI 1985). For previous years, scholars have commonly used the estimations made by Kirsten A. Appendini (1978), either to use them directly or as a basis for new estimations (Esquivel, 1999; Germán-Soto, 2005; Ruiz, 2006, 2007, 2010). Appendini estimated regional GDPs for 1900, 1940, 1950 and 1960 using a homogenous methodology (see Unikel et al., 1978).[14] The method used by Appendini (1978) consists of disaggregating the national output of each

[14] The regional GDP presented in Appendini (1978), for 1900 and 1960 had been previously published in Appendini et al., (1972). Moreover, the methodology applied in Appendini (1978) for the years 1940 and 1950 is the same that had been previously applied in Appendini et al. (1972) for 1900 and 1960.

sector across states according to the relative participation of each state in certain output indicators, measured at the state level.

More recently, Ruiz (2007) has offered an alternative estimation of regional pc GDPs at the state level for the years 1930, 1940, 1950, 1960 and 1965. This author uses the series provided by Appendini (1978) as a basis for all his estimates, and applies a very similar estimation methodology (see Ruiz, 2006).[15]

As mentioned before, this chapter aims to estimate regional GDP per capita figures from 1895 to 1930.[16] As in previous studies, I disaggregate, for each sector, the national GDP across states on the basis of several indicators. This implies that, for each sector, the sum of all states' GDPs is equal to the national GDP. As mentioned before, priority is given to direct production sources. Only in those sectors for which there is no direct information, such as industry for the early years and most services for all the period, I apply the indirect methodology developed by Geary and Stark (2002).

Geary and Stark's methodology is an indirect estimation technique to distribute national GDP figures among regions, under the assumption of perfect factor mobility and well integrated national markets. This method uses information on relative wages and sectoral shares of employment. The authors assume that each region's sectoral productivity is reflected in its sectoral wage, relative to the national sectoral wage. Thus, region's sectoral output is sector labour force multiplied by sector labour productivity. GDP in each region is the sum of its sector outputs (Geary and Stark, 2002: 921).

This methodology has been used in many recent works with a historical scope (Crafts, 2005; Felice, 2009; Henning, et al., 2011; Rosés, et al., 2010; Martínez-Galarraga, 2012; Badia-Miró et al., 2012).[17] Following Geary and Stark (2002: 933), regional GDP is defined as:

[15] This author has recently published new estimates of the industrial GDP sector at the state level from 1930 to 1965 (Ruiz, 2014).

[16] In 1893 the *Dirección General de Estadística* published, for the first time, the "Anuario Estadístico de la República" (Mexican Statistical Yearbook), which involved a substantial quality improvement in national statistics. Moreover, the first national Population Census ("Censo Nacional de Población") was published, also by the *Dirección General de Estadística*, in 1895. In Sandra Kuntz's words: *"…[by 1890] not only a wider statistic information is available, but it was also published regularly and under a more uniform criteria*" (Kuntz, 2002: 227, my translation). By contrast, the available information for previous years is much scarcer and makes much more difficult to estimate regional GDPs figures.

[17] Among these, it is important to highlight Crafts' (2005) research, which modified the original method by using tax data to allocate non-wage income across regions. Rosés et al. (2010) also did a

$$Y = \sum^{i} Yi \qquad [2.1]$$

where, Y_i is the state GDP, defined as:

$$Yi = \sum^{j} y_{ij}\ L_{ij} \qquad [2.2]$$

y_{ij} and L_{ij} being, respectively, the output per worker and the number of workers in state i and sector j. As we have no data for y_{ij} this value is proxied by the product of the national sectoral output per worker (y_j) times the ratio between the state's sectoral wage and the Mexican average wage for this sector (W_{ij}/W_j), under the assumption that each state's labour productivity in each sector is proportional to that state's sectoral wage. Thus, regional GDP is given by:

$$Yi = \sum^{j} \left[y_j\ \beta_j\ \left(\frac{W_{ij}}{W_j} \right) \right] L_{ij} \qquad [2.3]$$

where y_j is the national output per worker of sector j and $ß_j$ is defined as a scalar which preserves the relative state differences but scales the absolute levels so that the state totals for each sector add up to the known national total:

$$\beta_j = \frac{Y_j}{\sum^{i} \left[y_i\ \left(\frac{W_{ij}}{W_j} \right) \right] L_{ij}} \qquad [2.4]$$

There is a potential problem to apply this method to the Mexican case, which is associated to the Mexican labour market structure at the time. According to Kuntz:

> "[during the Porfiriato] *although both population and the monetized sector of the economy increased, thousands of people still remained in*

modification to the original method. Those modifications prove the flexibility of this methodology, which facilitates its adaptation to each economy's specific characteristics and source availability.

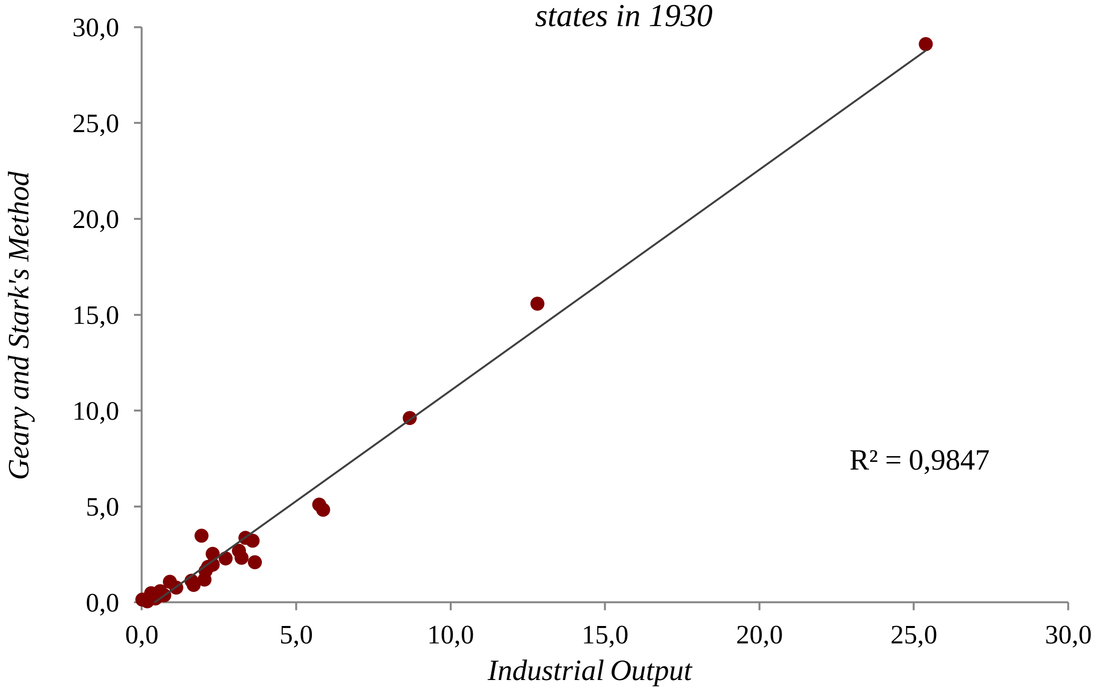
> *their rural communities or haciendas as indentured labourers, and rarely participating in the market. [...] In the South, masses of workers were incorporated into coffee and henequen plantations under labour relations that combined some degree of extra-economic coercion with low wage pay. However, it is not possible to estimate the number of workers involved"* (Kuntz, 2010: 327, my translation).

This situation could distort the results due to the underestimation of labour productivity, which might introduce biases in the distribution of national GDP among regions. However, this problem seems to affect mostly the primary sector, which is precisely the sector for which direct output information is more abundant and, therefore, where I do not need to apply the Geary and Stark methodology. In the case of the secondary and tertiary sectors there is abundant evidence of labour market mobility across regions and sectors, responding to economic incentives such as higher relative wages (Kuntz and Speckman, 2011: 517). For instance, Aurora Gómez-Galvarriato has found, in the case of the textile industry (the most developed one during the Porfiriato), that*: "... In 1893-1896 there existed a strong relationship between these two variables [labour productivity and wages]. (...)"* (Gómez-Galvarriato, 2002: 299). In other words, I only apply the Geary and Stark methodology to the industrial and some of the service sectors, which may be assumed to be less seriously affected by labour market rigidities. To prove the robustness of applying this methodology in the estimation, Figures 2.1(a) and 2.1(b) show the correlation between the states' shares in the 1930 manufacturing output that result from applying both the direct production and the Geary and Stark's methodologies.[18] As can be seen, the correlation between both values is fairly high, suggesting that the use of this methodology for previous years may provide likely

[18] 1930 is the first year in which I can perform this exercise, because is the date of the first complete Industrial Census (the previous Industrial Census of 1902 had many information gaps). The figure is based on population data taken from the fifth Census of Population (1930), and industrial wages and output at the state level from the 1930 Industrial Census. The shares for each state are presented in Table A-2.1. of the Appendix (A-2).

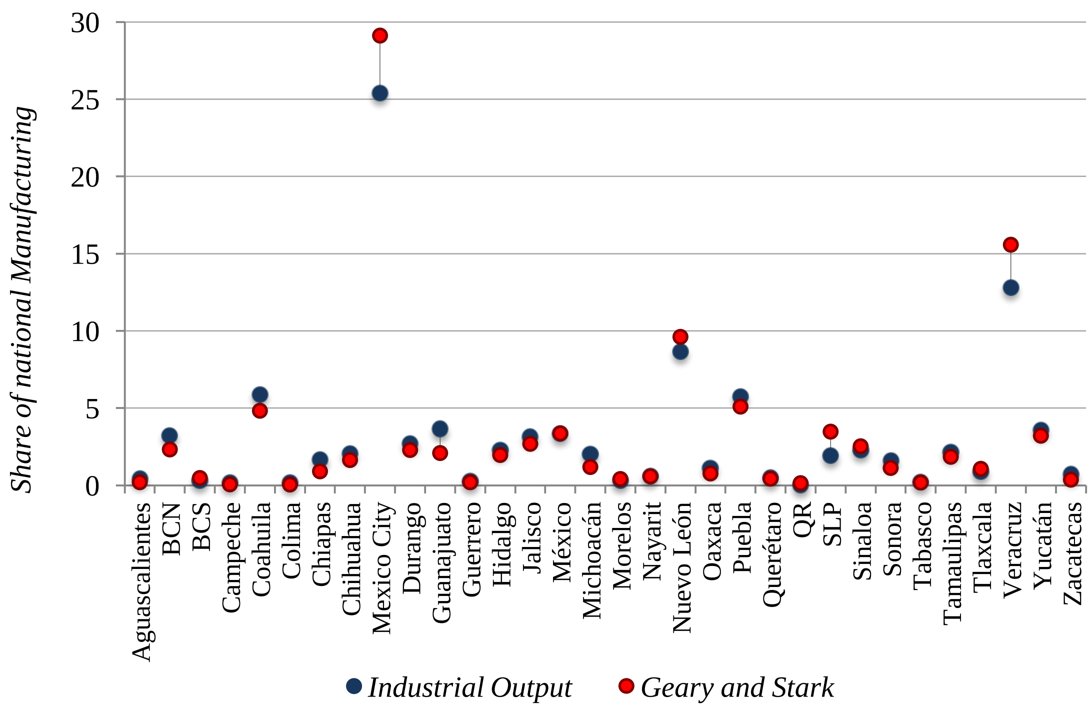
results.

Figure 2.1(a) Distribution of the Mexican manufacturing GDP by states in 1930



Source: See text.

Figure 2.1(b) Distribution of the Mexican manufacturing GDP by states in 1930



Source: See text.

Another estimation problem is related with the changes in the Mexican administrative division. During the period under study (1895–1930), the current State of Quintana Roo (which was only established as an autonomous State in 1974) changed its status several times, being considered either as a Federal territory or as a part of the Yucatán State. To allow comparability of the estimates over time, I had therefore to include Quintana Roo within the State of Yucatán for the entire period, even in those cases in which data is available for Quintana Roo as an independent State. Furthermore, during this period, the Baja California peninsula (nowadays divided into two autonomous States: Baja California North and Baja California South) was a single Federal territory. Therefore, I consider, for the period 1895-1930, the peninsula of Baja California as a single unit of analysis.

There are two main series of Mexican aggregate GDP for the period under consideration, which were estimated by Enrique Pérez (1960) and Mario Gutiérrez Requenes (1969) and cover the years 1895-1959 and 1895-1967 respectively. Both estimations have been repeatedly used in other works, and the National Institute of Geography and Statistic (INEGI) has reproduced Pérez's estimation in the "Estadísticas Históricas de México" (2009). These, in turn, have been used by Angus Maddison (1992), and Barro and Ursúa (2008) in their databases. On the other hand, Leopoldo Solís used Gutiérrez Requenes' series in his work "La realidad económica mexicana: retrovisión y perspectivas", which has been widely used by Mexican and international scholars (Solís, 1970), and the Bank of Mexico has also included this series in its database.

As in the case of Appendini et al. (1972), I use Gutiérrez Requenes' (1969) national GDP series for my estimates, for two main reasons. First, Gutiérrez Requenes (unlike Pérez), was explicit on both the methodology that he applied, and the sources he used for his aggregate GDP estimation. Secondly, Gutiérrez Requenes' (1969) GDP is disaggregated into thirteen sectors (agriculture, livestock, forestry, fishing, mining, oil, manufacturing, construction, electric energy, transport, government, commerce, and others), while Enrique Pérez's GDP is only disaggregated in seven subsectors (agriculture, livestock, mining, oil, manufacturing, transport, and other activities). Both reasons are important for this research since, whereas knowing the data and the method used by Gutiérrez Requenes to reconstruct the national GDP allows a more consistent estimation of regional figures, its higher disaggregation also allows a more precise distribution of national output.

Nevertheless, it is important to stress that both series present very similar trends and fluctuations over the period analysed.

As mentioned before, I distribute the different sectors of Gutiérrez Requenes' national GDP database among states following different procedures.[19] Firstly, I distributed the sectoral production directly, on the basis of output indicators, in the cases of the Primary sector (which includes Agriculture, Livestock, Forestry and Fishing), Mining, Oil and Commerce. By contrast, the Secondary sector (i.e. Manufacturing –with the exception of 1930-, Construction, and Electric Energy) and Services, with the exception of Commerce (i.e. Transport, Government, and Others), are obtained by using the Geary and Stark (2002) method.[20]

For those sectors in which the estimates are based on production values, in each case I use, depending on the availability of data, information in current or in constant prices. Thus, while in Agriculture and Livestock I use data in current prices for the entire period, in Mining and Forestry (with the exception of 1930) information is available in constant prices (gold *pesos*). The estimates of the Commerce sector are also constructed using data in constant prices (with the exceptions of 1921 and 1930). When current prices are used, inflation differentials across states could affect the relative participation of each state in the indicator of dispersion. Unfortunately, there is no index prices at the state level for the entire period that allows correcting this issue. This potential distortion is not present when the estimates are based on data in constant (national) prices, or in the Oil sector, in which I use units of production (barrels produced). Finally, it is also absent from those sectors in which the estimates are based on the Geary and Stark's methodology (i.e., the Secondary sector, with the exception of Manufacturing in 1930, and the Services sector, with the exception of Commerce), although this is dependent on the assumption that differences in wage levels across states reflect productivity differentials. Therefore, it is fairly unlikely that inflation differentials across states change the global estimate's results.

In the next lines I describe, in detail, the methodology and sources used for each year and each economic sector.

[19] The national GDP series provided by Gutiérrez Requenes (1969) is expressed in 1950 pesos. Unfortunately it is not clear whether this series was constructed with a structure of prices based on one benchmark year for the different sectors, or whether the structure of prices used was changing throughout the period.

[20] Table A-2.2 of the Appendix presents a summary of the methods used in each benchmark year and each economic sector.

2.2.1 *Primary sector*

2.2.1.1 *Agriculture*

Agriculture is the sector for which quantitative information is more abundant during the period of analysis. For the years 1895, 1900, and 1910, the distribution of the national agriculture output among states is based on the production of twelve products: corn, bean, barley, wheat, sugar cane, cotton, henequen, coffee, tobacco, chickpea, vanilla, and rubber.[21] This sample includes those crops that were relatively important not only at the national level, but also at the state level. Thus, for instance, although the henequen production only accounted for a low share of the national production, it was extremely concentrated in one state (Yucatán). According to the *Estadísticas Económicas del Porfiriato: Fuerza de trabajo y actividad económica por sectores (1964)*, these products added up to 81.5%, 80.8%, and 79.9% of the total agricultural production in 1895, 1900, and 1910 respectively. The volume of production is taken from the Mexican Statistical Yearbooks published in those years, and prices come from the *Estadísticas Económicas del Porfiriato* (at current prices). Corn, wheat and bean's prices are available at state level. For the rest, prices are at the national level.

For 1930, the national agricultural output is distributed according to the states' total agriculture production value, taken from the First Census of Agriculture and Livestock of that year. Finally, in the case of 1920 the quantity and quality of the available official statistical data is much worse, due to the Civil War's impact on the public institutions during the 1910s and 1920s. Therefore, there are no available data at the state level for most crops, and only some scattered information on some products such as corn, wheat and bean. For this reason, the agriculture values of 1921 are obtained by doing a lineal interpolation of the share corresponding to each state in 1910 and 1930.

I had to introduce some corrections on the raw data. In a few cases, state-level prices of certain crops (such as corn, wheat or bean) were extremely high, distorting the general estimation. In those cases, I took the average prices of the Regional Division to which the state belonged.[22] Thus, in 1895 and 1900, I replaced the price of corn, wheat and bean in Chiapas and Oaxaca by the average prices of the South

[21] The 1910 estimates are based on state data for 1907, which is the last year of publication of the Mexican Statistical Yearbooks before 1910.
[22] I use the Regional Division proposed in the *Estadísticas Económicas del Porfiriato…* (1964).

Pacific region, and, also in 1895, I replaced the price of corn in Veracruz by the average price of the Gulf of Mexico region. For 1910 I had to perform the same correction for the prices of corn in Sonora and Campeche, the price of wheat in Guerrero and Sonora, and the price of bean in Chiapas. Due to the absence of prices for Quintana Roo for 1910, I apply the same as in Yucatan. Finally, I have also replaced the production data of coffee, vanilla, and tobacco in Oaxaca for 1895 (which was unlikely high) by the average of the 1894 and 1896 figures, except in the case of vanilla, in which I take the 1898 figure, due to the absence of information for the previous years. The final estimates of state agricultural output can be seen in Table A-2.3 of the Appendix (A-2).

Some particular states experienced a high variability in agricultural production during the period under study. This was largely related with large changes in their production structure during the first globalisation. For instance, in Baja California the increase in cotton production provoked an upswing in the state's participation in the national agriculture output from 1910 to 1921 and 1930. Yucatán's share within the national agricultural output also varied widely, due to the fluctuations of henequen production, which was largely concentrated in this state.

2.2.1.2 *Livestock*

The only source that provides a complete livestock production database at the state level during the Porfiriato (1876-1910) is the 1902 Livestock Census, which is reproduced in the *Estadísticas Económicas del Porfiriato…*, and is the main source for my estimates for 1895, 1900 and 1910.[23] In other words, and due to the scarcity of information for the years 1895-1910, I had to assume that the distribution of livestock production across states remained constant throughout the period. I only could take into account price differences among states, at least for some products. In my estimation I consider the production of cattle, pork and milk. Cattle and pork production is taken in kilograms (weighted in carcasses), and milk production is taken in litres. According to the *Estadísticas Económicas del Porfiriato…* these products represented 89.49%, 85.67% and 84.83% in 1897, 1902 and 1907, respectively, of the total livestock production. Cattle and pork current prices are available at the state level, but milk prices are only available at the national one.

[23] The Statistical Yearbook does not give information on this sector at the regional level.

The sources for 1921 and 1930 are the Statistical Yearbook of 1923-1924 and the First Census of Agriculture and Livestock (1930). For 1921 I take the total value of cattle, pork and goat (in current *pesos*) in 1924 to distribute the national livestock GDP across states.[24] In the case of 1930 I also consider poultry value. According to the mentioned sources, these products amounted to 79.5% and 83.3% of total production in 1921 and 1930 respectively. Table A-2.4 presents the new estimates of livestock production at the state level for all benchmark years.

2.2.1.3 *Forestry and Fishing*

Information on forestry is also available in the Statistical Yearbooks for the years 1895 to 1910. For 1895 I can only take tanning bark –in kilograms- as a *proxy* of the production for this sector, and for 1900 and 1910 I consider the production value (in gold *pesos*) of mahogany, cedar, mesquite, pine and oak. These products sum up to 74% and 73% of total forestry production in 1900 and 1907, respectively (*Estadísticas Económicas del Porfiriato…*). As in agriculture, no information is available for Forestry around 1920, and I assume the regional distribution of forestry production to be the same in 1921 and in 1930. The source for the 1930 estimation is the First Census of Agriculture and Livestock (1930), which provides the Total Value of Forestry Production (in current *pesos*) for each state.

Fishing output at the national level is only available from 1921 onwards. This should not be a serious problem, since the share of this sector in the aggregate GDP is very low (0.04% in 1921 and 0.09% in 1930). As no statistical data is available for this sector at the regional level, I have distributed the fishing production of 1921 and 1930 among the coastal states, weighted according to each state's population. Table A-2.5 presents the estimates for both Forestry and Fishing.

2.2.2 *Mining and Oil*

2.2.2.1 *Mining*

I have distributed the Mining GDP among states on the basis of information on the output distribution of both 'mines in operation' and 'metal production' (excluding the iron and steel industry).[25] The source for 1895, 1900 and 1910 is the

[24] Information before 1924 is too scarce to be used as basis for the estimation.

[25] 'Mines in operation' production is the first step of the mining productive chain, and 'Metal production' correspond to any subsequent treatment received by metals. I add "Mines in operation"

Statistical Yearbook series, which gives production data ("Metal Production Total Value" and "Mines Production Value") at the state level in gold *pesos.*[26] The estimation of 1921 involves two steps.

First, the share corresponding to 'mines in operation' production is taken from the Mining Statistical Year Book of 1923 (*Anuario de Estadística Minera, 1923*). In this case, I sum the 'Production Value' in current *pesos* of gold, silver, lead and copper. These products account for around 85% of the total production of 'mines in operation' in 1923. Second, for the 'metal production', I carry out a lineal interpolation of the shares of the years 1910 and 1930.[27] For the 1930 estimation I use the First and Second Industrial Censuses, carried out in 1930 and 1935 respectively. Information on the output of the 'mines in operation' is obtained from the 1930 Census, and data on 'metal production' comes from the 1935 Census (I use the 'Total Value of production' in current *pesos*).[28] Table A-2.6 presents the estimation results.

In some cases, the state shares within the national mining output undertook wide fluctuations that can be easily explained. For instance, the high share of Chihuahua in 1930 is explained by the huge production of silver and lead around that year. That share was not exceptional since, in 1927, Chihuahua produced 32% of the national mining production. On the other hand, the downtrend in Guanajuato in the 1920s and 1930s is explained by the deep mining crisis that took place in that state in those decades. Finally, the fluctuations in the Aguascalientes' share can be explained by the arrival of the Guggenheim company at the end of the 19th century, which established one of the most modern mining plants in America at a time when capital was fairly unevenly distributed across the Mexican states.

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and "Metal production" on the basis of the indications of a working paper from the Bank of Mexico (1962) -where Gutiérrez Requenes developed his estimation-, and the Mining data presented in the First Industrial Census of 1930.

[26] For data availability reasons, I use information on 1898, 1899 and 1907 for 1895, 1900 and 1910. The only exception is Chihuahua in 1900, for which I use the 1900 figure due to the unlikely high level of the 1899 data.

[27] I assume that the ratio between the output of the 'mines in operation' and 'metal production' subsectors was the average of the ratios of 1910 and 1930.

[28] I have used the Requenes (1969) national index prices in order to account for the effect of inflation. Thus, 1930 and 1935 values are converted to 1930 *pesos*. The reason why I account for the effect of inflation is because the output of "mines in operation" in 1930 and the output of "metal production" in 1935, are given in current prices (1930's and 1935's prices respectively). Therefore, if the inflation effect is not considered, the "metal production" output component in 1935 could be overestimated in 1930.

2.2.2.2 *Oil*

Oil production does not appear in national GDP until 1902 (with a very low participation in total production: 0.01%); therefore, I only consider this sector from 1910 onwards. Oil production at the state level, in barrel units, comes from Brown (1993), the Statistical Yearbook of 1923–1924 and the First Industrial Census (1930), for the years 1910, 1921, and 1930 respectively. Table A-2.7 shows the oil production share at the state level; as can be seen there, oil production in those years was mostly located in Veracruz.

2.2.3 *Secondary sector*

In the case of the secondary sector, I have applied the indirect Geary and Stark's (2002) method in order to distribute the national GDP across the states, with the only exceptions of Manufacturing and Electric Energy in 1930. As mentioned before, this methodology requires, in addition to the national sectoral output, two main variables: labour force and wages, by economic sector and at the national and regional levels.[29] In this regard, I could only consider male workforce data, due to the serious biases involved in the available industrial female labour figures.[30] This means, according to the Geary and Stark methodology, that I assume that the population share and the productivity of the female workforce in each state was the same (relative to the national average) as that of the male workforce.[31]

2.2.3.1 *Manufacturing*

For 1895, 1900 and 1910, manufacturing labour force data are obtained from the First, Second, and Third Mexican Population Censuses published by *Dirección*

[29] The methodological refinement proposed by Crafts (2005) to the Geary and Stark methodology (2002), in which capital income is considered in addition to wage income, cannot be tested in the Mexican case due to the absence of an industrial tax database at the state level in the entire period. However, Geary and Stark (2014) have proved that their 'untreated' methodology generates accurate estimates of regional GDP for the UK case. The authors also set some critiques to Crafts' method.

[30] This bias problem is illustrated in Graph A-2.1 and Graph A-2.2, in the Appendix (A-2). These Graphs present the share of both male and female workforce over total population at the state level. Graph A-2.2 shows the highly unlikely up and down leaps of the female workforce registered in each State from one census to the next one over the period under study. Moreover, the available evidence on female industrial workers is also implausible when is considered in absolute and relative terms. For instance, according to the First Mexican Population Census, in 1895 the women employed in the industrial sector in the State of Chiapas was twice as high as in Mexico City (the specific numbers are 28,830, i.e. 17.43% of Chiapas' total female population vs. 14,976, i.e. 5.96% of Mexico City's total female population), a situation that is not consistent at all with the Mexican historiography. This, in turn, reflects the lack of homogeneity over time and across states in the census' definition criteria.

[31] The same reasoning could be applied to the child labour.

General de Estadística, and wages come from *Estadísticas Económicas del Porfiriato…* (1964). Actually, for these years wages are only available for the following macro-regions, which include several States: North, Gulf of Mexico, North Pacific, South Pacific, and Centre.[32] For the 1921 estimation, labour force comes from the Fifth Mexican Population Census and each State's relative wage is obtained as a weighted average of the relative wages of 1910 and 1930 (the latter are taken from the First Industrial Census, 1930).[33] Finally, the 1930 estimation is directly taken from the First Industrial Census (1930), which provides the total value of production and inputs. Table A-2.8 shows the estimates for this sector.

2.2.3.2 *Construction and Electricity*

Construction and Electricity sector estimates are obtained by applying the Geary and Stark methodology for all years, with the exception of the Electricity sector in 1930, in which I use production data coming from the First Industrial Census. The male workforce is taken from the Population Censuses of 1895, 1900, 1910, and 1940.[34] For 1921, I assume the same workforce structure across states as in 1910 (because the Population Census of 1920 does not provide disaggregated data of these sectors). On the other hand, I assume wages in the Construction and Electricity sectors to be the same as in Manufacturing. Table A-2.9 shows both estimations.

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[32] The macro-regions are composed as follows. North: Coahuila, Chihuahua, Durango, Nuevo León, San Luis Potosí, Tamaulipas and Zacatecas. Gulf of Mexico: Campeche, Quintana Roo, Tabasco, Veracruz and Yucatán. North Pacific: Baja California, Sinaloa, Sonora and Tepic. South Pacific: Colima, Chiapas, Guerrero and Oaxaca. Centre: Aguascalientes, Distrito Federal, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Morelos, Puebla, Querétaro and Tlaxcala. In the case of Nuevo León, I have always applied the wages of the highest-wage region, to account for the particular characteristics of that state's industry, which was one of the most modern in the country throughout the period (see, for instance: Haber, 1989; Cerutti, 1992; Marichal and Cerutti, 1997; and Kuntz, 2010).

[33] I give a two-thirds weight to the wages of 1910 and a one-third weight to the 1930's wages. This means that I assume that the structure of the manufacturing productivity in 1920 was more close to that of 1910 than to that of 1930. This is based on recent evidence suggesting that the impact of the Revolution on the industrial sector was not destructive. Instead, with the exception of a few years of the 1910 decade (from 1914 to 1917), the modern industrial sector experienced a relatively intense and sustained growth between 1910 to 1930. In fact, Haber (2010: 432) shows that during this period not only the number of total firms increased, but also the industrial installed capacity (approached by the machinery import) grew substantially.

[34] The Population Census of 1930 does not offer, at state level, the workforce of the Construction sector.

2.2.4 *Services: Government, Transport, Others*

Government, Transport and Others Services' regional GDP are also obtained by applying the Geary and Stark methodology. The male workforce for the three subsectors comes from the corresponding Population Censuses (1895, 1900, 1910, 1921 and 1930). In the case of Government, I add the population employed in 'Public Services' and 'Armed Forces' for the years 1895, 1900 and 1910, while for 1921 and 1930 I take the 'Public Administration' workers. Government wages at state level come from two sources: *Estadísticas Económicas del Porfiriato…* from 1895 to 1910 -for which I estimate a weighted average of 'Public Services' and 'Armed Forces' wages-, and the Statistical Yearbooks of 1930 for wages in 1921 and 1930 –in these years, I used wages in the 'Executive Power' sector.

For the Transport sector I use data on workforce in 'Communications and Transports', and the male workforce of Others services is the sum of 'Professionals' and 'Other Services' workers in 1895, 1900 and 1910, and the sum of 'Free Professions' and 'Non-Specific Occupations' workers in 1921 and 1930. As no wage data is available for these subsectors, I assume wages to be the same in all regions. This means assuming equal labour productivity in those sectors across all states. The estimation results for these three subsectors are presented in Table A-2.10.

2.2.4.1 *Commerce*

In the case of Commerce –the only service subsector for which I have a direct production indicator-, I carry out a direct estimation on the basis of data on 'Declared Sales' at the state level. This information comes from the Fiscal Statistics Bulletins (1895, 1900 and 1910), and the Bulletins of National Statistics (1921 and 1930). The 'Declared Sales' data is based on the stamp duty –which was a federal tax with the same specifications across all states. Due to the scarcity of information, I use the 'Declared Sales' of 1918 and 1924 to estimate the 1921 and 1930 figures respectively. The final results are shown in Table A-2.11.

2.3 The Mexican regional per capita GDPs, 1895-1930

2.3.1 *The new estimates: a global overview*

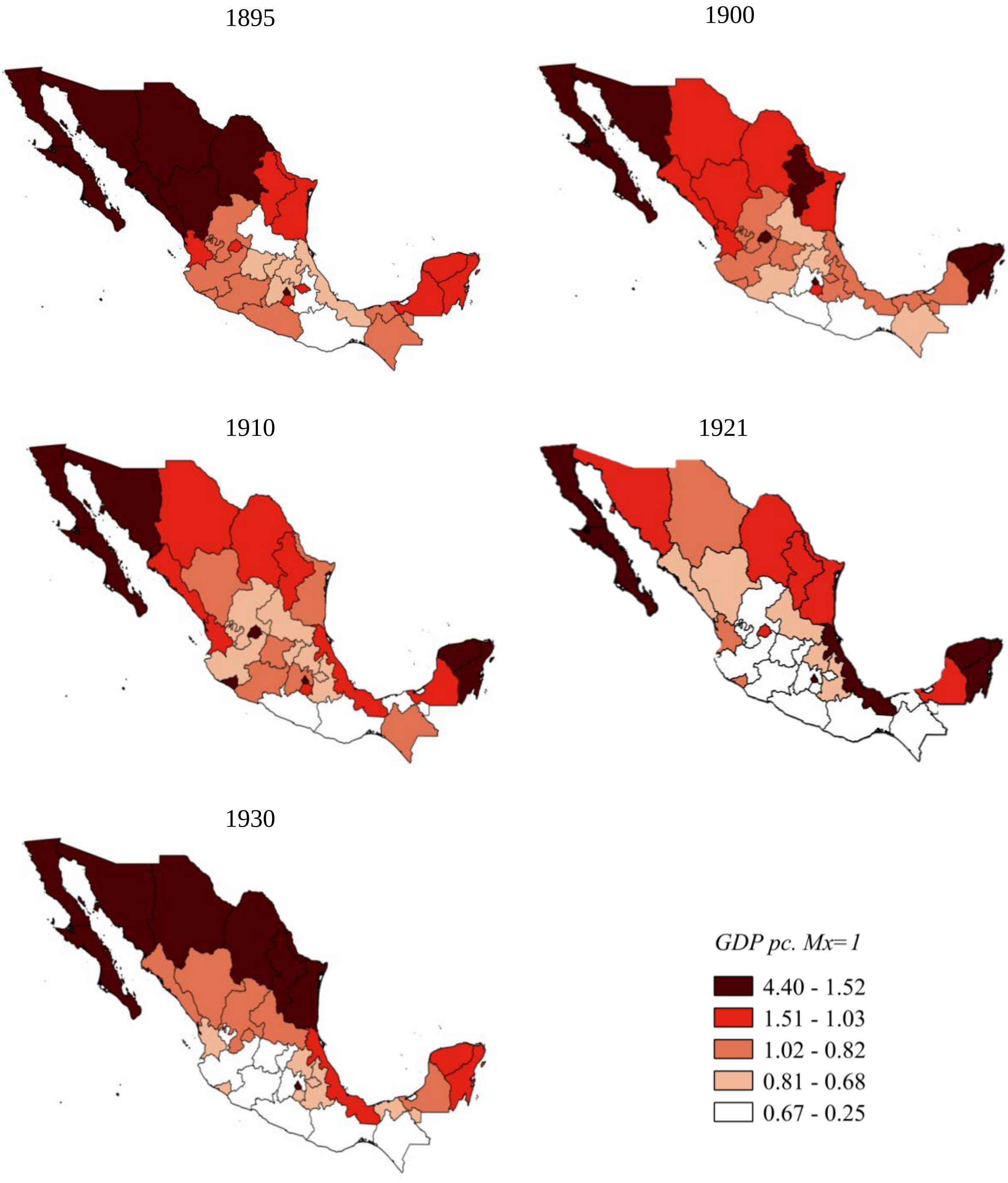
Map 2.1 shows the pc GDP estimates of the Mexican regions between 1895 and 1930. These results are fairly consistent with the economic history literature, and show that Mexican regional inequality was very high since the first stages of the process of national market integration. Regional disparities appear even clearer when the states are grouped in macro-regions, showing the long-term differences between the north and the south of the country (see Table 2.1).

In some regions, relative pc GDP experienced wide fluctuations over time. This is the case, for instance, of Aguascalientes, which started with a GDP per capita of 1.06 in 1895 –considering always the national average as the unit of reference-, increased up to 2.65 in 1900, and ended with a GDP per capita of 0.88 in 1930. Although such processes will be analysed and explained in detail in further research, the relative fast process of structural change in certain regions –such as the mining production areas-, and some external shocks (such as international demand fluctuations, or movements in the prices of some exportable agrarian and mining commodities) could largely explain those cases of high instability.

Moving to the sector level, Table 2.2 shows the spatial distribution of the Mexican manufacturing GDP from 1895 to 1960. The spatial distribution of this sector has often been identified as one of the most important explanatory factors of the evolution of Mexican regional inequality at least since the middle of the 20th century. The table shows that, while the centre region went through a process of de-industrialization throughout the period, the north and the capital regions became more industrialized. Moreover, the Coefficient of Variation (CV) suggests that manufacturing spatial dispersion started to increase at least since the 1910s.

This would partially contradict some recent research, in which the process of concentration of industry in Mexico City has been assumed to have started with the ISI policies. Nevertheless, my new estimates suggests that this process of manufacturing concentration began well before the import-substituting industrialization period (although it substantially accelerated after 1930).

Map 2.1 Regional GDP per capita in Mexico, 1895-1930 (Mexico=1)[35]



Source: See text.

[35] The intervals displayed in the legend are obtained as follows: the relative values estimated for all years are put together and ranked from the highest to the lowest ones in order to construct one single vector. Finally, this vector was divided into five groups with the same number of observations.

Table 2.1 Regional per capita GDP in Mexico, 1895-1930
(Mexico=1)

	1895	**1900**	**1910**	**1921**	**1930**
Mexico City	2.68	2.61	2.46	2.53	2.71
North	***1.94***	***1.71***	***1.53***	***1.45***	***2.21***
Baja California	3.63	3.11	2.28	2.62	4.4
Chihuahua	1.93	1.29	1.39	1.02	1.82
Coahuila	1.64	1.46	1.4	1.05	1.72
Nuevo León	1.25	1.6	1.28	1.28	1.66
Sonora	2.11	1.79	1.93	1.26	1.77
Tamaulipas	1.06	1.03	0.91	1.5	1.9
Pacific-North	***1.3***	***1.22***	***1.19***	***0.78***	***0.77***
Colima	1.02	0.91	1.52	0.89	0.8
Jalisco	0.95	0.98	0.71	0.61	0.55
Nayarit	1.38	1.51	1.42	0.84	0.78
Sinaloa	1.85	1.46	1.11	0.79	0.93
Centre-North	***1.13***	***1.25***	***1.23***	***0.83***	***0.89***
Aguascalientes	1.17	2.13	2.62	1.22	0.88
Durango	1.78	1.32	0.86	0.69	0.97
San Luis Potosí	0.65	0.68	0.71	0.73	0.84
Zacatecas	0.92	0.86	0.71	0.67	0.85
Gulf of Mexico	***1.04***	***1.14***	***1.31***	***1.55***	***1.03***
Campeche	1.41	0.98	1.11	1.21	0.88
Tabasco	0.91	0.83	0.62	0.46	0.68
Veracruz	0.71	0.97	1.03	2.66	1.26
Yucatán	1.11	1.77	2.47	1.85	1.3
Centre	***0.87***	***0.86***	***0.82***	***0.62***	***0.65***
State of Mexico	0.71	0.64	0.9	0.6	0.54
Guanajuato	0.78	0.82	0.83	0.57	0.62
Hidalgo	0.78	0.79	0.68	0.68	0.79
Puebla	0.66	0.87	0.73	0.68	0.7
Querétaro	0.78	0.76	0.76	0.66	0.51
Tlaxcala	1.13	0.84	0.79	0.61	0.68
Morelos	1.27	1.28	1.04	0.54	0.72
South	***0.75***	***0.6***	***0.7***	***0.42***	***0.4***
Chiapas	0.85	0.74	0.86	0.54	0.5
Guerrero	0.82	0.41	0.56	0.26	0.28
Michoacán	0.83	0.77	0.87	0.56	0.49
Oaxaca	0.48	0.46	0.51	0.32	0.31
Mexico (1950 pesos)	**513.2**	**606.29**	**768.45**	**786.4**	**938.81**
Yearly growth rate (%)		**3.33**	**2.37**	**0.21**	**1.97**

Source: See text.

2.3.2 *Comparison with previous estimates*

As mentioned before, there are no previous regional GDP figures available for Mexico for the years 1895, 1910, and 1921. So far, the estimates by Appendini (1972) and Ruiz (2007) are the only Mexican regional pc GDPs available for the years 1900 and 1930. Thus, I can only carry out a comparison of my estimates for those two years. Table 2.3 compares my figures for 1900 with Appendini's.

Table 2.2 Spatial distribution of Mexican manufacturing Gross Value Added (percentage)[36]

Region	1895	1900	1910	1921	1930	1940	1950	1960
Capital	17.5	15.9	17.1	23.2	28.8	40.2	37.4	49.4
North Gulf	4.2	3.9	5.3	8.2	10.8	9.6	9.6	9.7
North	3.0	5.1	5.6	5.2	8.0	7.9	12.3	6.0
North Pacific	7.0	6.6	7.9	7.5	8.0	4.9	6.4	5.5
Centre Gulf	5.0	5.7	7.0	9.0	13.0	4.4	7.5	5.5
Centre Pacific	21.1	21.0	15.5	12.5	5.3	5.5	6.1	7.3
Centre	28.0	26.0	22.6	19.9	13.4	12.3	9.3	8.7
Centre North	8.5	8.6	9.9	7.2	5.7	11.2	6.7	3.1
Peninsula	2.2	2.6	3.0	3.2	3.8	1.9	2.4	2.5
South Pacific	3.4	4.7	5.8	4.2	3.1	2.2	2.4	2.2
CV	***1.1***	***1.0***	***0.9***	***1.2***	***1.5***	***2.1***	***1.9***	***2.3***

Source: From 1895 to 1930: own estimates; from 1940 to 1960: Ruiz (2014).

Broadly speaking, the position and the values of each region are quite similar. Nevertheless, there are some remarkable differences in the cases of Baja California – in this case, the main difference is not the position but the GDP level-, Aguascalientes, Morelos, Jalisco, Tlaxcala, San Luis Potosí, and the State of Mexico. There are other less significant differences, such as the cases of Chihuahua, Sinaloa, Tamaulipas, Tlaxcala, and Guanajuato. In order to identify the reasons for the main differences, Table 2.4 compares Appendini's and my own estimates at the sectoral level.[37]

[36] The regions are composed by the following states. Capital: Estado de México, Mexico City; North Gulf: Nuevo León, Tamaulipas; North: Chihuahua, Coahuila; North Pacific: Baja California Norte, Baja California Sur, Sonora, Sinaloa, Nayarit; Centre Gulf: Veracruz, Tabasco; Centre Pacific: Jalisco, Michoacán, Colima; Centre: Guanajuato, Querétaro, Hidalgo, Tlaxcala, Puebla, Morelos; Centre North: Aguascalientes, Durango, Zacatecas, San Luis Potosí; Peninsula: Yucatán, Quintana Roo, Campeche; South Pacific: Guerrero, Oaxaca, Chiapas. The Coefficient of Variation (CV) has been obtained by considering the percentages at the state levels.

[37] I do not compare the shares of the primary sector because both estimations are based on fairly the same sources and methodology and, therefore, the resulting estimates are very similar.

Table 2.3 Comparison of 1900 regional GDP per capita.
(Mexico=1)

New estimates		**Appendini (1972)**	
Baja California	3.11	Mexico City	2.68
Mexico City	2.61	Baja California	2.62
Aguascalientes	2.13	Morelos	2.01
Sonora	1.79	Durango	1.98
Yucatán	1.77	Sonora	1.9
Nuevo León	1.60	Yucatán	1.88
Nayarit	1.51	Chihuahua	1.85
Sinaloa	1.46	Nuevo León	1.7
Coahuila	1.46	Coahuila	1.56
Durango	1.32	Aguascalientes	1.53
Chihuahua	1.29	Nayarit	1.44
Morelos	1.28	Sinaloa	1.18
Tamaulipas	1.03	Veracruz	1.14
Jalisco	0.98	Tlaxcala	1.06
Campeche	0.98	Colima	1.04
Veracruz	0.97	Zacatecas	1.01
Colima	0.91	Campeche	0.94
Puebla	0.87	Tamaulipas	0.92
Zacatecas	0.86	Puebla	0.87
Tlaxcala	0.84	Tabasco	0.84
Tabasco	0.83	San Luis Potosí	0.81
Guanajuato	0.82	Jalisco	0.79
Hidalgo	0.79	México	0.76
Michoacán	0.77	Hidalgo	0.68
Querétaro	0.76	Querétaro	0.65
Chiapas	0.74	Guanajuato	0.65
San Luis Potosí	0.68	Chiapas	0.64
México	0.64	Michoacán	0.61
Oaxaca	0.46	Guerrero	0.39
Guerrero	0.41	Oaxaca	0.33

Source: See text

Table 2.4 Percentage of sectoral GDP, 1900. Comparison between Appendini's estimation and my own figures

	Mining		**Manufacturing**		**Services**	
	New estimates	Appendini	New estimates	Appendini	New estimates	Appendini
Aguascalientes	7.2	0.62	1.4	0.73	0.83	0.72
Baja California	4.7	1.87	0.3	0.29	0.95	1.25
Campeche	0	0	0.7	0.22	0.85	1.00
Coahuila	4.1	5.96	3.7	2.50	3.36	3.47
Colima	0	0	0.3	0.24	0.52	0.62
Chiapas	0.1	0.22	0.8	0.29	1.50	1.28
Chihuahua	10	25.14	1.4	0.36	2.91	3.28
Mexico City	0	0	11	10.82	18.91	21.11
Durango	12.5	15.56	2	9.26	2.70	2.72
Guanajuato	4.2	3.74	9.9	2.67	5.37	4.47
Guerrero	0.5	0.39	0.7	0.50	1.16	1.06
Hidalgo	8.9	8.23	3.8	0.91	3.34	3.31
Jalisco	2.3	2.67	12.2	4.80	6.90	5.15
México	2.2	1.98	4.9	10.39	3.80	3.81
Michoacán	0.3	0.57	8.5	1.92	4.30	3.62
Morelos	0.2	0.16	0.7	3.57	1.47	1.90
Nayarit	0.7	0.74	1.4	0.96	1.02	1.00
Nuevo León	11.3	1.18	3	12.48	4.89	3.04
Oaxaca	0.6	0.83	3.2	1.42	3.00	2.78
Puebla	0.6	1.01	7.8	7.15	5.98	6.38
Querétaro	0.2	0.10	2.2	0.88	1.39	1.38
San Luis Potosí	7.5	5.12	2.7	5.88	3.07	3.03
Sinaloa	5.9	6.24	3.2	1.88	2.66	2.55
Sonora	7.7	9.27	1.7	2.29	2.65	2.57
Tabasco	0	0	0.6	0.39	1.12	0.99
Tamaulipas	0.1	0.07	0.9	0.05	2.28	2.20
Tlaxcala	0	0	1.6	2.04	1.07	1.17
Veracruz	0	0	5.1	9.86	6.82	8.38
Yucatán	0	0	1.9	1.68	2.56	3.12
Zacatecas	8.2	8.32	2.5	3.58	2.62	2.64
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**

Source: See text.

When GDP figures are disaggregated among sectors, the differences between both estimations increase significantly. As can be observed in the table, the main differences arise in both Mining and Manufacturing. The differences in the Mining sector come from the fact that, in the new estimation, I consider the production values of "Mines in operation" and "Metal Production" from the Statistical

Yearbooks, whereas Appendini's estimates only take into account the distribution of the former, from the same source.

In the case of Manufacturing, differences can be explained because, whereas for my estimate I applied the Geary and Stark (2002) method, Appendini (1972) used the industrial production data taken from the Industrial Census of 1902 (DGE 1903). The main problem of using the Industrial Census is that it seems to be highly biased due to the exclusion of the traditional manufacturing production, and the absence of many industrial establishments. Therefore, the representativeness of this Census is rather low and uneven across states, causing high distortions in the estimation. As is pointed out in the introductory part of the Census:

> *"The industry in Mexico is very widespread; there is a great amount of self-employed persons working at a very small scale, and this has undoubtedly caused that it was not possible to obtain enough data, and that countless cases of concealing happened, so only limited data supplied by some important industrial establishments were available. (…) For these reasons, it will be seen that only the data that have been possible to collect are published, and surely there are many more industrial establishments than the ones enumerated in this work…"* (DGE, 1903: ii, my translation).

This problem also shows up when observing the industrial workforce registered in the Industrial Census, which amounts to just 24% of the total industrial workforce recorded in the Population Census of 1900. This introduces biases at the state level. For instance, the manufacturing workforce listed in the 1902 Industrial Census for the states of Guanajuato and Nayarit correspond to 6.2% and 92.45% respectively of that registered in the Population Census of 1900.

By contrast, differences in the share of Services between the two estimates are minor. This is because the weight of Commerce within the Services sector is very high (around 51%) and, for this sub-sector, both Appendini and I have used the same proxy ("Declared Sales") to distribute the national Commerce output across states.[38]

[38] Actually, Appendini (1976) used this proxy to distribute all the national "Service" sector output across states. This is the reason why, in Appendini's estimation, areas with relative high commercial activity have a higher proportion of total Services, such as Mexico City (D.F.) and the State of Veracruz (in which one of the biggest Mexican ports is located).

Table 2.5 GDP per capita, 1930. Comparison between Ruiz's and my own figures (Highest value=100)[39]

New estimates		**Ruiz (2007)**	
Baja California	100.0	Baja California N	100.0
Mexico City	38.4	Mexico City	33.9
Tamaulipas	25.2	Sonora	25.0
Chihuahua	24.9	Tamaulipas	24.7
Sonora	24.8	Nuevo León	20.7
Coahuila	23.9	Coahuila	20.0
Nuevo León	22.0	Baja California S	19.6
Veracruz	17.8	Yucatán	17.2
Yucatán	16.8	Chihuahua	16.5
Mexico	**13.9**	Quintana Roo	15.0
Durango	13.8	Veracruz	13.9
Sinaloa	13.1	Sinaloa	13.5
Aguascalientes	12.7	Durango	11.8
Zacatecas	11.8	**Mexico**	**11.4**
Colima	11.6	Hidalgo	11.2
Campeche	11.5	Colima	9.8
San Luis Potosí	11.4	San Luis Potosí	9.7
Nayarit	11.0	Morelos	8.9
Hidalgo	10.6	Nayarit	8.2
Puebla	10.0	Campeche	7.2
Morelos	10.0	Puebla	6.5
Tabasco	9.5	Jalisco	6.5
Tlaxcala	9.4	Zacatecas	6.5
Guanajuato	8.9	Aguascalientes	6.5
Querétaro	8.0	Tabasco	6.0
Jalisco	7.6	State of Mexico	5.9
State of México	7.5	Guanajuato	5.8
Michoacán	6.9	Tlaxcala	5.7
Chiapas	6.6	Chiapas	5.3
Oaxaca	4.2	Michoacán	4.8
Guerrero	4.0	Querétaro	4.4
		Guerrero	2.8
		Oaxaca	2.2

Source: See text.

Finally, a comparison between my estimates and the 1930 figures proposed by Ruiz (2007: xxix) is shown in Table 2.5. Once again, the differences are minor when total state values are considered. Ruiz's data allow comparing the two estimates for the industrial sector (Table 2.6). As shown in the table, while

[39] The comparison is presented in this form because there is no other figure available in Ruiz (2007).

manufacturing estimates are fairly close, the construction subsector presents wider differences. This could be explained because Ruiz assumed equal productivity across the states, while I applied the Geary and Stark's method (see previous section).

Table 2.6 Percentage of sectoral GDP, 1930. Comparison between Ruiz's and my own figures[40]

	Manufacturing		**Construction**	
	New estimates	Ruiz	New estimates	Ruiz
Aguascalientes	0.4	0.45	0.2	1.08
Baja California	3.5	3.65	2.4	0.65
Campeche	0.2	0.20	0.1	0.60
Coahuila	5.9	6.27	4.1	3.10
Colima	0.2	0.17	0.1	0.50
Chiapas	1.7	1.96	0.5	3.72
Chihuahua	2.1	1.63	2.2	3.06
Mexico City	25.4	25.01	48.00	20.87
Durango	2.7	3.00	0.7	1.32
Guanajuato	3.7	3.80	1.3	3.65
Guerrero	0.3	0.28	0.2	1.38
Hidalgo	2.3	1.80	1.7	2.99
Jalisco	3.1	3.21	2.8	8.64
México	3.4	3.25	2.7	4.03
Michoacán	2	1.89	0.9	5.22
Morelos	0.3	0.35	0.7	0.87
Nayarit	0.6	0.67	0.4	1.18
Nuevo León	8.7	8.98	9.4	3.84
Oaxaca	1.1	1.23	0.3	2.25
Puebla	5.7	5.89	5.2	7.27
Querétaro	0.5	0.45	0.3	0.94
San Luis Potosí	1.9	2.07	2.6	3.58
Sinaloa	2.3	2.49	1.6	1.97
Sonora	1.6	1.33	1.3	1.97
Tabasco	0.2	0.22	0.2	0.74
Tamaulipas	2.1	1.88	1.4	2.07
Tlaxcala	0.9	1.06	0.7	1.27
Veracruz	12.8	12.28	6	5.97
Yucatán	3.6	3.84	1.8	3.45
Zacatecas	0.7	0.46	0.2	1.80
TOTAL	**100**	**100**	**100**	**100**

Source: See text.

[40] The high Mexico City's share in Construction (48%) in 1930 would be consistent with this region having 83.2% of the total Construction output in 1960, according to the VII Industrial Census (1960).

2.4 Conclusions

So far, the only available estimates of Mexican regional GDPs for the period before 1940 were those of Appendini (1972) for 1900 and Ruiz (2007) for 1930. In this chapter I have presented the methodology, sources and results of a new regional GDP pc estimation in Mexico for the benchmark years 1895, 1900, 1910, 1921 and 1930. The new evidence suggests that the regional disparities between the north and south of the country can be traced back at least to the early stages of the integration of national markets. Those disparities widened between 1895 and 1930, due to a large extent to the progress in the industrialization of the capital and northern regions, and the de-industrialization of the centre regions. As a result, it was during the 1930s, at the end of the export-led growth episode of Mexican history, when the country's regional inequality reached the maximum level.

APPENDIX A-2

Table A-2.1
Manufacturing distribution by states in 1930 (percentage)

	Industrial Census	Geary and Stark Method
Aguascalientes	0.44	0.21
Baja California Norte	3.23	2.33
Baja California Sur	0.30	0.48
Campeche	0.18	0.07
Coahuila	5.87	4.83
Colima	0.18	0.06
Chiapas	1.68	0.91
Chihuahua	2.07	1.64
Mexico City	25.39	29.12
Durango	2.72	2.29
Guanajuato	3.66	2.10
Guerrero	0.26	0.21
Hidalgo	2.30	1.97
Jalisco	3.15	2.69
México	3.36	3.37
Michoacán	2.03	1.19
Morelos	0.30	0.41
Nayarit	0.59	0.59
Nuevo León	8.68	9.62
Oaxaca	1.12	0.77
Puebla	5.75	5.10
Querétaro	0.49	0.44
Quintana Roo	0.02	0.15
San Luis Potosí	1.93	3.48
Sinaloa	2.30	2.53
Sonora	1.61	1.13
Tabasco	0.23	0.19
Tamaulipas	2.15	1.85
Tlaxcala	0.91	1.08
Veracruz	12.81	15.58
Yucatán	3.59	3.22
Zacatecas	0.73	0.37
TOTAL	***100***	***100***

Source: See Chapter 2.

Table A-2.2
Methods used for the new regional GDP estimation in each year and sector

	1895		**1900**		**1910**		**1921**		**1930**	
	Direct Approach	*Geary and Stark (2002)*	*Direct Approach*	*Geary and Stark (2002)*	*Direct Approach*	*Geary and Stark (2002)*	*Direct Approach*	*Geary and Stark (2002)*	*Direct Approach*	*Geary and Stark (2002)*
Primary										
Agriculture	**X**		**X**		**X**		**X**		**X**	
Livestock	**X**		**X**		**X**		**X**		**X**	
Forestry	**X**		**X**		**X**		**X**		**X**	
Fishing*	**n.d.**		**n.d.**		**n.d.**		**n.d.**		**n.d.**	
Mining	**X**		**X**		**X**		**X**		**X**	
Oil	**n.d.**		**n.d.**		**X**		**X**		**X**	
Industry										
Manufacturing		**X**		**X**		**X**		**X**	**X**	
Construction		**X**		**X**		**X**		**X**		**X**
Energy		**X**		**X**		**X**		**X**	**X**	
Services										
Commerce	**X**		**X**		**X**		**X**		**X**	
Government		**X**		**X**		**X**		**X**		**X**
Transports		**X**		**X**		**X**		**X**		**X**
Others		**X**		**X**		**X**		**X**		**X**

Source: Own elaboration.
* For the method used to estimate this sector, see Section 2.1.

Table A-2.3
Regional agriculture GDP (percentage)

	1895	1900	1910	1921	1930
Aguascalientes	0.13	2.11	0.36	0.32	0.29
Baja California	0.30	0.07	0.09	2.81	5.03
Campeche	1.43	0.05	0.51	0.49	0.47
Coahuila	5.18	2.72	2.71	4.72	6.37
Colima	0.30	0.40	1.93	1.11	0.44
Chiapas	2.77	3.86	6.35	4.78	3.49
Chihuahua	5.37	0.86	1.85	2.49	3.02
Mexico City	0.83	0.63	0.58	0.72	0.84
Durango	6.50	3.72	2.06	2.50	2.85
Guanajuato	7.37	7.96	7.68	5.83	4.32
Guerrero	7.22	1.64	4.39	2.96	1.79
Hidalgo	2.71	2.75	2.56	3.09	3.53
Jalisco	10.24	8.66	4.83	5.32	5.72
México	5.06	5.81	9.15	6.57	4.45
Michoacán	7.45	4.93	7.14	5.95	4.99
Morelos	2.75	2.74	1.85	1.68	1.54
Nayarit	1.49	3.35	1.87	1.86	1.85
Nuevo León	1.25	1.10	0.79	1.12	1.38
Oaxaca	6.04	2.99	5.59	4.93	4.39
Puebla	5.09	10.40	4.42	5.55	6.46
Querétaro	1.08	0.83	1.18	1.03	0.90
Quintana Roo	0.00	0.00	0.02	0.03	0.05
San Luis Potosí	1.97	1.24	1.16	1.80	2.33
Sinaloa	5.15	2.10	1.26	3.59	5.50
Sonora	2.21	2.01	1.22	2.42	3.40
Tabasco	0.91	0.93	0.64	1.60	2.38
Tamaulipas	0.46	0.74	0.85	1.42	1.88
Tlaxcala	1.32	1.22	1.05	1.48	1.84
Veracruz	3.25	13.33	9.98	9.78	9.61
Yucatán	2.92	9.43	14.78	10.86	7.65
Zacatecas	1.25	1.41	1.17	1.20	1.23
TOTAL	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.4
Regional Livestock GDP (percentage)

	1895	**1900**	**1910**	**1921**	**1930**
Aguascalientes	0.8	0.9	0.9	0.8	0.5
Baja California	2.2	2.1	2.1	1.1	1.2
Campeche	0.9	0.9	0.7	0.3	0.5
Coahuila	2.5	2.4	2.6	3.1	3.5
Colima	0.6	0.6	0.6	1.2	0.4
Chiapas	3.3	2.8	3.2	3.7	4.0
Chihuahua	5.8	5.3	4.9	3.6	6.0
Mexico City	4.4	4.8	4.5	1.6	1.4
Durango	4.1	3.5	3.5	1.1	2.7
Guanajuato	4.4	4.2	4.3	3.6	5.5
Guerrero	3.1	3.2	3.0	3.5	2.7
Hidalgo	2.6	2.5	2.4	2.8	2.9
Jalisco	10.1	9.8	9.2	11.3	8.6
México	4.6	4.3	4.7	6.3	5.5
Michoacán	7.1	6.8	6.9	9.3	6.9
Morelos	1.3	1.5	1.4	0.2	0.8
Nayarit	2.0	1.9	1.9	1.6	1.4
Nuevo León	2.8	2.5	2.6	3.2	3.4
Oaxaca	4.3	5.1	4.4	4.4	3.5
Puebla	4.0	4.0	4.1	4.2	4.8
Querétaro	1.1	1.2	1.1	3.3	1.2
Quintana Roo	0.0	0.0	0.0	0.0	0.0
San Luis Potosí	2.7	2.7	2.5	2.7	2.7
Sinaloa	4.8	4.6	5.1	3.4	2.8
Sonora	4.5	3.8	5.0	2.9	5.3
Tabasco	1.5	1.4	1.4	0.7	2.1
Tamaulipas	2.6	2.6	2.6	1.8	2.4
Tlaxcala	0.7	0.7	0.7	0.2	0.8
Veracruz	3.6	4.8	5.5	10.1	10.9
Yucatán	3.4	5.0	4.7	3.8	1.7
Zacatecas	4.3	3.9	3.7	4.4	3.8
TOTAL	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.5
Regional forestry and fishing GDP (percentage)

	Forestry					Fishing	
	1895	**1900**	**1910**	**1921**	**1930**	**1921**	**1930**
Aguascalientes	0.0	0.1	0.1	0.1	0.1	0.0	0
Baja California	0.0	0.5	0.6	0.2	0.2	0.9	1.2
Campeche	0.0	2.7	2.0	11.2	11.2	1.1	1.1
Coahuila	0.8	2.1	1.9	0.6	0.6	0.0	0
Colima	1.4	0.0	0.0	0.3	0.3	1.3	0.8
Chiapas	0.6	1.4	1.3	6.0	6.0	5.9	6.6
Chihuahua	6.7	6.8	5.5	8.3	8.3	0.0	0
Mexico City	0.0	0.0	0.0	0.5	0.5	0.0	0
Durango	8.0	10.2	8.7	13.1	13.1	0.0	0
Guanajuato	1.4	2.2	2.2	1.3	1.3	0.0	0
Guerrero	14.2	1.2	1.9	0.9	0.9	7.9	8
Hidalgo	3.5	2.2	0.7	0.1	0.1	0.0	0
Jalisco	19.1	5.1	7.8	7.6	7.6	16.7	15.6
México	0.6	5.7	3.6	9.2	9.2	0.0	0
Michoacán	6.8	22.0	18.4	9.5	9.5	13.2	13.1
Morelos	1.5	0.7	0.6	0.1	0.1	0.0	0
Nayarit	5.1	2.1	3.4	0.8	0.8	2.3	2.1
Nuevo León	4.2	3.5	1.3	1.1	1.1	0.0	0
Oaxaca	9.8	1.1	2.8	3.0	3.0	13.7	13.5
Puebla	0.0	10.6	5.0	4.9	4.9	0.0	0
Querétaro	0.0	0.1	0.1	0.2	0.2	0.0	0
Quintana Roo	0.0	0.0	0.3	4.9	4.9	0.0	0
San Luis Potosí	0.1	0.5	0.7	1.6	1.6	0.0	0
Sinaloa	0.8	0.5	0.5	1.0	1.0	4.8	4.9
Sonora	4.3	6.9	8.3	0.1	0.1	3.9	3.9
Tabasco	0.1	1.8	1.5	1.5	1.5	3.0	2.8
Tamaulipas	0.2	1.5	1.2	0.5	0.5	4.0	4.3
Tlaxcala	0.0	0.2	0.0	0.3	0.3	0.0	0
Veracruz	1.6	7.7	18.6	8.2	8.2	16.3	17.2
Yucatán	0.0	0.0	0.0	2.3	2.3	5.2	4.9
Zacatecas	9.3	0.7	0.9	0.6	0.6	0.0	0
TOTAL	***100***	***100***	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.6
Regional mining GDP (percentage)

	1895	**1900**	**1910**	**1921**	**1930**
Aguascalientes	4.2	7.2	14.5	4.1	0.4
Baja California	4.8	4.7	0.5	1.7	2.5
Campeche	0.0	0.0	0.0	0.0	0.0
Coahuila	4.0	4.1	6.3	2.3	5.2
Colima	0.0	0.0	0.0	0.0	0.0
Chiapas	0.2	0.1	0.0	0.0	0.0
Chihuahua	6.7	10.0	10.6	14.6	25.9
Mexico City	0.0	0.0	0.0	4.0	2.1
Durango	13.2	12.5	6.6	5.8	6.5
Guanajuato	4.7	4.2	4.6	2.6	1.2
Guerrero	0.4	0.5	1.8	0.9	1.2
Hidalgo	7.0	8.9	5.2	13.0	11.4
Jalisco	2.5	2.3	0.7	2.8	1.3
México	1.9	2.2	7.6	3.9	0.6
Michoacán	0.4	0.3	6.4	2.7	2.2
Morelos	0.2	0.2	0.0	0.0	0.3
Nayarit	0.5	0.7	0.6	0.1	0.0
Nuevo León	13.0	11.3	10.5	15.0	7.1
Oaxaca	0.3	0.6	0.3	0.1	0.1
Puebla	0.2	0.6	1.7	0.4	0.9
Querétaro	0.3	0.2	0.3	0.0	0.0
Quintana Roo	0.0	0.0	0.0	0.0	0.0
San Luis Potosí	7.1	7.5	5.0	3.1	7.5
Sinaloa	8.6	5.9	3.3	1.6	1.3
Sonora	11.8	7.7	10.0	11.8	11.2
Tabasco	0.0	0.0	0.0	0.0	0.0
Tamaulipas	0.1	0.1	0.4	0.0	0.0
Tlaxcala	0.0	0.0	0.0	0.0	0.0
Veracruz	0.0	0.0	0.0	0.0	0.0
Yucatán	0.0	0.0	0.0	0.0	0.0
Zacatecas	8.0	8.2	3.2	9.4	11.2
TOTAL	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.7
Regional oil GDP (percentage)

	1910	1921	1930
Aguascalientes	0.0	0.0	0.0
Baja California	0.0	0.0	0.0
Campeche	0.0	0.0	0.0
Coahuila	0.0	0.0	0.0
Colima	0.0	0.0	0.0
Chiapas	0.0	0.0	0.0
Chihuahua	0.0	0.0	0.0
Mexico City	0.0	0.0	0.0
Durango	0.0	0.0	0.0
Guanajuato	0.0	0.0	0.0
Guerrero	0.0	0.0	0.0
Hidalgo	0.0	0.0	0.0
Jalisco	0.0	0.0	0.0
México	0.0	0.0	0.0
Michoacán	0.0	0.0	0.0
Morelos	0.0	0.0	0.0
Nayarit	0.0	0.0	0.0
Nuevo León	0.0	0.0	0.0
Oaxaca	0.0	0.0	0.0
Puebla	0.0	0.0	0.0
Querétaro	0.0	0.0	0.0
Quintana Roo	0.0	0.0	0.0
San Luis Potosí	0.0	1.4	3.1
Sinaloa	0.0	0.0	0.0
Sonora	0.0	0.0	0.0
Tabasco	0.0014	0.0	0.0
Tamaulipas	0.0	3.3	7.2
Tlaxcala	0.0	0.0	0.0
Veracruz	99.999	95.3	89.7
Yucatán	0.0	0.0	0.0
Zacatecas	0.0	0.0	0.0
TOTAL	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.8
Regional manufacturing GDP (percentage)

	1895	**1900**	**1910**	**1921**	**1930**
Aguascalientes	1.5	1.4	1.4	0.9	0.4
Baja California	0.4	0.3	0.4	0.9	3.5
Campeche	0.6	0.7	0.6	0.5	0.2
Coahuila	1.6	3.7	3.1	3.1	5.9
Colima	0.2	0.3	0.5	0.5	0.2
Chiapas	0.9	0.8	1.0	1.1	1.7
Chihuahua	1.4	1.4	2.5	2.1	2.1
Mexico City	11.6	11.0	12.4	19.9	25.4
Durango	1.5	2.0	2.5	2.0	2.7
Guanajuato	10.3	9.9	8.1	6.2	3.7
Guerrero	0.4	0.7	0.9	0.6	0.3
Hidalgo	3.1	3.8	2.6	2.3	2.3
Jalisco	12.7	12.2	8.7	7.5	3.1
México	5.9	4.9	4.7	3.3	3.4
Michoacán	8.2	8.5	6.3	4.5	2.0
Morelos	0.8	0.7	0.8	0.3	0.3
Nayarit	2.5	1.4	1.9	1.5	0.6
Nuevo León	3.4	3.0	4.2	5.5	8.7
Oaxaca	2.1	3.2	3.9	2.5	1.1
Puebla	8.4	7.8	7.7	8.3	5.7
Querétaro	2.5	2.2	1.7	1.3	0.5
Quintana Roo	0.0	0.0	0.1	0.0	0.0
San Luis Potosí	2.7	2.7	3.7	2.9	1.9
Sinaloa	2.4	3.2	2.6	2.7	2.3
Sonora	1.7	1.7	3.0	2.3	1.6
Tabasco	0.5	0.6	0.6	0.7	0.2
Tamaulipas	0.8	0.9	1.1	2.7	2.1
Tlaxcala	2.9	1.6	1.7	1.6	0.9
Veracruz	4.5	5.1	6.4	8.4	12.8
Yucatán	1.6	1.9	2.3	2.7	3.6
Zacatecas	2.8	2.5	2.3	1.5	0.7
TOTAL	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.9
Regional construction and electricity GDP (percentage)

	Construction					Electricity				
	1895	**1900**	**1910**	**1921**	**1930**	**1895**	**1900**	**1910**	**1921**	**1930**
Aguascalientes	1.0	1.1	0.9	0.2	0.2	0.5	0.5	1.3	0.3	0.4
Baja California	0.5	0.3	0.6	2.0	2.4	0.0	0.0	0.0	0.0	1.6
Campeche	1.0	1.1	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.1
Coahuila	1.1	2.9	2.6	3.9	4.1	1.7	1.8	2.8	4.5	3.6
Colima	0.3	0.4	0.5	0.1	0.1	0.1	0.2	0.2	0.0	0.2
Chiapas	0.7	0.7	0.9	0.4	0.5	0.1	0.2	0.0	0.0	0.4
Chihuahua	1.0	1.6	2.3	0.5	2.2	0.1	0.1	0.7	0.6	6.7
Mexico City	18.3	18.2	20.5	37.6	48.0	2.0	1.9	13.1	26.4	36.9
Durango	1.3	1.7	2.5	2.7	0.7	2.7	2.8	2.0	2.3	1.0
Guanajuato	7.9	6.4	6.9	2.8	1.3	8.9	8.7	8.1	3.6	5.3
Guerrero	0.4	0.5	0.9	0.2	0.2	0.1	0.2	0.4	0.1	0.1
Hidalgo	4.1	3.2	2.9	2.4	1.7	9.9	9.7	6.6	6.0	6.1
Jalisco	11.2	14.2	8.7	3.1	2.8	10.8	10.5	3.5	1.4	4.2
México	5.2	4.8	5.2	4.4	2.7	31.9	31.3	25.9	24.2	3.9
Michoacán	5.7	5.8	5.0	1.2	0.9	3.7	3.6	2.2	0.6	4.7
Morelos	1.2	0.9	1.0	0.9	0.7	0.3	0.3	0.4	0.4	0.1
Nayarit	2.0	1.3	1.9	0.6	0.4	1.2	0.9	1.1	0.4	0.3
Nuevo León	2.7	2.8	3.1	7.9	9.4	0.2	0.2	0.1	0.3	2.5
Oaxaca	1.2	1.7	2.2	0.6	0.3	4.2	6.2	7.3	2.3	0.7
Puebla	9.9	9.1	7.3	6.5	5.2	11.0	10.8	10.3	10.0	6.0
Querétaro	2.0	1.9	1.7	0.7	0.3	0.7	0.7	1.6	0.7	0.8
Quintana Roo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis Potosí	3.0	2.4	3.3	3.6	2.6	0.6	0.7	2.4	2.8	0.4
Sinaloa	2.0	2.3	1.9	1.2	1.6	5.3	4.3	0.6	0.4	0.9
Sonora	1.9	1.9	2.8	1.3	1.3	0.1	0.1	0.1	0.0	0.3
Tabasco	0.6	0.8	0.6	0.2	0.2	0.1	0.1	0.0	0.0	0.3
Tamaulipas	0.6	0.6	0.8	0.7	1.4	0.1	0.1	0.1	0.1	4.0
Tlaxcala	4.1	2.2	1.9	1.5	0.7	0.5	0.4	4.7	4.0	0.1
Veracruz	4.4	4.2	4.7	8.7	6.0	1.9	2.2	4.0	8.2	5.4
Yucatán	2.5	3.0	3.4	3.4	1.8	0.4	0.4	0.2	0.2	2.0
Zacatecas	2.5	2.0	2.0	0.4	0.2	0.9	0.9	0.6	0.1	1.2
TOTAL	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2.

Table A-2.10
Regional government, transport and other services GDP (percentage)

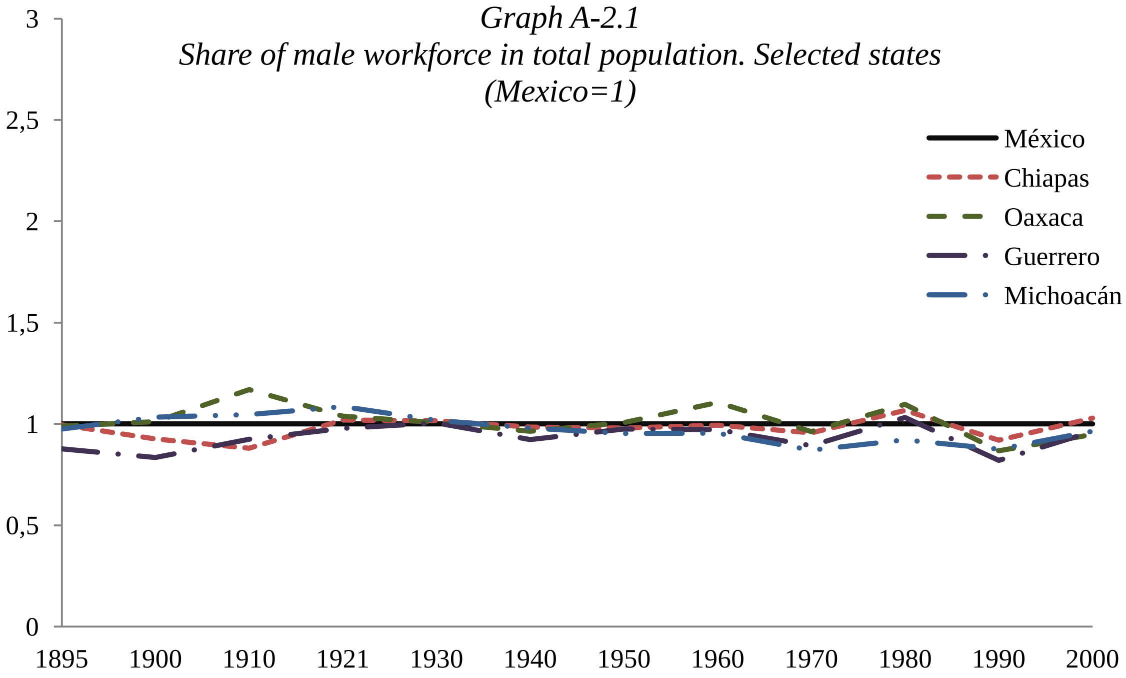
	Government					Transport					Other services				
	1895	**1900**	**1910**	**1921**	**1930**	**1895**	**1900**	**1910**	**1921**	**1930**	**1895**	**1900**	**1910**	**1921**	**1930**
Aguascalientes	0.6	0.7	0.6	0.4	0.3	1.3	1.2	1.1	1.4	1.3	0.9	0.9	1.0	1.4	1.8
Baja California	0.8	0.8	1.2	3.7	4.8	0.8	0.9	1.5	1.0	0.7	0.5	0.4	0.6	0.8	1.2
Campeche	2.3	1.0	0.6	1.8	0.9	0.5	1.3	2.4	2.1	1.0	1.1	0.5	0.4	0.6	0.5
Coahuila	2.1	1.6	2.4	1.7	1.6	6.3	3.5	2.3	4.2	4.8	1.7	3.3	3.2	4.7	4.8
Colima	0.6	0.4	0.5	0.0	0.5	0.5	0.5	0.5	1.2	0.5	0.5	0.4	0.5	0.8	0.2
Chiapas	1.0	1.1	1.7	0.9	1.3	1.0	0.8	0.8	0.8	1.2	3.5	2.0	1.7	1.2	0.6
Chihuahua	2.5	2.4	2.8	4.1	3.9	1.2	1.2	2.1	1.5	2.9	2.4	2.5	3.7	3.4	5.0
Mexico City	16.4	18.1	22.5	11.5	11.4	10.0	8.9	11.1	16.3	22.7	16.6	16.1	22.7	24.0	34.1
Durango	1.0	1.5	1.2	1.4	1.0	1.9	2.3	2.0	1.6	2.1	2.2	2.8	2.3	1.2	1.4
Guanajuato	8.1	6.0	2.8	4.6	3.8	7.0	8.9	10.2	6.3	5.5	7.6	6.5	5.4	2.8	5.1
Guerrero	2.3	2.5	4.0	1.7	1.4	0.8	0.4	0.7	0.5	0.6	1.3	1.3	1.2	1.0	1.5
Hidalgo	6.6	4.1	3.0	6.3	5.9	3.9	4.6	3.6	2.2	2.0	3.5	3.1	3.2	4.1	1.2
Jalisco	5.4	7.7	4.1	7.5	7.6	10.1	12.7	8.8	10.6	7.2	7.9	9.4	5.7	6.4	4.3
México	4.6	2.7	3.6	5.0	4.8	6.9	5.5	5.7	3.1	3.4	4.3	3.7	5.3	5.8	3.9
Michoacán	3.5	4.9	3.7	5.6	3.7	10.0	10.0	9.5	8.7	6.0	5.4	4.9	4.4	2.6	1.7
Morelos	3.1	1.5	2.1	0.2	0.8	0.7	0.6	0.4	0.2	0.3	0.9	0.7	0.9	0.4	0.3
Nayarit	1.3	1.4	2.3	1.0	0.8	2.1	1.8	1.9	1.7	0.9	1.1	1.0	1.5	0.8	0.4
Nuevo León	2.8	3.1	2.3	1.3	1.6	1.2	0.9	1.8	2.6	3.4	2.8	8.6	2.7	2.0	4.7
Oaxaca	4.0	4.3	4.5	2.7	2.9	2.2	2.0	2.5	2.0	2.3	3.4	3.5	3.5	1.4	1.0
Puebla	5.2	8.0	6.4	8.7	4.3	8.4	9.1	6.8	7.9	4.3	5.2	4.7	5.0	4.6	6.0
Querétaro	1.3	1.1	0.9	0.1	0.9	1.8	1.6	1.4	1.8	0.9	1.9	1.4	1.3	0.7	1.0
Quintana Roo	0.0	0.0	1.4	1.0	0.6	0.0	0.0	0.6	0.4	0.2	0.0	0.0	0.6	0.8	0.1
San Luis Potosí	1.3	1.7	1.9	1.8	1.5	2.2	2.6	2.8	2.4	4.2	3.7	3.3	3.7	2.2	2.5
Sinaloa	2.7	2.7	1.8	0.4	3.6	2.0	4.6	1.7	1.7	2.1	2.1	2.8	1.6	2.6	0.6
Sonora	2.7	5.8	4.1	3.2	4.3	0.6	1.1	2.0	1.7	2.1	1.9	3.0	3.5	2.1	3.2
Tabasco	1.6	1.3	1.6	0.7	2.7	0.6	1.3	1.1	1.2	0.8	0.9	1.3	0.7	0.3	0.4
Tamaulipas	3.4	3.5	3.2	4.7	4.7	0.9	0.9	1.2	3.2	3.7	3.5	2.5	2.0	5.1	5.5
Tlaxcala	0.6	0.8	1.0	1.1	1.3	6.2	3.0	1.8	1.1	1.0	1.8	0.7	0.7	1.0	0.9
Veracruz	6.5	5.4	5.6	8.4	7.7	4.6	3.4	6.9	6.1	6.6	6.0	4.5	5.8	6.8	2.0
Yucatán	2.9	1.1	2.7	7.4	7.6	2.7	2.3	2.8	2.9	3.3	2.3	1.7	2.6	6.6	1.8
Zacatecas	2.8	2.7	3.2	1.1	1.8	1.5	2.0	1.8	1.8	2.1	3.4	2.7	2.4	2.1	2.3
TOTAL	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2

Table A-2.11
Regional commerce GDP (percentage)

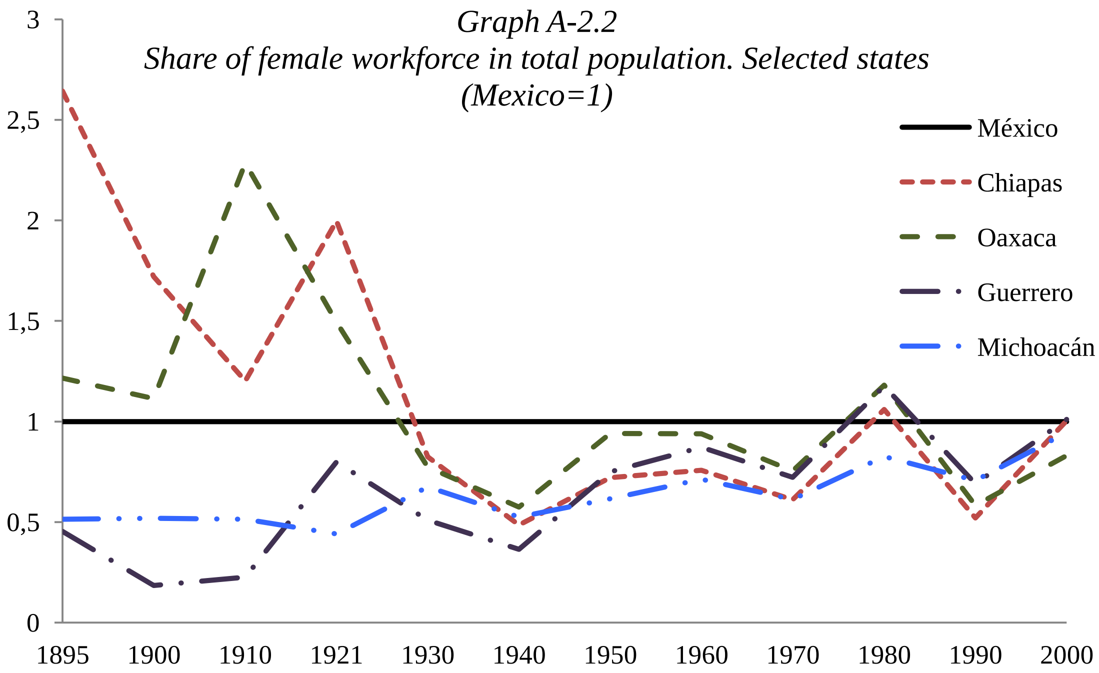
	1895	**1900**	**1910**	**1921**	**1930**
Aguascalientes	0.6	0.7	0.9	0.9	0.8
Baja California	1.3	1.3	1.1	1.0	2.2
Campeche	1.1	1.0	0.9	1.1	0.6
Coahuila	2.9	3.6	3.8	2.4	3.5
Colima	0.8	0.6	0.5	0.5	0.5
Chiapas	1.3	1.3	1.0	1.3	1.0
Chihuahua	3.6	3.5	3.3	2.2	2.7
Mexico City	24.0	22.4	25.0	37.1	36.5
Durango	2.6	2.8	2.0	1.2	1.2
Guanajuato	4.7	4.0	4.2	2.7	3.3
Guerrero	1.0	1.0	1.3	0.1	0.6
Hidalgo	3.6	3.2	2.5	2.0	2.5
Jalisco	3.0	4.2	3.8	3.3	2.8
México	4.6	3.8	3.6	2.1	2.4
Michoacán	2.9	3.0	3.1	2.2	2.3
Morelos	2.3	2.1	1.6	0.2	0.5
Nayarit	1.4	0.9	1.2	0.8	0.6
Nuevo León	2.1	3.2	2.3	2.2	2.3
Oaxaca	1.5	2.7	2.0	2.2	2.3
Puebla	5.0	6.1	6.5	6.3	5.0
Querétaro	1.3	1.4	1.4	1.2	0.8
Quintana Roo	0.0	0.0	0.0	0.0	0.0
San Luis Potosí	2.7	3.2	3.3	2.5	2.4
Sinaloa	2.3	2.3	2.1	1.0	1.5
Sonora	2.6	2.3	2.1	2.1	1.7
Tabasco	1.2	1.0	0.9	1.0	0.7
Tamaulipas	2.2	2.3	2.0	3.9	7.6
Tlaxcala	0.9	1.0	0.9	0.4	0.6
Veracruz	9.2	9.1	11.0	9.8	8.1
Yucatán	3.5	3.3	3.7	5.7	2.3
Zacatecas	3.6	2.7	1.9	0.6	0.8
TOTAL	***100***	***100***	***100***	***100***	***100***

Source: See Chapter 2



Graph A-2.1
Share of male workforce in total population. Selected states (Mexico=1)

Source: Own elaboration with data taken from the INEGI.



Graph A-2.2
Share of female workforce in total population. Selected states (Mexico=1)

Source: Own elaboration with data taken from the INEGI.

Chapter 3

Regional income distribution in Mexico: new long-term evidence, 1895-2010[41]

[41] This chapter has been accepted for publication in *Economic History of Developing Regions* (Aguilar-Retureta, 2016). I thank the participants at the "Regional GDPs in Latin America, a long-term perspective (1870-2010)" symposium, held at the 4th Latin America Economic History Congress, as well as the participants at the Second workshop "The New Economic Historians of Latin America", and the "PhD students' Seminar in Economic and Social History" at the University of Oxford. Finally, I wish to thank Alejandra Irigoin, Juan Flores, Joan Rosés, and Max-Stephan Schulze for their very useful comments on this work.

Abstract

Recently, Economic History literature has paid close attention to the changes undertaken by regional income inequality. Nevertheless, this literature has mainly focused on developed economies, and new evidence is required from peripheral economies. This chapter presents several dimensions of Mexican regional disparities over the long run, considering for the first time a period from the domestic markets integration to nowadays. The results show that, despite a persistent north-south income division, inequality has followed an N-form trend over the long term. This trend is highly correlated to the different economic models adopted by Mexico since late 19th century. The new evidence suggests that the initial divergence process was driven by a few rich states becoming richer, together with several poor regions becoming relatively poorer. The subsequent convergence process is associated to the rich states falling towards the national income levels and, to a much lesser degree, to the improvement of the poorest states' positions. Finally, Moran's I coefficients show that the only statistically significant income cluster appearing over the entire period was the low-income cluster formed by the southern regions. In other words, in the Mexican case having rich neighbours does not involve a greater chance of being prosperous.

3.1 Introduction

As has been reviewed in the introduction of this thesis, the evolution of regional income distribution and its determinants has been paid close attention in the recent Economic History literature. Scholars have mainly focused on Western Europe and the US, for which the available evidence suggests that spatial inequality has commonly followed an inverted-U shape in the long term.[42] This was the consequence of a process of regional income divergence during the first stages of domestic market integration, and a further decrease in disparities as economic growth and national market integration continued moving forward. These findings are consistent with some of the predictions of the New Economic Geography (NEG), and also fit with the seminal Williamson's (1965) 'inverted-U' trend proposal. The NEG framework suggests that the interaction between the fall in transport costs, increasing returns and market potential can first lead to economic activity agglomeration, increasing therefore regional income inequalities (Krugman, 1991). However, firms may gradually become sensitive to congestion costs if trade costs continue falling, causing a subsequent dispersion of the economic activity (Puga, 1999). Thus, market integration might eventually lead to regional income convergence. On the other hand, the 'inverted-U' pattern described by Williamson (1965) could be understood as an extension of the Kuznets' curve at the regional level, implying that in the early stages of industrialization regional inequalities within countries tend to increase, to decrease thereafter from the moment when industrialization spreads across most regions. In both theoretical frameworks regional income inequality is determined, essentially, by the location decisions of industrial activity.

Nevertheless, very little evidence is available on developing countries, in which the patterns and causes of the long-term evolution of spatial economic distribution may have been far different from those of industrialized countries. Actually, as mentioned before, the analysis of peripheral economies may provide new hypothesis and perspectives on the forces behind regional economic growth and regional inequality.[43] In order to contribute to this literature, this thesis provides a case study for Mexico, which has not been analysed yet from an Economic History

[42] See detailed references in the introductory chapter.
[43] See, for instance, Badia-Miró (2015) or Caruana-Galizia (2013).

perspective. The aggregate study of regional inequality in Mexico, which has often been approached through β-convergence and σ-convergence analyses, has usually been restricted to the most recent decades. Moreover, even though these convergence studies are useful to understand regional inequality trends, they provide a highly simplified view of the historical evolution of regional income distribution process, as they totally ignore the spatial location component (Yamamoto, 2008). For instance, convergence analyses do not take into account the possible impact that a relatively rich region may have on the nearby areas (*spatial clustering*), or how the shapes of income distribution evolve over the long run. These dimensions of regional income disparities are highly relevant in the long run. For example, in the Mexican case, it would be essential to understand the impact of Mexico City on its closest states or the effect of the US on the northern states.[44]

In this regard, this chapter aims to analyse multiple dimensions of the Mexican regional income inequality evolution in the long term, considering for the first time a very long time span, from the first globalization to the present (1895–2010). This analysis is based on new GDP *per capita* figures at the state level that have been presented in the previous chapter. There I have presented GDP *per capita* figures for 1895 to 1930 based on the methodology proposed by Geary and Stark (2002). These figures have been linked to those available for 1940-2010 (see section 3.3). In the next sections, I first present some conventional indicators of regional inequality, such as the Coefficient of Variation (CV), the Gini coefficient, and the Theil, Williamson and Herfindahl-Hirschman indexes. Secondly, I estimate Kernel distributions of regional income, in order to provide a picture of the shape and modality of spatial income distribution in the long term. Thirdly, I analyse regional income mobility through the Spearman rank and the Kendall's τ-statistic. Finally, I use the Moran's I coefficient to study the intensity of spatial clustering of regional incomes per capita. All these indicators aim at providing a complete picture of the Mexican regional income disparities over the long term, and at contributing to the international literature on historical regional inequality, by analysing an economy

[44] These two facts have been pointed out as one of the most important causes of regional economic growth in Mexico both during the ISI period and the subsequent stage of economic openness, especially since the North America Free Trade Agreement (NAFTA) came into effect in 1994 (Jordaan and Sanchez-Reaza, 2006).

that did not belong to the western core.[45]

The long-term perspective adopted in this chapter allows a detailed analysis of the evolution of regional income inequality across the different economic models that have been adopted in Mexico since the start of modern economic growth. More specifically, the period under analysis includes the agro-export model of the first international globalisation (1895–1930), the State-Led Industrialization period (1930–1980) and the current model of high economic openness (1980–2010). The results show that, despite a persistent north-south income division, inequality has followed an N-form trend over the long term. This trend is highly correlated to the different economic models adopted by Mexico. The initial divergence phase, which had been completely overlooked by previous research, was driven by a few rich states becoming richer, together with several poor regions becoming relatively poorer. The subsequent convergence process was associated to the rich states falling towards the national income levels and, to a much lesser degree, to the improvement of the poorest states' positions. Finally, during the last decades, few states have taken advantage of the increasing economic openness (mainly the northern states and Mexico City), causing a new phase of regional income divergence from 1980 to 2010.

This chapter is structured as follows. Next section offers a brief summary of the Mexican economic growth process since the late 19th century. Section 3.3 presents a long-run description of Mexican regional income distribution, on the basis of several indicators. In section 3.4, spatial econometrics is used to test the presence of spatial income autocorrelation among Mexican states. Conclusions are presented in section 3.5.

3.2 Regional economic growth in Mexico from 1895 to 2010

Mexican states' long-term economic growth has been largely affected by the economic model adopted in each historical period. As mentioned in the introductory section (1.4), the primary-export boom, that took place from the late nineteenth

[45] Recent literature has applied similar techniques to explain multiple dimensions of regional per capita income disparities within different countries, see Bosch, et al. (2003), Aroca, et al. (2005), Yamamoto (2008), Germán-Soto and Escobedo (2011), Badia-Miró (2015), and Tirado and Badia-Miró (2014). Moreover, a distribution dynamics analysis among the OECD countries in the long-term can be found in Epstein et al. (2003).

century to the 1929 Great Depression, caused important changes in the country's economic structure. Historians have pointed out that it was at this moment that Mexico embraced the capitalist system (Kuntz, 2010). Besides, during this period the country went through an important process of economic modernization, largely associated to the expansion of industry and, specially, the mining sector. Industry, mining, and agrarian exports (mainly henequen) were the main forces behind the transformation of the national economic structure (Kuntz, 2010: 321). Whereas these sectors accounted for a growing share of total GDP, agriculture for domestic consumption gradually fell behind. According to Pérez López (1960), the participation of manufacturing and mining in total GDP grew from 9.1% to 13.2%, and from 4.9% to 9.5% respectively between 1895 and 1929. Instead, the share of traditional agriculture within GDP decreased from 23.8% in 1895 to 13.9% in 1929. This process of structural change is essential to understand the increase in differences among regions throughout the period. The states in which industry and mining were located had a much higher dynamism than the rest. As pointed out in Chapter 2, Mexico City, the northern region, and some particular states (Veracruz and Yucatán) were the best performing areas during this period. Yucatán benefitted from the most successful agro-export activity: henequen.[46] On the other hand, industrial activity was concentrated in Mexico City, Veracruz and the north (specially Nuevo León). According to my estimates, the participation of these three states in the country's total manufacturing activity increased from 19.5% in 1895, to 46.9% in 1930. By contrast, the mining sector experienced an increasing geographic dispersion during this period (although it was also mostly concentrated in the north and north-centre regions). This dispersion might have partially overcome the effects of industrial concentration on regional income inequality, as happened in the Chilean case (Badia-Miró, 2015). However, my estimates clearly show that both the Mexico City economic dynamism and the north/south division of the country started at least in the late nineteenth century.

After the primary-export boom, Mexico undertook a process of accelerated industrialization based on the growth of domestic markets (1930-1985). This period is commonly known in Latin America as the Import Substitution Industrialization (ISI) period. The ISI period is generally considered as a closed-economy model, due

[46] In fact, this was the only non-mining successful export commodity during the First Globalisation (Riguzzi, 1995: 174).

to the strong commercial protectionist strategy adopted in those years. It was during this period when the Mexican economy experienced the greatest growth rates in the history of the republic, having an annual average GDP growth rate of 5.24% and 6.38% during the years 1932-1949 and 1949-1981 respectively (Márquez, 2010: 553). The low level of international integration had strong economic implications at the regional level, and it especially encouraged the intensification of economic concentration. Although, during this period, several policy programs attempted to de-centralize different economic activities and the industrial sector in particular, the latter was greatly concentrated in Mexico City and the surrounding areas (especially the State of Mexico), together with a few other states such as Jalisco and Nuevo León.[47]

The concentration of industrial activity in Mexico City has been theoretically explained on the basis of New Economic Geography's predictions (see section 1.4).[48] As a consequence, according to Germán-Soto (2005), Mexico City, together with the State of Mexico, reached a share of 36.14% of Mexico's total GDP in 1980. Nevertheless, despite the high concentration of economic activity in Mexico City, the literature has also identified a reduction of regional income disparities during this period. Following Sánchez-Reaza and Rodriguez-Pose (2002: 77), this can be explained, for the late years of the ISI period, by the oil production boom of the 1970s and 1980s, which was mostly located in the Southeast of Mexico, and, secondly, by the rapid out-migration from the southern states to the rest of the country and the US.

By the mid-1980s, the Mexican economy started a process of increasing openness and decreasing state intervention. The debt crisis and the downfall of the oil price are the main factors behind the collapse of the ISI model. The new Mexican export-promotion strategy started with the incorporation of Mexico to the General Agreement on Tariffs and Trade (GATT) in 1986, and continued with a deepening in regional international integration in 1994 through the signature of the North American Free Trade Agreement (NAFTA). According to the World Bank, Mexican openness rate was 24% in 1980 and 61% in 2010 respectively (World Bank, 2014).

[47] As mentioned in the introductory chapter, during the ISI period, the government tried to encourage the dispersion of industrial activity, for example, by promoting the creation of industrial parks in different states. Nevertheless, those political efforts were not successful (Aguilar, 1993: 341).

[48] See Hernández (1980) for a narrative confirming the NGE hypothesis for the Mexican case during the ISI period.

The process of economic openness and regional international integration has significantly affected the patterns and trends of regional growth in Mexico during the last twenty years. In 2012, the north-border states (6 out of 32) accounted for 52.87% of the total export value. Meanwhile, Mexico City and the State of Mexico, for instance, only represent 6.3% of national exports (INEGI, 2014).[49] Hanson (1998a, 1998b) has observed the same trend in manufacturing employment: free trade in North America has boosted, on the one hand, the expansion of manufacturing labour force in the north-border states and, on the other hand, the contraction of this sector in Mexico City.

The next section presents several measures of Mexican regional income disparities in the long run, beyond the well-known β-convergence and σ-convergence analyses that have been the object of most previous literature (see section 1.4 for a detailed analysis of the evidence on regional income inequality in Mexico during the last decades).

3.3 The long-run trends of regional income disparities in Mexico, 1895-2010

In order to present the trends and patterns of regional income inequalities in Mexico since the late nineteenth century, I link the GDP *per capita* presented in the previous chapter for the years 1895-1930 with those available for 1940 to 2010. I use German-Soto's (2005) GDP figures for 1940 to 2000, and the INEGI estimates for 2010 as well as the corresponding National Population Censuses to express GDP in *per capita* terms.[50] In order to account for the extreme spatial concentration of oil production, I have also estimated the states' GDP for 1940-2010 excluding oil production. From 1940 to 1960, the percentage of each state's oil production is taken from Ruiz (2007) and, for 1970 to 2010, it is available in INEGI (1985, 2002, 2014).

[49] Thanks to oil exports, Campeche and Tabasco were the origin of 13.77% of the national exports value.

[50] Esquivel (2002) offers alternative GDP per capita estimates for the same period. I preferred to use Germán-Soto (2005) because he presents an "un-treated" GDP per capita database, contrary to Esquivel (2002), in which GDP per capita figures are presented with some 'corrections' related to the allocation of the oil production. Thus, using Germán-Soto (2005) allows me to apply the same method for the entire period (1895-2010) in order to offer a supplementary database without oil production. Nevertheless, both series present very similar trends and distribution patterns among regions over the long run. Figures of 2010 GDP *per capita* at the state level are at: www.inegi.org.mx/est/contenidos/proyectos/cn/pibe/tabulados.aspx

These figures can be linked to my own estimates without oil production for the period before 1940, obtaining as a result two state GDP databases, with and without the oil sector, for the whole period (1895-2010). Table 3.1 shows these figures, in benchmark years from the early 20th century to the present.[51] As can be noted, there is a marked persistence of the high pc GDP levels of both Mexico City and the North region and, on the other side, a poor income performance of the Centre and South regions in relation to the national average over the long run. Map 3.1 illustrates the spatial dimension of regional income inequality and its evolution over time. On the basis of these data, the next section presents several indicators that allow approaching the different dimensions of the long-term evolution of Mexican regional income disparities.

3.3.1 *Regional disparity indexes*

To start with, Figure 3.1 depicts the standard deviation of regional GDP per capita figures (with and without oil production), which can be taken as an indicator of σ-divergence.[52] As can be seen in the graph, Mexican regional inequality has followed a ‘N’ trend in the long-term. The reasons for the inequality increase of the early decades, which lasted until the 1940s (and was especially intense during the 1920s), can be understood by looking at the income per capita estimates.

During the primary export-led growth period of the first globalization, the North region and Mexico City had an extraordinarily good performance relative to the national average. Mexico City started with a GDP per capita 2.63 times as large as the national one in 1895, and increased up to 2.83 in 1930. In the North region, the equivalent figures were 1.94 and 2.27.

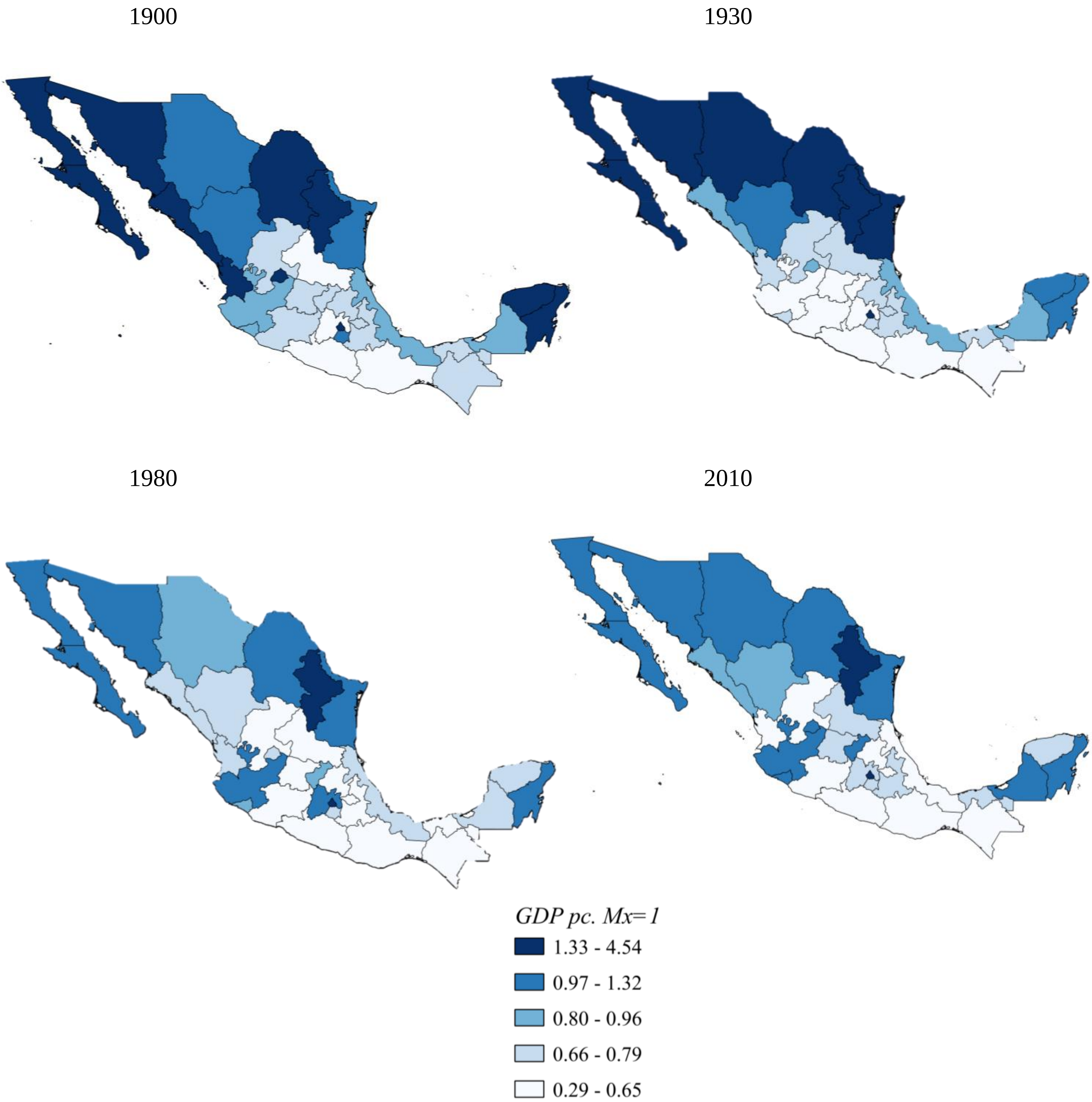
[51] This periodization is frequently used in Latin American literature to distinguish between different economic models during the period from the First Globalisation and the present, see for instance Bértola and Ocampo (2010).
[52] All inequality indices used in this section reflect σ-convergence, since their aim is to measure regional dispersion of income among states.

Table 3.1 Regional per capita GDP in Mexico
(Mexico = 1)

	1900	1930	1930*	1950	1950*	1980	1980*	2010	2010*
Mexico City	*2.61*	*2.71*	*2.83*	*2.63*	*2.71*	*1.91*	*2*	*2.27*	*2.39*
North	***1.71***	***2.21***	***2.27***	***1.59***	***1.64***	***1.19***	***1.25***	***1.22***	***1.27***
Baja C. North	3.11	4.4	4.54	2.87	2.96	1.28	1.34	1.03	1.08
Baja C. South	n.d.	n.d.	n.d.	1.18	1.22	1.27	1.33	1.11	1.16
Chihuahua	1.29	1.82	1.89	1.41	1.45	0.94	0.99	1.04	1.09
Coahuila	1.46	1.72	1.78	1.28	1.33	1.15	1.2	1.31	1.37
Nuevo León	1.6	1.66	1.71	1.57	1.62	1.58	1.65	1.9	1.97
Sonora	1.79	1.77	1.82	1.56	1.61	1.08	1.14	1.05	1.11
Tamaulipas	1.03	1.9	1.85	1.28	1.31	1.03	1.08	1.12	1.08
Pacific-North	***1.22***	***0.77***	***0.79***	***0.81***	***0.84***	***0.85***	***0.89***	***0.88***	***0.93***
Colima	0.91	0.8	0.82	0.83	0.85	0.91	0.95	1.01	1.06
Jalisco	0.98	0.55	0.57	0.71	0.74	1.01	1.06	1.01	1.06
Nayarit	1.51	0.78	0.8	0.74	0.77	0.71	0.74	0.65	0.69
Sinaloa	1.46	0.93	0.96	0.95	0.98	0.76	0.79	0.85	0.9
Centre-North	***1.25***	***0.89***	***0.91***	***0.62***	***0.64***	***0.64***	***0.67***	***0.85***	***0.89***
Aguascalientes	2.13	0.88	0.91	0.46	0.48	0.79	0.83	1.1	1.16
Durango	1.32	0.97	1	0.75	0.78	0.72	0.76	0.86	0.9
San Luis Potosí	0.68	0.84	0.83	0.7	0.71	0.58	0.61	0.79	0.83
Zacatecas	0.86	0.85	0.88	0.55	0.57	0.47	0.49	0.63	0.66
Gulf of Mexico	***1.14***	***1.03***	***0.97***	***1.1***	***1.06***	***1.18***	***0.82***	***1.72***	***0.96***
Campeche	0.98	0.88	0.91	0.84	0.87	0.76	0.8	4.39	1.17
Tabasco	0.83	0.68	0.7	0.57	0.59	2.51	0.58	1.41	0.71
Quintana Roo	n.d.	n.d.	n.d.	1.93	1.99	1.2	1.25	1.28	1.35
Veracruz	0.97	1.26	0.91	1.28	0.97	0.72	0.73	0.68	0.67
Yucatán	1.77	1.3	1.34	0.87	0.90	0.72	0.75	0.84	0.88
Centre	***0.86***	***0.65***	***0.68***	***0.5***	***0.52***	***0.73***	***0.76***	***0.76***	***0.8***
Guanajuato	0.82	0.54	0.65	0.46	0.48	0.65	0.68	0.84	0.88
Hidalgo	0.79	0.62	0.83	0.43	0.45	0.66	0.69	0.61	0.64
Morelos	1.28	0.79	0.74	0.79	0.81	0.77	0.8	0.77	0.81
Puebla	0.87	0.7	0.72	0.53	0.55	0.65	0.68	0.69	0.73
Querétaro	0.76	0.51	0.53	0.41	0.43	0.86	0.9	1.14	1.2
State of Mexico	0.64	0.68	0.56	0.51	0.53	0.97	1.02	0.72	0.76
Tlaxcala	0.84	0.72	0.7	0.37	0.38	0.55	0.58	0.53	0.55
South	***0.6***	***0.4***	***0.41***	***0.4***	***0.41***	***0.59***	***0.52***	***0.51***	***0.53***
Chiapas	0.74	0.5	0.52	0.4	0.42	0.87	0.5	0.44	0.44
Guerrero	0.41	0.28	0.29	0.4	0.41	0.53	0.56	0.52	0.55
Michoacán	0.77	0.49	0.51	0.42	0.44	0.55	0.58	0.63	0.66
Oaxaca	0.46	0.31	0.32	0.36	0.37	0.4	0.42	0.45	0.48

Source: See Chapter 1.
(*) Oil production excluded.

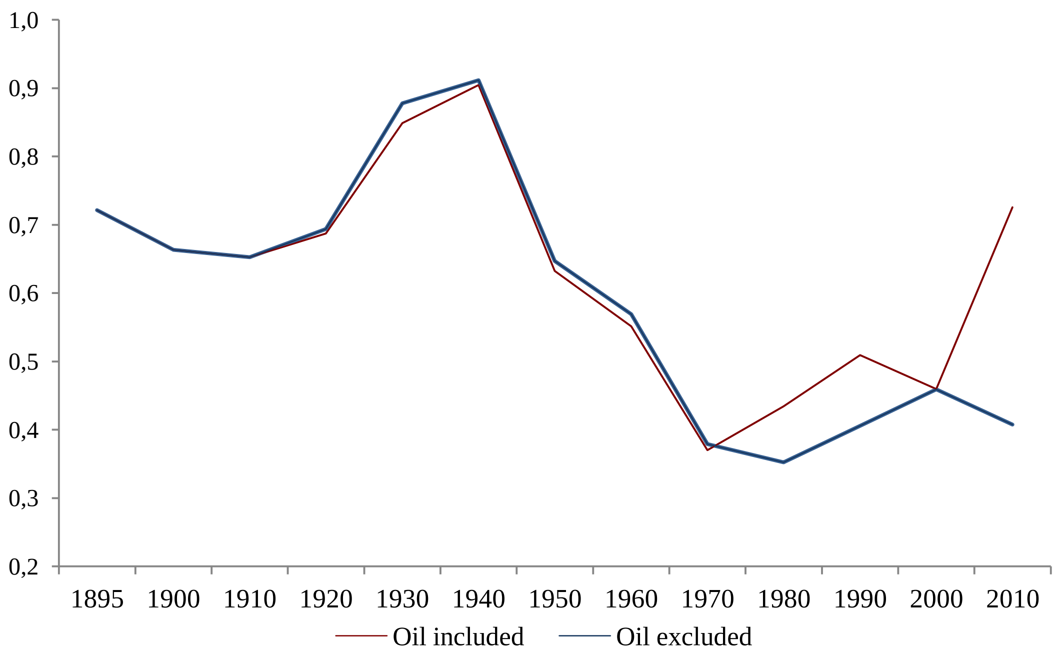
Map 3.1 Regional GDP per capita in Mexico, 1900 – 2010 (Mexico=1)



Note: The intervals displayed in the legend are obtained as follows: the relative values estimated for all years are put together and ranked from the highest to the lowest in order to construct one single vector. Finally, this vector was divided into five groups with the same number of observations.
Source: See text.

At the same time, other regions lost positions relative to the national average. This was the period in which the North/South income division was consolidated, since the south region lagged behind and would never significantly converge again with the national average (see Table 3.1). From the 1940s onwards, coinciding with the ISI model consolidation, an accelerated process of regional income convergence took place. This tendency continued until the economic liberalization of the 1980s. From then on, regional divergence has been a constant –with the exception of the 2000s. This recent divergence can be explained because, while the poorest states (mainly the south) have remained far below the national average income, the north-border region has kept its income advantage and some particular states, such as Guanajuato (Centre-north region), Querétaro (Centre region), and Quintana Roo (Gulf of Mexico region), have improved their income performance (Rodríguez-Oreggia, 2005). In addition, Mexico City's GDP per capita experienced an upswing pattern during this period (from 2.00 to 2.54 times the national average between 1980 and 2000).

Figure 3.1 Standard Deviation, 1895-2010. Mexico=1



Source: See text

The oil sector did not have any significant impact on regional disparities before the 1970s first oil boom. As Figure 3.1 shows, when oil production is considered, the reversal of the convergence process begins around 1970, only a few years before the breakpoint of the series without oil. The highest impact of the oil industry took place during the oil production boom of the last decade of the analysis (2000-2010). As a consequence, the inequality trend is totally different between both series during this decade. If oil production is included, the series shows a strong process of regional divergence (up to a level close to those of 1950). However, when oil is excluded, this was a period of slight income convergence among the states. From now on the analysis will be limited to the series without oil.[53]

These results are consistent with the interpretations suggested in previous analysis, with the only difference that, due to the scarcity of data, previous research had completely overlooked the first regional income disparity upswing (1895-1930). Rather, as mentioned before, most analyses have so far focused either on the convergence period under way from the 1940s onwards or, even more, on the inequality increase that took place after the economic liberalisation which started in the 1980s. Sánchez-Reaza and Rodríguez-Pose (2002), for instance, observe that, after controlling for possible biases related to the inclusion of oil-producing and *maquiladora*-based states, the economic openness period that started in 1985 appears to have led to a divergence process, in which the states closest to the US market have obtained the highest benefits. This hypothesis is also supported in Chiquiar (2005), who focus his analysis on the post-NAFTA period. The author stresses that the winners of the divergence process that was triggered by liberalization were those states that had a higher initial endowment of human and physical capital. These were mainly located in the North, and they could also have benefited from its proximity to the US market (Chiquiar, 2005: 258).

As has been indicated, previous literature has been mainly based on the traditional and β-convergence analysis, missing therefore some significant dimensions of the long-term evolution of regional income disparities.[54] Figure 3.2 presents several alternative income inequality measurements to the standard convergence analysis, such as the Williamson Index, the Gini coefficient, the Theil

[53] The literature on Mexican regional disparities has often warned against the bias associated to oil production. See, for instance, Esquivel (1999), Sánchez-Reaza and Rodríguez-Pose (2002), and Aroca et al. (2005). Due to its extremely high spatial concentration, the oil industry production could cause a distorted picture of some regions' income per capita, given that those regions may not really benefit from oil incomes.

[54] One exception is Aroca et al. (2005), in which the authors employ techniques taken from the spatial economics literature to describe the regional income growth in Mexico for the period 1985-2002.

index, and the Coefficient of Variation. The former is especially useful, since it takes into account the effect of each state's population on regional income disparities, by weighting deviations with population shares. Thus, less populated regions have a minor impact in the index (and *vice versa*).[55] Although the general trend is still the same as in the standard deviation, this index would suggest a slightly interruption of the convergence process during the 1950s. This may be explained for two main reasons. The first one is the comparatively good performance of Mexico City, by far the most populated region of the country (it concentrated 11.8% and 14.0% of national population in 1950 and 1960 respectively), and whose GDP per capita, relative to the national average, increased from 2.71 in 1950 to 2.76 in 1960. The second reason is the low population density of some of the rich states that were performing worse than the national average, such as Baja California Norte (with 0.8% and 1.4% of the national population in 1950 and 1960), Baja California Sur (0.2% in both years), and Quintana Roo (with 0.10% and 0.14% of the national population in 1950 and 1960). These states went from having a relative GDP per capita of 2.96, 1.22, and 1.99 in 1950 to 1.89, 0.96 and 0.50 in 1960, respectively. By contrast, during the 1960s Mexico City's GDP per capita converged with the national average (from 2.76 in 1960 to 1.95 in 1970), as did other highly populated rich states, such as Nuevo León, which had a relative GDP per capita of 2.13 in 1960, and 1.69 in 1970.

Both the Gini coefficient and the Theil index increase with income inequality. Once again, a N-shape pattern emerges in the long run. In fact, the trend shown by both indices is very similar, and follows closely the evolution of the Williamson Index. The earlier twentieth century remains as the period of fastest regional income divergence, and the maximum levels of inequality were reached in 1940, much later than in most industrialized economies or Spain but earlier than in other European peripheral countries, such as Italy or Portugal.[56] The levels of the Gini and Theil indices in Mexico are relatively high in comparison with those found in the

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[55] The Williamson index, proposed in Williamson (1965), is calculated as follows:

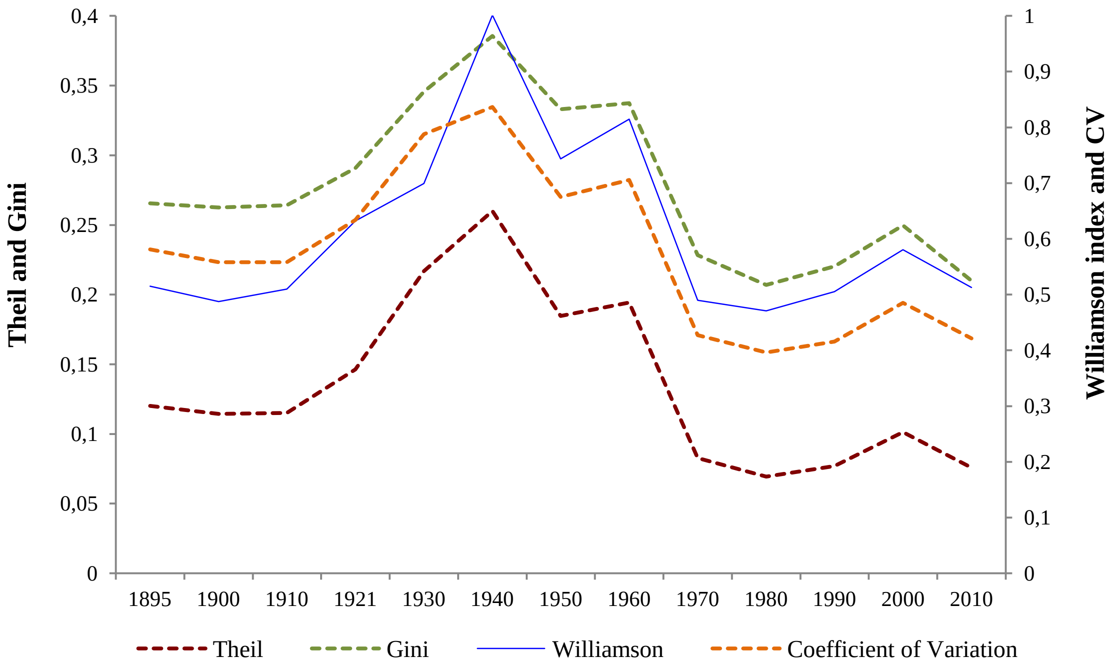
$$WI = \sqrt{\sum_{i=1}^{n}\left(\frac{y_i}{y_m}-1\right)^2\frac{p_i}{p_m}}$$

where y is income per capita, p is population, and i and m refer to the i-region and the national total, respectively.

[56] In Italy, the Williamson index of regional inequality reached its maximum level in 1951 (Felice, 2011), and in Portugal the Gini index reached its maximum in 1970 (Badia-Miró, et al., 2012: 232).

international literature. For instance, the maximum value of the Gini index in Italy, Spain and Portugal in the long term was around 0.21, i.e. half of the maximum value reached in the Mexican case. The Theil index offers similar results: while the maximum value in the Mexican case was close to 0.25, the Spanish and Portuguese maximum values were 0.17, and 0.04 respectively (Rosés et al., 2010: 254; Badia-Miró, et al., 2012: 232).[57] Finally, the trend followed by the Coefficient of Variation is also the same as in the other indicators. An international comparison of CV levels reinforces the idea that Mexico had higher levels of regional income inequality than Western European countries and the US. Following Crafts (2005), Britain's CV values, which have been regularly used as a reference for the core economies, ranged between 0.10 and 0.25 in the long term (1871-2001). Meanwhile, in the Mexican case CV values have ranged from 0.39 to 0.83.

Figure 3.2 Inequality index: Theil, Gini, Williamson and Coefficient of Variation, 1895-2010.



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[57] Differences in the number and scale of the spatial units in each country are a potential limitation in this comparison. However, the number of Mexican states (36) lies in between the number of Spanish provinces (50) and the number of Portuguese districts (18) and Italian regions (19).

3.3.2 *Regional income concentration*

Figure 3.3 shows the Herfindahl-Hirschman Index (HHI) of Mexican regional incomes and the share of Mexico City within the national total GDP. The HHI offers an alternative approach to regional income disparities, since it does not take into account each state's relative GDP per capita, but the share of each state within national GDP, measuring therefore the level of spatial concentration of national income. The HHI is defined as:

$$H_j^C = \sum_{i=1}^{N} \left(\frac{X_{ij}}{\sum_{i=1}^{n} X_{ij}} \right)^2 \qquad (3.1)$$

where X_{ij} is GDP in region *i* and sector *j*.

Figure 3.3 Herfindahl-Hirschman Index, 1895-2010 and the Share of Mexico City GDP in national GDP

Source: See text

This index ranges from 1 (when all activity is concentrated in one region) to 1/n (when the activity is equally distributed among the *n* regions of a country). In Mexico, the index follows an 'inverted-U' pattern, in which the divergence process of the period 1980-2010 is missing. In addition, the initial process of increasing concentration lasts until the 1960s, and not until the 1940s as in the case of the previous indices. Both differences respond to one fact: the economic importance of Mexico City, the biggest economic centre of the country. As Figure 3.3 shows, there is a close correlation between both series.[58]

The trend displayed by the HHI, together with Mexico City's GDP share, complements the description made in section 3.2. Previous literature has insisted that the ISI model (1930-1980) boosted the concentration of economic activity in Mexico City. However, the figure shows that this process started earlier, in the 1910s, during the export-led growth model. Concentration in the capital reached its maximum in 1960, and the sudden decrease of the HHI and the Mexico City's GDP share during the 1960s can be partially explained by the behaviour of the State of Mexico, which was by then becoming, to a large extent, an extension of Mexico City. So, while Mexico City lost 10.7 percentage points of participation in the national GDP from 1960 to 1970, the State of Mexico won 4.8 points in the same period.[59]

This pattern changed from 1980s onwards, when both Mexico City's and the State of Mexico's GDP shares fell. From 1980 to 2010, they lost 7.6 and 1.2 percentage points of participation in national GDP, respectively. The 'winners' in this period, as mentioned before, have been those states that could benefit most from the economic openness policy. The main ones were the north border states, led by Nuevo León, which won 2 points of national GDP since 1980, and also some central and southern states, such as Guanajuato, Querétaro and Quintana Roo, which won 1.2, 0.9 and 1.2 percentage points of participation in national GDP from 1980 to 2010. In Guanajuato and Querétaro, large foreign investment has contributed to the development of the capital-intensive industrial sector, whereas the Quintana Roo case has benefited from the development of tourism.

[58] This is rather usual in countries in which one economic centre concentrates a large part of total GDP. See, for instance, the case of Chile and its capital Santiago (Badia-Miró, 2015).

[59] The rest of Mexico City's GDP share lost was distributed among several states, causing marginal changes in their GDP shares. The only exception to this pattern was the state of Jalisco, which won 2.5 points within national GDP in the same period.

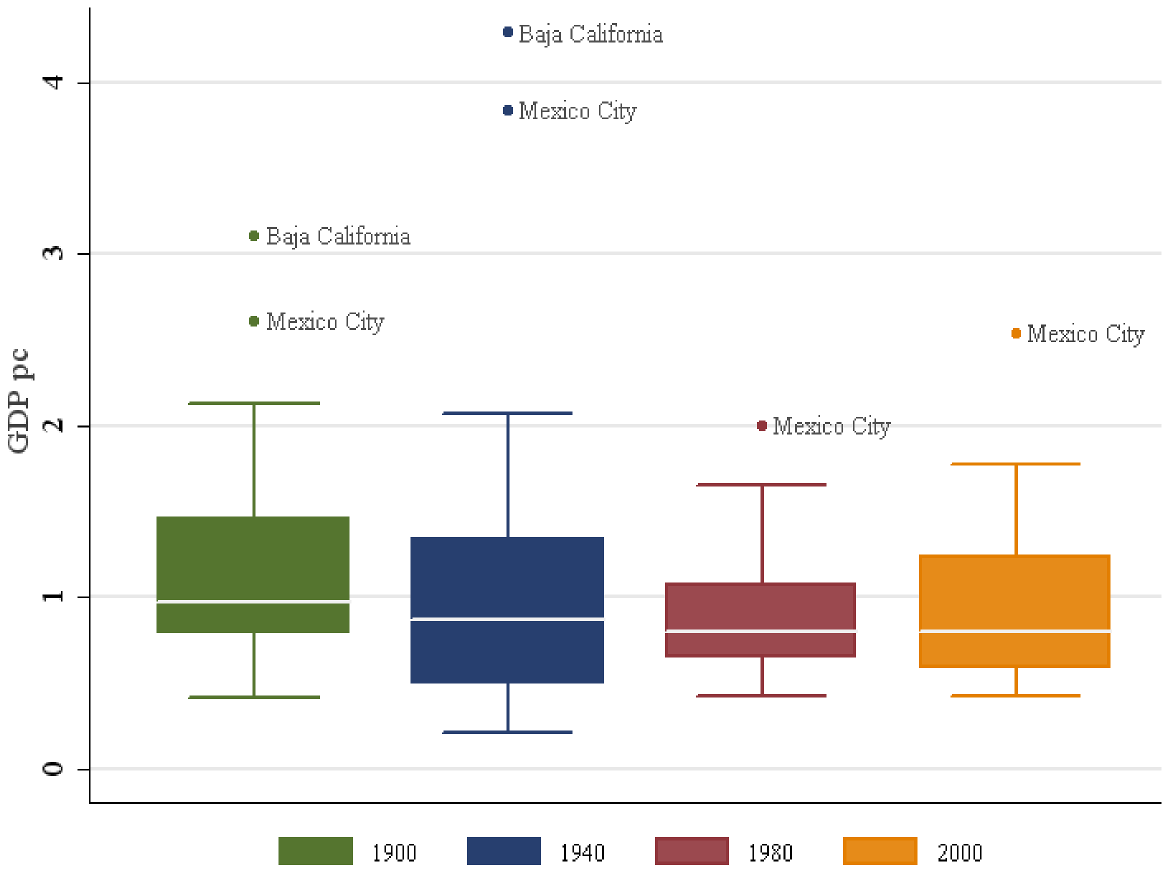
Summing up the evidence in Figure 3.1 to 3.3, it is interesting to observe that the increasing concentration of economic activity in Mexico City was accompanied, at least since 1940, by a regional convergence process, which brought the southern regions close to Mexico City in terms of average productivity. There are two potential explanations of this convergence. Firstly, the concentration of industry in Mexico City boosted the agglomeration of other activities with low productivity levels, mainly within the service sector. Secondly, productivity in the primary sector of the southern regions increased substantially, due to large migration flows to the rest of the country. By contrast, the dispersion of industrial activity in the most recent decades has not been accompanied by income convergence, as in most industrialized economies, but by divergence, since industry has tended to move towards regions with relatively higher income per capita levels.

3.3.3 *Regional distribution dynamics*

All the indices estimated so far have shown the evolution of regional income inequality in Mexico in the long run. Nevertheless, as Quah's (1993) seminal work stressed, the classical convergence approach (Barro, 1991, and Barro and Sala-i-Martin, 1992) is unable to capture some crucial features of regional inequality, such as distributional dynamics. To address this issue, I present in the next paragraphs some indicators of the regional distribution of economic activity in Mexico. To start with, Figure 3.4 presents a few box-plot graphs of regional GDP per capita figures. These graphs offer a very illustrative picture of the regional income distribution for those years in which there was a break in the evolution of regional income inequality (1900, 1940, 1980, 2000).[60] For instance, during the early divergence process, before 1940, the interquartile range increased, driven by the relatively poorer states becoming even poorer. In fact, both the median income and the lower values dropped in relative terms.

[60] Box-plot has three main components: the box, the whiskers, and the outliers (or the extreme values). The box is the interquartile range (IQ), being the distance between the 25th and 75th percentiles. The line within the box represents the median income. The whiskers represent the upper and lower values: the upper/lower value is the largest/smallest data point less/greater than or equal to the 75th/25th percentile value plus 1.5*(IQ). The values out of the whiskers are considered extreme values, and are plotted individually (i.e., these values are not considered in the percentiles).

Figure 3.4 Box-plots estimates: 1900, 1940, 1980 and 2000. (Mexico=1)



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On the other hand, quite surprisingly, the upper value, together with the 75th percentile, remained fairly the same. The only group of states that actually increased the income level were the top extreme values (Baja California and Mexico City), which achieved, as mentioned before, values up to 3 or 4 times the national average. Later on, the strong process of convergence between 1940 and 1980 is also reflected in the main components of the 1980 box-plot. Not only the interquartile range is the narrowest over the long run, but also the lowest and upper values, including the extreme values (in which only Mexico City remains), tended to concentrate around the national average. This suggests that σ-convergence was driven by both the poorer states improving their economic performance and the richer states falling towards the national income average.[61] Finally, during the divergence period that started in 1980, the interquartile range increased again, mostly because of the rich states and Mexico

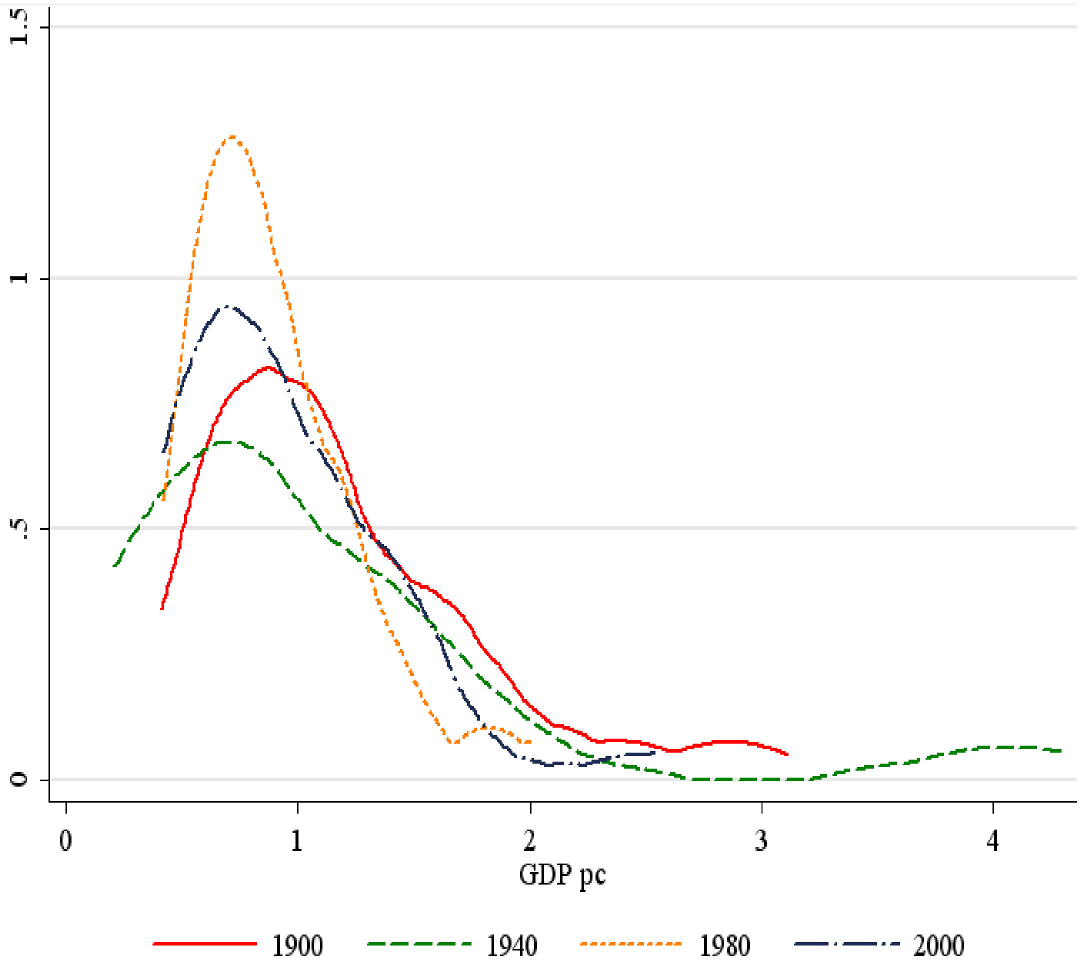
[61] As mentioned in Section 3.2, this was the period in which Mexico achieved its fastest economic growth over the long term. Therefore, as the values are presented in relative terms, having the richest states falling towards the national mean does not imply that those states became poorer.

City moving farther away from the national average, where the incomes of the poorer states remained rather stable in relative terms.

Figure 3.5 shows the Kernel distributions for each of those years, as a complement of the box-plot analysis. The shapes of the curves are also in line with the income inequality trends describe in Figure 3.2. So, the year with the greatest income inequality (1940) is also the year in which the peak of the distribution was lower, reflecting a very wide dispersion of regional income per capita figures. Instead, when regional disparities achieved its minimum (1980), the distribution was much more concentrated and, therefore, had a highest peak. It is interesting to observe that in 1900 and 2000 the shape of the distribution was very similar, which is consistent with the very similar levels of inequality in those two years (see Figure 3.2). Finally, an examination of the 1940 and 1980 density curves, suggests that the income convergence process that took place between those years was led by the rich states (namely, the north-border states and Mexico City) falling towards the national average, and in a lesser degree to an improvement in some non-rich states, such as the southern and some central regions.

The Kernel distributions also show that a few states always had levels of income significantly higher than the rest of the country, causing the rise, though in different degrees throughout the period, of the twin peaks described in Quah (1997). This was specially marked in 1940 (the year of the highest level of income inequality), in which the GDP per capita of Mexico City and Baja California reached their maximum relative value (3.84 and 4.29 times the national GDP per capita, respectively). This is reflected in a long right-tail of the distribution, which was accompanied by a relatively long left-side, suggesting that 1940 was also the year in which the poorest states' relative position was worst. By contrast, although it is also clearly bi-modal, the 1980 distribution is the narrowest. Once again, this reflects the relative high level of the GDP per capita of Mexico City. The new divergence process from the 1980s onwards is once more reflected in a lower peak and an increasing dispersion of the right tail of the distribution.

Figure 3.5 Kernel distribution estimates: 1900, 1940, 1980 and 2000



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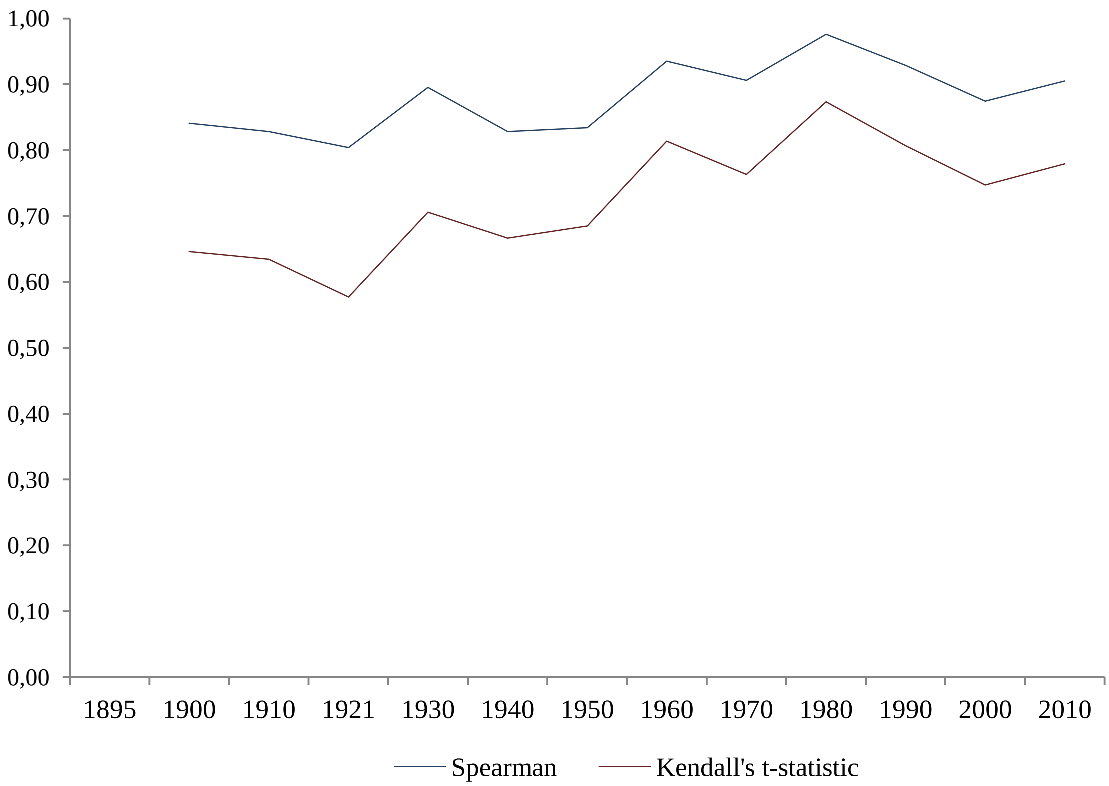
3.3.4 *Rank income mobility*

Kernel densities provide relevant information for a complete understanding of income distribution, but they do not give information on the transition from one snapshot to another (Aroca et al., 2005: 349). It would be important, for instance, to know if the states at the end of the right tail of the distribution were always the same, or whether there is a random behaviour, with states moving up and down the distribution. In order to provide an insight of the states' rank mobility, Figure 3.6 presents the Spearman and Kendall's τ-statistic.[62] The Spearman correlation and the

[62] The Spearman coefficient of correlation is calculated as: $\rho = 1 - \frac{6\sum d^2}{n\,(n^2-1)}$, where n is the size of the sample, and d is the difference between the rank scores of two variables X and Y (in our case, the income rank in two different periods). Kendall's τ-statistic considers the degree of concordance in the rankings of all pairs of observations for two variables. In the context of regional income mobility, the first variable would be the regional incomes for the initial year, while the second would be the incomes in the end year of the interval period. If two regions have the same relative rankings in both periods that pair is said to be concordant. However, if the relative rankings of the two switch over the

Kendall's τ-statistic range from -1 to 1. In both cases, the higher the coefficient, the lower the rank mobility (being 1 the value representing no mobility).[63] In the Mexican case, rank mobility was very low in the long run, which is consistent with the general picture provided in Table 3.1, and supports the idea of a persistent north-south regional income division.

Figure 3.6 Spearman and Kendall's τ-statistic, 1895-2010



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Furthermore, there is not a clear correlation between the periods of σ-convergence or divergence and the evolution of rank mobility. While all income dispersion indices confirm the N-shape trend in the long run, both the Spearman and Kendall τ-statistics experience a constant increase. The only exception is the period of stagnation or slight decrease of the indices from the 1980s to the 2000s, which could be related to the process of economic openness and the cases of successful

interval, then the pair is discordant. Kendall's τ- statistic is measured as: $\tau = \frac{N_c - N_d}{(n^2 - n)/2}$, where n is the number of observations, N_c is the number of concordant pairs, and N_d the number of discordant pairs. With n observations there are $(n^2 - n)/2$ pairwise comparisons to be made.

[63] In the Spearman coefficient, d^2=0 leads to $\rho = 1$, while in the Kendall's τ-statistic, if $N_c=(n^2 - n)/2$, and therefore $N_d=0$, $\tau=1$.

states that might be affecting the national ranking (such as Guanajuato, Querétaro, Quintana Roo, and some north border states which were 'falling-behind' during the ISI period).

3.4 A spatial econometrics analysis: Moran's I

3.4.1 *Global Moran's I*

This section aims at testing, through the estimation of the Moran's *I* statistic, whether the distribution of regional income has been characterized by statistically significant spatial autocorrelation over the period under study. High spatial correlation would be associated to a high level of spatial *clustering* of either rich or poor regions. When there are significant levels of spatial clustering, it means that the income observed in one state is relatively close to the income of the neighbouring states. In the opposite case, in the absence of statistical significant correlation, the incomes of neighbouring states are randomly distributed. The global Moran's *I*-statistic is calculated as: [64]

$$I_t = \frac{n}{S}\frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij} z_i z_j}{\sum_{i=1}^{n} z_i^2} \text{ ,} \forall\, t = 1, 2, \dots, T \qquad (3.2)$$

where n is the number of states, w_{ij} are the elements of a binary contiguity matrix (that take the value 1 if the states *i* and *j* are neighbours by sharing a common border, and 0 otherwise), S is the sum of all the elements of w_{ij}, and z_i and z_j are normalized vectors of the log of per capita GDP of states *i* and *j*.

I_t is actually an average of N "local" Moran indicators (equation 3.3), measured at the state level and which allows analysing spatial clustering among neighbouring states:

$$I_i = \frac{z_i \sum_j w_{ij} z_j}{\sum z_i^2 / n} \qquad (3.3)$$

[64] For a detailed description of Moran's *I*-statistic and other spatial statistics techniques applied to economic growth see Rey (2001), and Anselin et al. (2004).

Moran's *I-statistic* allows analysing whether the north/south persistent income division observed in the Mexican case has encouraged the development of spatial clusters in the long term, i.e., whether these patterns have gone hand in hand with a statistically significant income spatial autocorrelation among the rich/poor states. In the Mexican case, Aroca et al. (2005), and Germán-Soto and Escobedo (2011), have used these techniques for the most recent decades. While Aroca et al. aim to analyse the impact of economic openness on spatial distribution (1970-2002), Germán-Soto and Escobedo extend their research to 1940-2005. Both studies share the same conclusion: there has been a persistent low-income cluster in the south of the country during the entire period under study. Nevertheless, Aroca et al. (2005) do not find statistically significant spatial autocorrelation in other areas of the country, while Germán-Soto and Escobedo observe the existence of high-income clusters of some northern and central estates. This difference might be explained by the different GDP per capita database used by those authors. Aroca et al. (2005) introduced several corrections to the INEGI database, mainly related to the allocation of oil production, and also to the population data of some particular states in some years. Instead, Germán-Soto and Escobedo (2011) used the database presented in Germán-Soto (2005), in which, as mentioned before, there was no correction for oil production.

In this chapter, I extend the time span further to cover all the period 1895-2010. In addition, I use a different database, which excludes oil production for the entire period by applying a homogenous methodology. The results are shown in Figure 3.7 (global Moran's I estimate) and Map 3.3 (local Moran's I –clustering-).[65] As can be seen in the figure, the global level of spatial autocorrelation decreased at the beginning of the period to remain rather constant from 1910 onwards. The relatively high value of the global Moran's I in 1895 can be explained, essentially, by the presence of a cluster of high-income states in the north (Baja California Norte, Sonora and Sinaloa) which disappeared from 1900 on. After 1900 no other significant high-income cluster of states appeared in Mexico, and the levels of spatial

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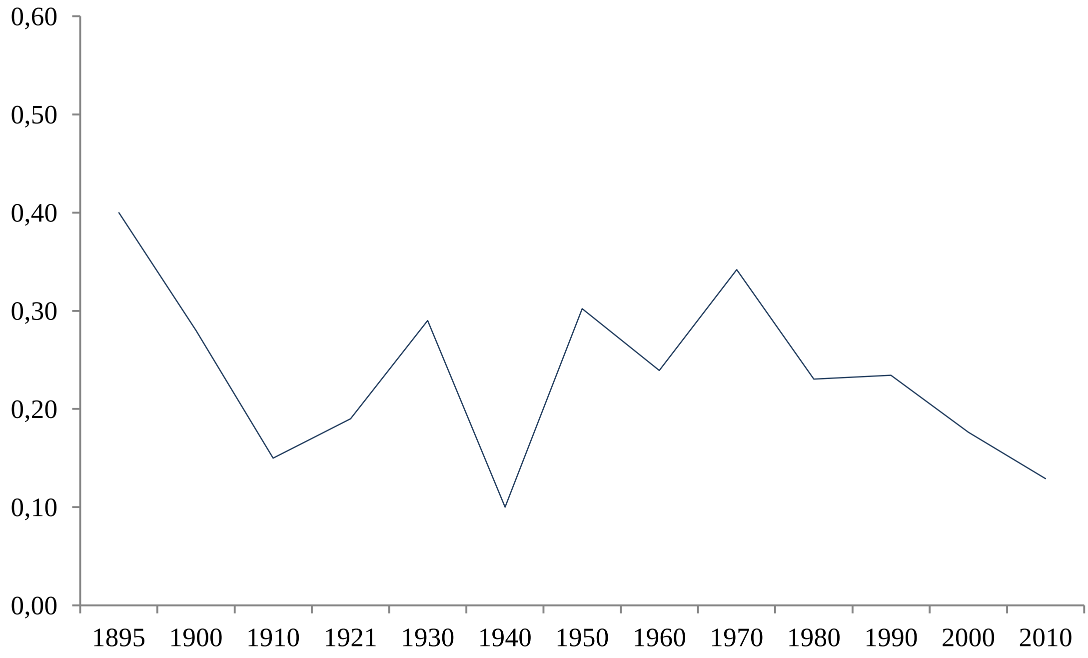
[65] As my state GDP per capita estimates for the period from 1895 to 1930 consider both Baja California territory (North and South) as a single state, as well as Yucatan and Quintana Roo (see chapter 2), I have removed from the Moran's I analysis of that period Baja California South and Quintana Roo. The other alternative is to assign the same income values to Baja California North and Baja California South, and to Yucatan and Quintana Roo. This strategy, however, could bias the Moran's I results, since it would artificially impose perfect spatial income autocorrelation between two pairs of neighbouring states.

autocorrelation remained rather low, being mainly explained by similarities among neighbouring (poor) southern states, see Map 3.3. Unlike what has happened with income inequality, the low level of autocorrelation was not significantly affected by changes in the economic policy model over the long term.

Figure 3.7 Global Moran's I (weighted by contiguity), 1895-2010



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3.4.2 *Local Moran's I*

In order to illustrate spatial autocorrelation, Map 3.2 plots the statistically significant income clusters for the following benchmark years: 1900, 1940, 1980 and 2000. The maps confirm that, despite their relatively good economic performance, north-border states have not been consolidated as a rich cluster through the entire period. For a north-border income cluster to emerge it would have been necessary, due to the contiguity technique used as the basis of the spatial weighting matrix, not only to have a significant spatial income autocorrelation across the north-border states themselves, but also with their neighbouring states, namely the 'second-line' northern states (Sinaloa, Durango, Zacatecas and San Luis Potosí). This condition was not met during the period under study. Instead, spillovers form the north-border states to the 'second line' northern states has not been strong enough to boost a statistically significant high-income cluster in the northern region. On the contrary, income levels decreased rapidly with the distance from the border (See Table 3.1), which is consistent with the fact that the relatively good economic performance of the north-border states is largely related to their integration with the US market. In this sense, Hanson (2001), using data on the 10 major Mexican-US border-city pairs, has observed that the growth of export manufacturing in Mexico can account for a substantial portion of employment growth in US border cities between 1975 and 1997.[66] In other words, the backward and forward linkages of the main economic activity of northern regions (manufacturing) have been largely located in the US market, especially since the increase in economic openness that started in the mid-1980s.

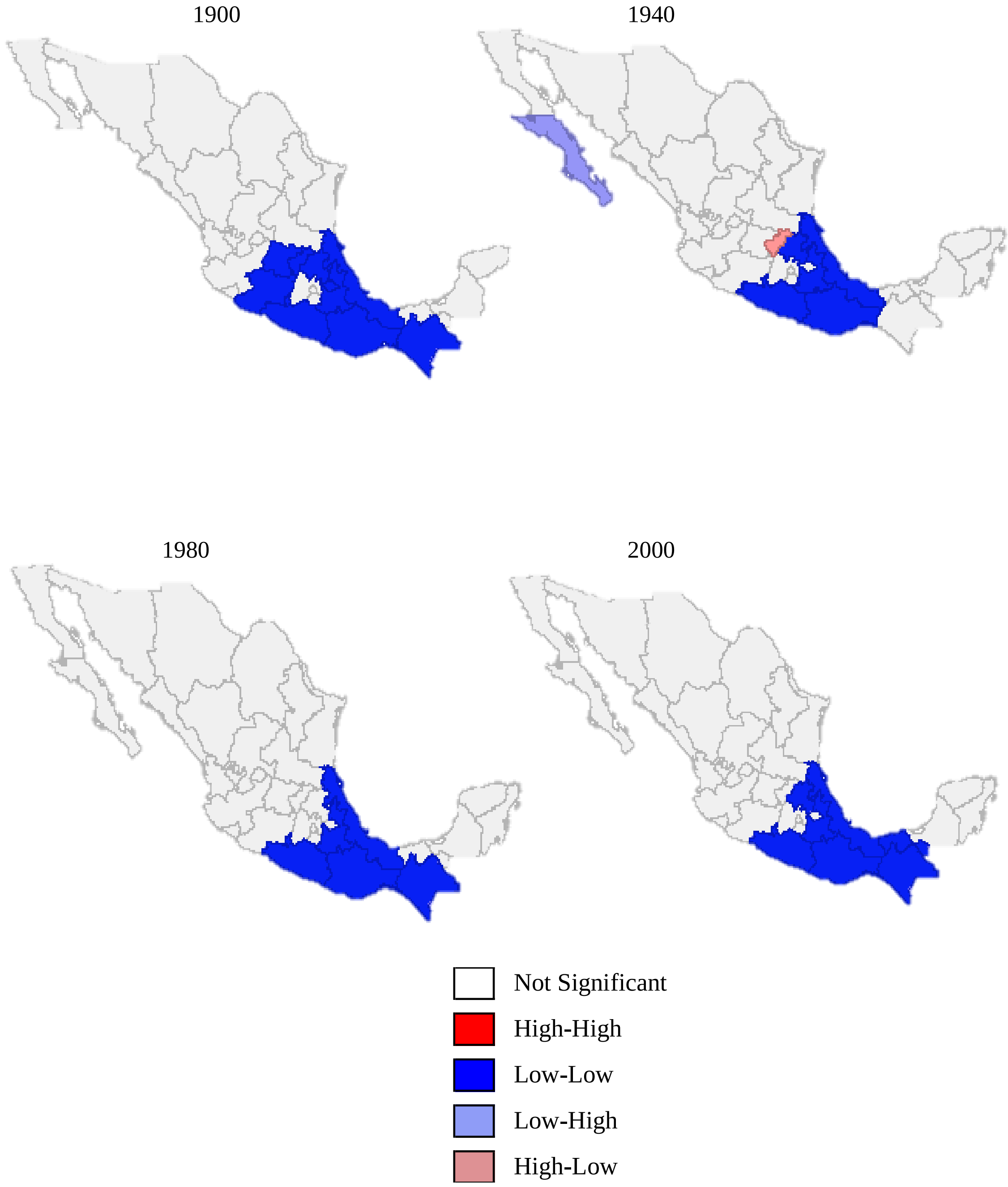
By contrast, the existence of a persistent poor income cluster formed by the southern states is unquestionable.[67] Map 3.2 indicates that the poor-income clustering of the southern states has not specific of a particular period but has been a persistent feature of the country's regional distribution, in which the southern region seems to be trapped in a long run dynamic of poor economic performance.[68] This finding is consistent with Aroca et al.'s (2005) suggestions for the early years of economic openness (1985–2002). These authors consider the consistently poor income of the southern cluster as the central element behind the divergence process that has taken place since the beginning of the liberalization process and, especially, since the signature of NAFTA (Aroca et al., 2005: 372).

[66] On the other hand, Hanson (2001: 285) did not find statistically significant correlation between local employment in the U.S. interior cities and Mexican export production.

[67] The case of Querétaro in 1940 (light-red state) is a particular case of a rich state (Querétaro) surrounded by very poor states. By 1940, Querétaro had a GDP *per capita* 1.16 times as large as the national average. On the other hand, the equivalent figures in its neighbouring states, Hidalgo, San Luis Potosí, Guanajuato and the State of Mexico, were 0.51, 0.56, 0.50, and 0.49, respectively.

[68] Internal migration flows have played an important role in the evolution of regional inequality, especially during the State-led industrialisation period of regional convergence (see next chapter). Nevertheless, this process was not enough to change the clustering pattern observed over the long term..

Map 3.2 Local Moran's I. Significant Clustering Maps: 1900, 1940, 1980 and 2000[69]



Source: Own elaboration, using GeoDa

[69] These clusters are derived from the local Moran's I- statistic and are statistically significant at the 5 per cent.

Map 3.2 also shows that Mexico City, despite its historical economic dynamism, has been unable to foster the formation of a statistically significant cluster in the centre of the country. In other words, Mexico City's economic dynamism has not been strong enough to spread to the neighbouring states, not even during the ISI period, when economic concentration in Mexico City achieved its maximum (see Figure 3.3). Similarly, the recent dynamism of Quintana Roo has not affected its neighbouring states (Yucatán and Campeche).[70] These examples, together with the north-border states experience, suggest that, in the Mexican case, having rich neighbours does not involve a greater chance of being prosperous.[71]

3.5 Concluding remarks

This chapter has offered new evidence of the evolution and dynamics of regional inequality in Mexico over the long run (1895-2010). Mexican regional inequality has been characterized by a long-lasting north-south regional income division. Against this persistent background, over time Mexican regional inequality has followed an 'N'-shape trend, which largely matches the different economic models that have been adopted in Mexico. Thus, the years of export-led growth, from the late 19th to the 1930s, were characterized by a strong regional divergence process, which had been overlooked by the previous literature on the topic. By contrast, during the ISI period (1940-1980), there was intense convergence among the Mexican regional economy and, finally, in the context of increasing international integration that started in the 1980s, divergence has again been the norm. Beyond those fluctuations, and regardless the historical period under consideration, regional inequality in Mexico has always been comparatively high.

The Herfindahl-Hirschman Index indicates that Mexico City's economic performance has been the main force behind the spatial concentration of economic

[70] This is largely a consequence of the location-specific character of tourism, which is the main engine behind Quintana Roo's economic growth.

[71] Recently, Tirado and Badia-Miró (2014) have also used this technique for the Iberian case from an historical perspective. The authors conclude that, unlike Mexico, Iberia has experienced an increasing spatial correlation in the long run, which can be seen in the permanent increase in the values of both the global and the local Moran's *I* statistics (led by the expansion of both rich and poor regions). However, they also find an administrative capital effect with no diffusion to the closest regions, as in the case of Mexico City.

activity in the country. The gradual increase in concentration started in the early 1900s and reached its maximum ca. 1960, during the ISI period. Interestingly enough, and unlike what happened in the Western European economies and the US, increasing concentration during the ISI decades was accompanied by strong regional income convergence, which would contradict both the Williamson curve and the NEG predictions.

As shown by the box-plot analysis, the early process of Mexican regional divergence, from the late 19th century to ca. 1940, was driven not only by the richest states becoming richer, but also by the poorest regions becoming relatively poorer. By contrast, the subsequent convergence was mainly associated to the rich states falling towards the national average income levels and, to a much lesser degree, to the improvement of the poorest states' positions. The Kernel densities confirm these conclusions, and suggest the rise of twin peaks explained in Quah (1997) during the entire period. Finally, the Spearman and Kendall's τ-statistics show a very low mobility throughout the period, which would be consistent with the idea of persistent spatial income distribution.

Such persistence has been confirmed by the Moran's *I* statistic of spatial autocorrelation, which show a permanent statistically significant income cluster of poor southern states. By contrast, the presence of spatial clustering in the northern region is rejected by the tests, which indicates that the relatively good income dynamic of the north-border states, clearly associated to their integration with the US market, has not spread to the neighbouring region. Likewise, the high income of Mexico City has not radiated to other central states, not even during the ISI period, in which economic activity greatly tended to concentrate around this city.

Chapter 4

Explaining Regional Inequality from the periphery: the Mexican case, 1900-2000[72]

[72] I thank the participants at the seminar "Desigualdad Económica Regional en Perspectiva Histórica: Europa y Latinoamérica", held at the University of Valencia, Spain. I wish to thank Julio Martínez-Galarraga, Daniel Tirado and Joan Rosés for their very useful comments on this chapter.

Abstract

Economic Historians have paid close attention to the long term evolution of regional inequality. Nevertheless, so far research has largely focused on industrialised economies, neglecting to a large extent the experience of low- and middle-income countries. This chapter aims to provide, using a new regional labour productivity database, evidence on the determinants of regional income inequality changes in Mexico from 1900 to the present. Different forces have driven regional inequality in each historical period. During the primary-export led-growth period of the first globalization (1900-1930) differences across regions in the intensity of structural change caused an increasing divergence. From 1930 to 1980, during the State-led Industrialisation, internal migrations contributed to a strong process of regional convergence in productivity, both in the within and the between-sector components of regional inequality. Finally, the increasing regional divergence that has taken place from 1980 onwards has been mainly an effect of the operation of labour productivity differentials within each sector.

4.1 Introduction

As has been indicated in the introductory chapter, there is a growing economic literature dealing with the reasons of regional income inequality. Different theoretical approaches have suggested alternative explanations on how regional inequality evolves, and on the mechanisms behind its trends.[73] The Neoclassical Growth model (on the basis of the Solow model), under the assumption of diminishing returns to both physical and human capital, predicts regional convergence as a result of the reduction of the differentials of capital-labour ratios across regions. Secondly, under the same assumption, the Heckscher-Ohlin neoclassical trade theory suggests that regional disparities are determined by differences among regions in factor endowments and relative input prices. In that context, economic integration and factor mobility generates convergence through the equalization of factor prices, and the reduction in factor endowment differences (Slaughter, 1997). On the other hand, Endogenous Growth Theory and New Economic Geography (NEG), based on the assumption of increasing returns are much less optimistic about the impact of market integration on convergence. In fact, both of them predict an initial process of regional divergence. Finally, some researchers have highlighted the importance of structural change as a source of regional income convergence. The basic idea is that, considering the reallocation of resources from low-productivity to high-productivity sectors as a source of growth, convergence would result from low-income regions undertaking a fast process of structural change.[74] At some point, regions initially specialised in low productivity sectors start their own process of structural change (from low value-added sectors towards higher value-added ones) due to the reduction of labour reallocation costs (such as transport costs and the costs of acquiring non-agricultural skills), as well as increasing interregional factor mobility.[75]

[73] See the introductory chapter (section 1.2).
[74] Structural change is typically explained by two mechanisms: "1) an income elasticity of the demand for farm products less than one, and 2) faster TFP growth in farming relative to other sectors in the economy, (…) since fewer workers are needed to produce the same amount of farm goods" (Caselli and Coleman, 2001: 586).
[75] Even though the model proposed in Caselli and Coleman (2001) does not rely on interregional factor mobility, there is large evidence suggesting that this condition has played an important role in the process of structural change (see Williamson, 1965; Enflo and Rosés, 2015).

Economic History has recently provided increasing evidence on regional inequality trends and its determinants in the very long term, which allows testing the different theoretical predictions. This literature has mostly focused on high-income economies, such as the European countries and the US, for which industrial location has been the central factor driving regional disparities. However, a few recent works have also shed some light on the long-run trends of regional income inequality in peripheral economies, especially from Latin America and Asia. Generally speaking, one may conclude that, in the long run, there has been neither a common trend (although several of those economies have experienced the inverted-U pattern suggested by Williamson), nor a unique explanatory factor behind regional income inequality.[76]

Moreover, it seems clear that there are significant differences between low and middle-income economies and industrialised ones that must be considered when explaining the evolution and causes of regional inequality in the long run. Firstly, unlike what happened in industrialised economies, the location of manufacturing and high value-added services and the presence of agglomeration economies might not be the main source of regional income disparities in low-income countries. Instead, primary activities, the exploitation of natural resources, or FDI location may perform a central role over the long term. Secondly, small peripheral countries usually have a greater dependency on the international economy (through the demand and/or price fluctuations of commodities), which has important spatial implications.[77] Furthermore, low and middle-income economies tend to have, compared to industrialised ones, higher differences in economic structure across regions, which makes the analysis of regional development more complex.[78]

This chapter aims at contributing to this literature by providing new evidence on another peripheral country: Mexico. In this chapter I use a new long run database of regional labour productivity, which allows tracing the evolution and explanatory

[76] The main findings of the different European case studies can be seen in the introductory section 1.3.
[77] In this regard, Rodríguez-Pose and Ezcurra (2013) have shown a positive association between the degree of economic openness and the magnitude of within-country regional disparities. Moreover, the authors show that the effect of economic globalization on regional disparities is greater in low and middle-income countries.
[78] This is relevant to the Economic Growth literature because, as has been pointed out by Barro et al. (1995: 103), so far most empirical support for convergence has been derived from economies with similar regional structures, such as the US and the European countries. Thus, more evidence on long run experiences of economies with uneven spatial structures could be very illustrative in order to test some of the main theoretical predictions on the evolution of regional inequality.

forces of Mexican regional inequality since the early 20th century. In the next pages, I show that productivity inequality across Mexican regions has followed a N-form trend in the long run which, in turn, has been closely correlated to the main institutional changes adopted in Mexico from 1900 onwards. In addition, following the convergence decomposition proposed by Caselli and Tenreyro (2004), I show that structural change and neoclassical forces have determined the evolution of Mexican regional inequality during the 20th century.

The rest of the chapter is structured as follows. Section 4.2 presents the new regional GDP per worker database (1900 – 2000) and the main features of the long-term evolution of Mexican regional inequality in productivity. In Section 4.3, I study the determinants of regional disparities through an analysis of convergence decomposition into three components: within-industries inequality, labour reallocation, and between-industries inequality. On the basis of this analysis, in section 4.4 I suggest some explanatory factors of the process of regional convergence (or its absence) during the 20th century. Finally, section 4.5 concludes.

4.2 Mexican regions' labour productivity by sector: A new database, 1900-2000

Using my new GDP *per capita* database, the previous chapter has described several dimensions of regional income disparities in Mexico from 1895 to 2010. There I show that, despite a persistent north-south division (reflected in very low mobility indicators), regional income inequality has followed a N-form trend over the long term. This has been closely related with the different development models adopted in Mexico since the early stages of national market integration. Thus, regional disparity increased during the periods of higher international integration (the primary-export-led growth model from 1895 to the 1930s, and the most recent period of economic openness starting in the 1980s), and decreased during the State-led Industrialisation period of that took place between 1930s and the 1970s. In contrast with the experience of high-income countries, in Mexico regional convergence was accompanied by a process of spatial concentration of industrial activity. On the other hand, the results of a spatial correlation analysis of income levels suggest a statistically significant clustering of poor southern states, while the richest regions (Mexico City and the northern states) did not develop any high-income cluster around them.

Map 4.1 Mexican macro-regions[79]

Source: Own elaboration using QGIS software.

In order to analyse the determinants of Mexican regional disparities from a longer perspective, in this chapter I present a new database of labour productivity (GDP per worker) at the state level.[80] Labour productivity figures have been constructed as follows. Firstly, national GDP, taken from the Maddison project database (Maddison, 2013), has been distributed among states in each benchmark

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[79] The definition of the macro-regions identified in Map 4.1 is based on both geographical and economic characteristics (see Table 4.1) and has already been used in previous research on Mexican regional inequality (Esquivel, 1999). The macro-regions are composed by the following states. *North*: Baja California Norte, Chihuahua, Coahuila, Nuevo León, Sonora, and Tamaulipas; *North-Pacific:* Baja California Sur, Colima, Jalisco, Nayarit and Sinaloa; *Centre-North:* Aguascalientes, Durango, San Luis Potosí and Zacatecas; *Gulf of Mexico*: Campeche, Tabasco, Quintana Roo, Veracruz and Yucatán; *Centre*: Guanajuato, Hidalgo, Morelos, Puebla, Querétaro, State of Mexico and Tlaxcala; *South:* Chiapas, Guerrero, Michoacán and Oaxaca. Mexico City, due to its population size, is considered as an additional macro-region.

[80] Mexican states are the equivalent to NUTS 2 according to the European classification. Throughout this chapter, *state* and *region* are treated as synonyms.

year, on the basis of my own state GDP shares for 1900-1930, and Germán-Soto's (2005) estimates for 1940 to 2000. I have then disaggregated each regional GDP figure into five economic sectors: agrarian activities, mining, oil, industry, and services. In this sense, the oil sector includes the extraction of crude oil and natural gas. This sector has been removed from the analysis in this thesis, to avoid distortions in the study of regional disparities. This is because oil production, which is extremely concentrated in certain areas, account for a significant share of these areas' GDP over time, but very little impact on their local economic development (OECD, 1997). Sector shares have been taken from my estimates for 1900-1930, Appendini (1978) for 1940-1960, [81] and INEGI (1985, 2002) for 1970-2000. [82] Finally, I have divided each sectoral GDP figure at the state level by the amount of labour force in that state and sector, estimated from Population Censuses.

Population census data have been subjected to several corrections. First, the 1921 Population Census does not provide sectoral labour force at the state level, but just at the national one. To distribute the national data among states, I use a weighted average of the state sectoral labour shares of 1910 and 1930.[83] Furthermore, the sectoral classification of the labour force in the 1980 Population Census is biased due to the large size of the category "insufficiently specified activities".[84] Thus, I have used a weighted average of labour productivity levels in 1970 and 1990 to estimate the sectoral labour force at the state level in 1980. [85]

[81] As Appendini (1976) estimation does not include the distribution of the secondary sector between mining, oil and industry, I use Ruiz's (2007) estimate of mining, oil and industry production to distribute the Appendini's data.

[82] INEGI (2002) provides data for 1993. I assume that sector shares were the same in 1990 and 1993.

[83] The 1910 shares' weight is twice as large as that of the 1930 ones. This means that the distribution of the national labour force among states in 1921 is assumed to be closer to that of 1910 than to that of 1930. This is based on recent evidence suggesting that the impact of the Revolution (started in 1910) on economic performance was moderate (See Haber, 2010: 432) and the need to account for relatively intense economic change during the 1920s

[84] For instance, according to the 1980 Population Census, Mexico City had 1,241,602 workers in this category, while in the 1970 and 1990 Censuses the equivalent numbers were just 62,023 and 115,572, respectively. Similar situations can be observed in the rest of the states.

[85] The 1970 shares' weight is twice as large as that for 1990. This tries to account for the increasing economic openness and profound institutional reforms that took place in Mexico since the mid-1980s. Thus, I assume that states' sectoral labour productivity structure in 1980 was more similar to that of 1970 than to that of 1990.

Table 4.1 Labour Productivity at the state level: 1900-2000 (Mexico=1)[86]

	Overall				Agriculture				Mining				Industry				Services			
	1900	**1930**	**1980**	**2000**	**1900**	**1930**	**1980**	**2000**	**1900**	**1930**	**1980**	**2000**	**1900**	**1930**	**1980**	**2000**	**1900**	**1930**	**1980**	**2000**
Mexico City	*2.62*	*3.61*	*1.63*	*2.12*	1.7	0.9	0.9	1.3	0.0	1.6	0.8	2.0	1.0	1.6	1.3	2.4	1.3	1.3	1.2	1.7
North	*1.73*	*2.27*	*1.21*	*1.30*	*1.6*	*2.5*	*1.9*	*2.1*	*1.7*	*2.2*	*1.6*	*1.9*	*1.2*	*2.5*	*1.0*	*1.1*	*1.5*	*1.3*	*1.1*	*1.3*
Baja California	2.77	4.13	1.31	1.29	3.0	6.7	1.7	1.7	1.5	0.5	1.5	3.5	1.5	6.3	1.2	1.0	1.9	1.8	1.1	1.3
Chihuahua	1.26	1.99	1.07	1.38	1.2	1.5	1.6	2.6	1.1	1.9	1.6	0.6	0.8	1.1	0.8	0.9	1.6	1.3	1.0	1.6
Coahuila	1.39	1.86	1.26	1.32	1.4	2.3	1.5	2.9	0.8	0.7	1.1	1.2	0.9	2.1	1.2	1.3	1.1	1.1	1.0	1.2
Nuevo León	2.01	1.83	1.22	1.6	1.0	1.0	2.0	1.7	3.9	8.8	1.6	1.5	1.3	3.5	0.7	1.4	1.8	1.0	1.5	1.5
Sonora	1.93	1.83	1.36	1.18	2.2	2.3	3.3	2.1	1.7	1.0	2.1	1.3	1.4	1.0	1.1	1.0	1.0	0.9	1.0	1.2
Tamaulipas	1.04	1.97	1.06	1.03	0.9	1.2	1.6	1.7	0.9	0.0	1.4	3.5	0.9	1.0	1.0	1.0	1.5	1.9	1.0	1.0
Pacific-North	*1.13*	*0.76*	*1.01*	*0.87*	*1.4*	*1.3*	*1.8*	*1.6*	*0.7*	*0.2*	*1.2*	*1.6*	*1.1*	*0.6*	*0.9*	*0.7*	*0.8*	*0.7*	*0.9*	*0.8*
Baja California S	n.d.	n.d.	1.4	1.09	nd	nd	2.7	2.0	nd	nd	2.0	2.5	nd	nd	1.1	0.7	nd	nd	1.1	1.0
Colima	0.83	0.81	0.92	0.92	0.9	1.2	1.6	1.4	0.0	0.0	1.0	2.0	0.6	0.3	0.9	1.1	0.9	0.8	0.8	0.8
Jalisco	0.89	0.56	1.02	0.93	1.0	0.9	1.8	1.9	0.7	0.4	1.3	1.7	1.0	0.4	0.8	0.8	0.6	0.6	0.9	0.9
Nayarit	1.41	0.74	0.77	0.59	2.2	1.5	1.4	1.2	0.7	0.0	0.5	0.7	1.4	0.5	0.9	0.5	0.8	0.6	0.9	0.6
Sinaloa	1.4	0.93	0.92	0.8	1.5	1.7	1.7	1.6	1.5	0.4	1.0	1.0	1.4	1.1	0.9	0.7	1.0	0.7	0.9	0.8
Centre-North	*1.25*	*0.93*	*0.79*	*0.91*	*1.3*	*0.8*	*1.2*	*2.0*	*1.9*	*1.0*	*0.8*	*0.6*	*0.9*	*0.8*	*0.7*	*0.8*	*1.1*	*0.9*	*0.9*	*0.9*
Aguascalientes	1.94	1.01	0.86	1.2	2.2	0.6	1.4	2.0	4.6	0.5	0.5	0.4	1.1	0.4	0.7	1.1	0.8	1.0	0.9	1.1
Durango	1.46	0.96	0.89	0.92	1.6	1.1	1.5	2.7	1.2	1.1	0.9	0.6	0.8	1.6	1.0	0.8	1.3	0.7	0.9	0.8
San Luis Potosí	0.69	0.85	0.73	0.81	0.4	0.7	0.8	0.9	1.2	1.3	0.7	0.6	0.9	0.7	0.8	1.0	0.9	0.9	0.8	0.8
Zacatecas	0.89	0.88	0.69	0.72	0.8	0.7	1.2	2.4	0.5	1.2	1.0	0.7	0.9	0.4	0.5	0.4	1.2	0.9	0.9	0.7
Gulf of Mexico	*1.12*	*0.97*	*0.89*	*0.76*	*1.4*	*1.6*	*1.1*	*0.5*	*0.0*	*0.0*	*1.4*	*1.3*	*0.9*	*0.8*	*0.9*	*0.6*	*1.3*	*0.9*	*1.0*	*0.9*
Campeche	0.9	0.92	0.9	0.65	0.6	1.3	1.6	0.7	0.0	0.0	1.4	0.0	0.9	0.3	0.8	0.3	1.2	1.0	1.2	0.8
Tabasco	0.89	0.75	0.69	0.57	0.9	1.6	0.8	0.5	0.0	0.0	1.7	0.0	0.9	0.3	0.8	0.7	1.4	0.9	0.9	0.6
Quintana Roo	n.d.	n.d.	1.25	1.28	nd	nd	1.4	0.3	nd	nd	1.4	2.8	nd	nd	0.8	0.4	nd	nd	1.1	1.4
Veracruz	1.01	0.9	0.8	0.59	1.2	1.1	0.8	0.5	0.0	0.0	1.0	1.4	1.0	1.7	1.1	0.9	1.5	0.9	0.9	0.6
Yucatán	1.66	1.3	0.82	0.73	2.9	2.4	0.6	0.7	0.0	0.0	1.3	2.5	0.9	1.1	0.9	0.6	1.2	0.9	0.9	0.8
Centre	*0.86*	*0.64*	*0.78*	*0.80*	*0.9*	*0.8*	*0.9*	*1.0*	*0.8*	*0.4*	*0.6*	*0.9*	*1.0*	*0.7*	*0.9*	*0.9*	*1.0*	*0.8*	*0.9*	*0.8*
Guanajuato	0.8	0.63	0.83	0.83	0.8	0.8	1.1	1.3	0.3	0.3	0.5	0.5	1.1	0.5	0.7	0.7	0.7	0.8	1.0	0.9
Hidalgo	0.78	0.8	0.62	0.65	0.6	0.7	0.5	0.7	0.7	0.9	0.7	0.6	1.0	0.9	1.1	0.8	0.8	0.9	0.8	0.7
Morelos	1.24	0.66	0.94	0.84	1.6	1.2	1.5	1.8	0.5	0.6	0.8	0.9	1.0	0.8	0.9	0.9	1.7	0.6	0.8	0.7
Puebla	0.89	0.72	0.62	0.71	1.0	0.8	0.5	0.5	2.8	0.6	0.5	0.9	1.0	0.7	0.8	0.8	0.9	1.1	0.9	0.9
Querétaro	0.77	0.49	0.9	1.22	0.6	0.6	1.0	1.3	0.7	0.1	0.4	0.3	1.0	0.4	1.1	1.3	0.7	0.8	1.0	1.1
State of Mexico	0.67	0.55	1.05	0.81	0.7	0.7	0.8	1.3	0.7	0.2	0.7	1.2	1.0	0.7	1.3	1.0	0.8	0.7	0.8	0.6
Tlaxcala	0.9	0.66	0.48	0.56	0.8	1.1	0.5	0.6	0.0	0.0	0.8	1.6	1.0	0.5	0.6	0.5	1.1	0.8	0.8	0.6
South	*0.60*	*0.39*	*0.55*	*0.55*	*0.8*	*0.7*	*0.7*	*0.7*	*1.4*	*0.3*	*1.0*	*1.7*	*0.8*	*0.3*	*0.7*	*0.5*	*0.9*	*0.7*	*0.9*	*0.7*
Chiapas	0.79	0.48	0.47	0.47	1.2	1.0	0.7	0.4	3.2	0.0	0.7	2.1	0.6	0.7	1.1	0.7	1.2	0.6	0.8	0.7
Guerrero	0.46	0.28	0.67	0.62	0.6	0.4	0.6	0.7	1.1	0.8	0.7	0.7	0.6	0.2	0.7	0.4	1.0	0.8	1.0	0.8
Michoacán	0.71	0.49	0.64	0.65	0.8	0.8	0.9	1.3	0.9	0.4	1.8	3.0	1.1	0.4	0.6	0.6	0.6	0.6	0.9	0.6
Oaxaca	0.45	0.3	0.4	0.47	0.5	0.5	0.5	0.5	0.3	0.1	0.6	0.8	0.6	0.2	0.5	0.4	1.0	0.8	0.9	0.7
Mexico (GK 1990 $)	***4440***	***5604***	***20513***	***22060***	***2140***	***1856***	***5577***	***7526***	***12756***	***56270***	***29425***	***30808***	***6448***	***9689***	***22721***	***21604***	***16668***	***21435***	***31474***	***26545***

[86] Oil sector excluded.

The final result of these calculations is a database of regional GDP per worker disaggregated into five economic sectors for the final year of each decade between 1900 and 2000, expressed in 1990 International Geary-Khamis dollars.[87]

Table 4.1 shows the different sectors' labour productivity at the state level relative to the national average, as well as the macro-regions' average, for four selected benchmark years. Oil sector has been removed. The table indicates that Mexico City and the northern regions have always had the highest levels of labour productivity, whereas the central and southern regions have been at the other end of the ranking, which is consistent with the GDP per capita figures shown in previous chapters. Some extremely high relative levels of labour productivity stand out, such as those of Baja California North and Nuevo León in 1900 and 1930, in the agriculture and mining sectors respectively, as well as those for the industrial sector in Baja California and Nuevo León in 1930. Broadly speaking, these figures reflect the very high land-labour and capital-labour ratios in those states and sectors. Table 4.1 also shows the drop in the average industrial and services labour productivity from 1980 to 2000, when they came closer to the national level of overall labour productivity. This can be explained due to the poor economic performance of those sectors in most states, with only a few exceptions, such as Mexico City, Nuevo León, Aguascalientes, Querétaro, Colima and Quintana Roo. The decrease in these sectors' labour productivity, which was especially intense in the Gulf of Mexico and the South, has been well studied in previous research. For instance, Romero et al. (2005) have shown that national GDP *per capita* growth from 1982 to 2000 was the effect of a rise in activity rates, rather than a reflection of increases in overall labour productivity.[88]

Interestingly enough, the period in which the northern bordering states had a relatively better industrial performance (compared with the national one), was during the agro-export led-growth decades (1900-1930) and not, as might be expected, during the most recent stage of economic openness (1980-2000). There is a recent body of literature that highlights the benefits, in terms of GDP *per capita*, that these states have obtained from recent economic openness (Esquivel, 1999; Jordaan and

[87] All details and the complete database can be seen in Appendix A-4.

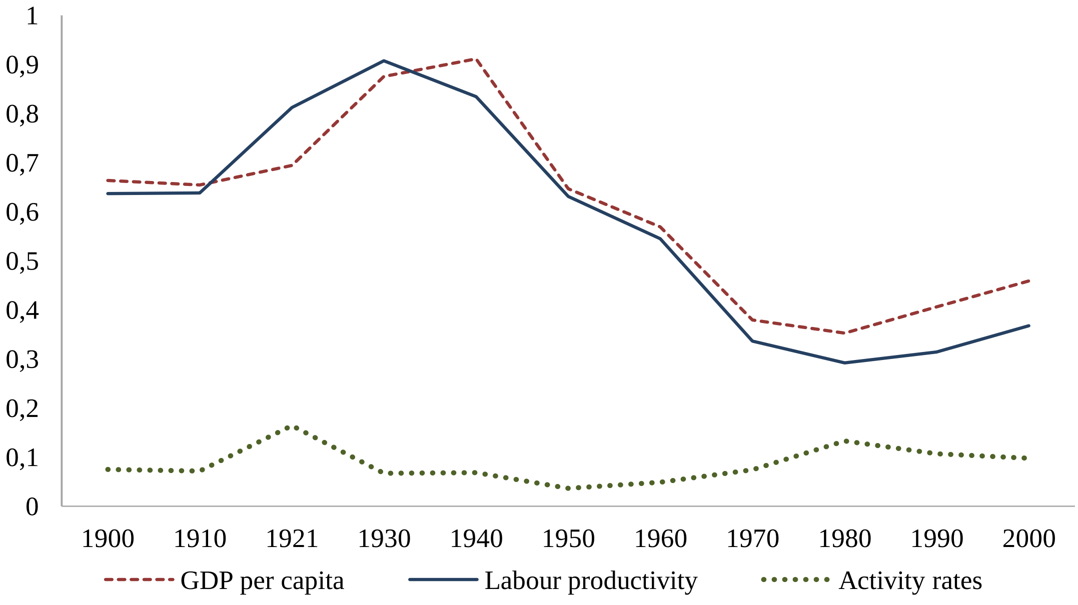
[88] GDP per capita can be decomposed into labour productivity and the activity rate: $\frac{Y}{P} = \left(\frac{Y}{L}\right)\left(\frac{L}{P}\right)$, where Y is total production, P is population, and L is the labour-force. GDP per capita and labour productivity are often treated as synonyms in the economic history literature, but they may follow different paths in certain cases (see Duro and Esteban, 1998).

Rodríguez-Oreggia, 2012; Sánchez-Reaza and Rodríguez-Pose, 2002; Rodríguez-Oreggia, 2005; Chiquiar, 2005). However, my estimation shows that, when considering labour productivity, in the last decades of the 20th century, all northern states sectors had, a rather steady performance, compared with the national average.[89] Instead, Mexico City's labour productivity has substantially increased since the 1980s, especially in the mining and industrial sectors.[90]

Figure 4.1 shows the evolution of σ-convergence (measured through the standard deviation) of state GDP *per capita*, labour productivity and activity rates from 1900 to 2000. It clearly shows that labour productivity is the main variable explaining changes in Mexican regional income inequality over the long run. In both cases, maximum inequality was reached at the end of the first globalization period (in 1940 in the case of pc GDP and in 1930 in the case of labour productivity). From then on, both regional GDP pc and labour productivity tended to converge across states until 1980, to start a new period of divergence thereafter. By contrast, regional inequality in activity rates has remained almost constant over the entire period.[91]

[89] This is in line with evidence provided by Leon (2004).
[90] Section 4.4 presents some explanatory factors for these changes.
[91] The 1921 peak in regional inequality of activity rates is due to the spatially uneven impact of the Mexican Revolution on population and labour force across states (see Kuntz, 2010: 338). Nevertheless, this peak barely modifies the general picture of stability. On the other hand, the uneven pattern of labour productivity and GDP *per capita* inequality between 1930 and 1940 is caused by Mexico City. While Mexico City's labour productivity got closer to the national average in this period (from 3.61 times in 1930 to 3.38 times in 1940), GDP *per capita* figures increased from 2.82 times the national level in 1930 to 3.84 times in 1940, due to a rapid increase in the activity rates of the capital district (due to migration).

Figure 4.1 Standard deviation of Mexican states' GDP per capita, labour productivity and activity rates (Mexico=1)[92]



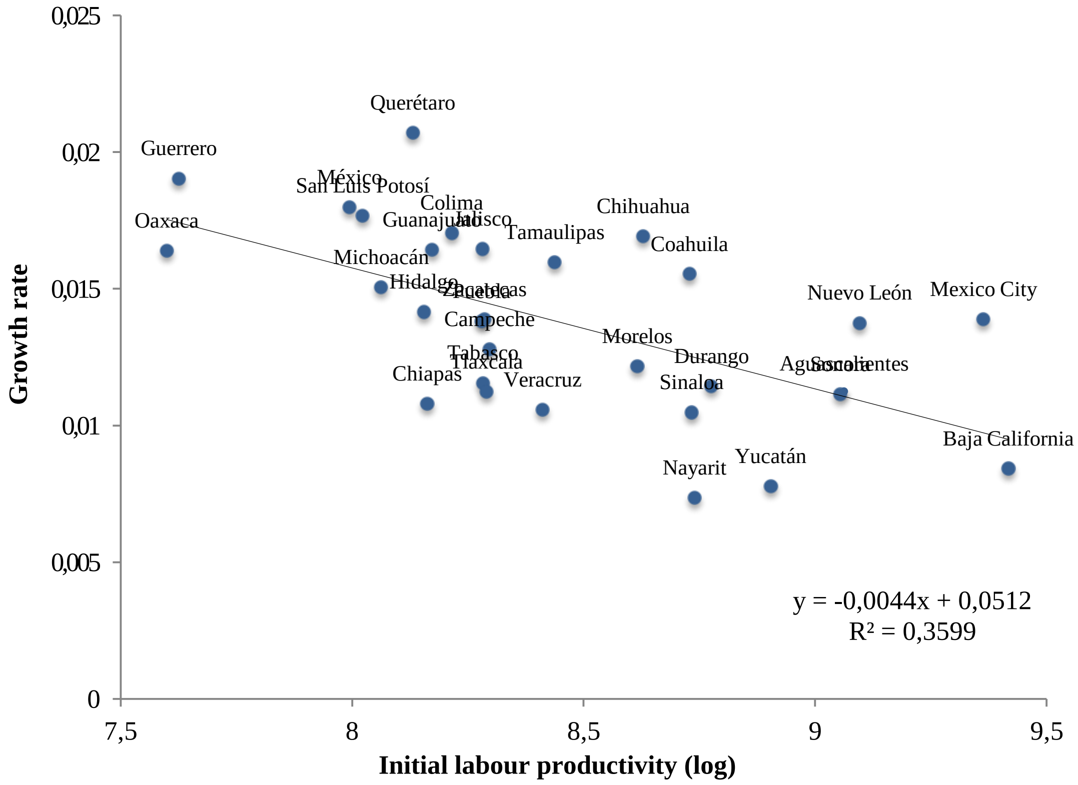
Source: See text.

Taking the whole period 1900-2000 together, Figure 4.1 seems to indicate that the Mexican states tended to converge in the very long run. However, since σ-convergence is not a necessary condition for ß-convergence,[93] Figure 4.2 provides evidence on unconditional ß-convergence of overall labour productivity for the Mexican states from 1900-2000. Although the degree of fit is not high, the picture would be consistent with the presence of unconditional ß-convergence in labour productivity among the Mexican states during the 20th century. As this figure depicts, southern and central states, which started with the lowest labour productivity levels, had the highest growth rates over the long run, while the opposite happened with the northern bordering states and Mexico City. The next section aims at exploring the main determinants of this long-term convergence trend, an also the different short-term episodes of convergence and divergence among the Mexican states, through a decomposition exercise for the entire period, as well as for the following sub-periods: 1900-1930, 1930-1980, and 1980-2000.

[92] Oil sector excluded.

[93] Unconditional β-convergence is defined as a negative correlation between the income per capita growth rate and the initial level of income per capita for a sample of economies in a particular interval of time (Barro and Sala-I-Martín, 1991).

Figure 4.2 Unconditional ß-convergence of Mexican labour productivity at the state level (1900 – 2000)



Source: See text.

4.3 The determinants of convergence: a decomposition analysis

As has been mentioned above, Mexican regional inequality has closely followed the evolution of disparities in labour productivity. This section presents the results of a decomposition analysis of changes in labour productivity inequality, following Caselli and Tenreyro (2004). [94] These authors decompose total convergence into three components within-sector convergence, labour reallocation and between-sector convergence. While the former is roughly associated to technological catching-up effects (Enflo and Rosés, 2015: 205), labour reallocation and between-sector convergence capture the effects of structural change on regional

[94] This method is actually an extension of that presented in Caselli and Coleman (2001).

disparities.[95] Using this method, Caselli and Tenreyro find that capital accumulation and structural transformation have been the main forces behind the convergence of Southern European countries with Northern ones in labour productivity from 1960 to 2000. This methodology has recently been applied by Enflo and Rosés (2015) to the case of Sweden over the long run (1860-2000), for which they find that convergence has mainly been driven by structural change forces. This process was only replaced, from 1980 onwards, by an increasing regional divergence, led by labour reallocation and increasing regional disparities in labour productivity within sectors.

In this chapter, I apply the methodology proposed by Caselli and Tenreyro (2004) to the Mexican case. This is the first time this methodology is used to analyse the long-term determinants of regional inequality in a developing country. In this research, I use Mexico City as the reference region. This choice is based on historical arguments. As can be seen in Table 4.1, this region has had the highest levels of labour productivity in all economic sectors, relative to the rest of the macro-regions, over the entire period.[96] Therefore, using Mexico City's labour productivity levels as 'benchmark region' will allow capturing the forces behind regional convergence trends.[97]

Thus, this chapter presents the sources of convergence between the Mexican macro-regions (*i*) and the 'benchmark region' (Mexico City; from now on, *Mx)*.[98] Following Caselli and Tenreyro (2004: 492), the decomposition of convergence can be formally expressed as follows. Total value added per worker (labour productivity) can be seen as the weighted sum of sectoral labour productivities:

$$LP_t^i = \sum_{j=1}^{J} S_{jt}^i \; LP_{jt}^i \tag{4.1}$$

---

[95] Both components are closely correlated. In fact, if both of them are added, the result will be the same as the "Between-sector" component of certain inequality indices, such as the decomposed Theil index proposed in Akita and Kataoka (2003).

[96] Taking Mexico City as reference may introduce some bias in the convergence decomposition analysis, as it has lower labour productivity than other regions in certain sectors such as agriculture and mining. However, the contribution of these sectors seem to play a secondary role in convergence over the long term. In fact, my results (see below, Table 4.2 and 4.3) show the minor role of these sectors, at least, in the within-sector component. Moreover, an alternative estimation using the North region (the most productive in agriculture and mining) as reference, provide very similar results (see Table B-4.1 in Appendix B-4).

[97] Oil sector (production and labour force) is not considered in this analysis.

[98] As were presented before, the macro-regions are: North, North-Pacific, Centre-North, Gulf, Centre, South, and Mexico City (the benchmark region).

where *LP* is labour productivity, *S* is the share of employment, *i* denotes the region, *j* the sector (primary, mining, industry and services), and *t* is time.

Thus, labour productivity convergence to the benchmark region can be measured by:

$$\Delta\frac{LP_t^i - LP_t^{Mx}}{LP_t^{Mx}} = \frac{LP_t^i - LP_t^{Mx}}{LP_t^{Mx}} - \frac{LP_{t-1}^i - LP_{t-1}^{Mx}}{LP_{t-1}^{Mx}} \qquad (4.2)$$

This measure of convergence can be decomposed into three channels of convergence: within-industry, labour reallocation, and between-industry. To start with, the following term (3) is added and subtracted to equation (1), obtaining equation (4)

$$\sum_{j=1}^{J} S_{jt}^i \, LP_{jt}^{Mx} \qquad (4.3)$$

$$LP_t^i = \sum_{j=1}^{J} S_{jt}^i \left(LP_{jt}^i - LP_{jt}^{Mx}\right) + \sum_{j=1}^{J} S_{jt}^i \, LP_{jt}^{Mx} \qquad (4.4)$$

Then:

$$LP_t^i - LP_t^{Mx} = \sum_{j=1}^{J} S_{jt}^i \left(LP_{jt}^i - LP_{jt}^{Mx}\right) + \sum_{j=1}^{J} (S_{jt}^i - S_{jt}^{Mx}) LP_{jt}^{Mx} \qquad (4.5)$$

$$\frac{LP_t^i - LP_t^{Mx}}{LP_t^{Mx}} = \sum_{j=1}^{J} S_{jt}^i \left(\frac{LP_{jt}^i - LP_{jt}^{Mx}}{LP_t^{Mx}}\right) + \sum_{j=1}^{J} (S_{jt}^i - S_{jt}^{Mx}) \frac{LP_{jt}^{Mx}}{LP_t^{Mx}} \qquad (4.6)$$

Finally, taking first differences and grouping terms conveniently I obtain the equation for the convergence decomposition:

$$\Delta\frac{LP_t^i - LP_t^{Mx}}{LP_t^{Mx}} = \sum_{j=1}^{J}\overline{S_{jt}^i}\ \Delta\left(\frac{LP_{jt}^i - LP_{jt}^{Mx}}{LP_t^{Mx}}\right) +$$

$$+\sum_{j=1}^{J}\overline{\left(\frac{LP_{jt}^i}{LP_t^{Mx}}\right)}\Delta S_{jt}^i - \sum_{j=1}^{J}\overline{\left(\frac{LP_{jt}^{Mx}}{LP_t^{Mx}}\right)}\Delta S_{jt}^{Mx} \tag{4.7}$$

$$+\sum_{j=1}^{J}\left(\overline{S_{jt}^i} - \overline{S_{jt}^{Mx}}\right)\Delta\left(\frac{LP_{jt}^{Mx}}{LP_t^{Mx}}\right)$$

where: $\Delta x_{jt} = x_{jt} - x_{jt-1}$; and $\overline{x_{jt}^i} = \frac{x_{jt}^i + x_{jt-1}^i}{2}$

Thus, "total convergence" is the quantity on the left-hand side in equation (4.7). This is the convergence of each macro-region's overall labour productivity to that of the benchmark (*Mx*). "Within–sector convergence" is the quantity on the first line of the right-hand side, and it captures the convergence of each sector's labour productivity with its level in *Mx*, weighted by the average labour share in that sector. As Rosés and Enflo (2015: 205) have noted, when assuming perfect competition and fully employed resources, within-industry convergence could be attributable to the catching-up of both regional differences in capital-labour ratios and technological differences across states (through the neoclassical mechanisms of convergence). However, this component could be reflecting not only these but also other types of convergence sources. For instance, as economic sectors are heterogeneous, factor mobility within each sector (from lower towards higher labour productivity sectors, such as the move of factors from traditional agriculture to agro-export production) could also lead to an upswing of within-industry convergence.

The second line in equation (4.7) represents the labour reallocation component. This component, which is weighted by the relative labour productivity of each sector, measures the share of convergence due to inter-sectoral workforce movements. As Caselli and Tenreyro point out (2004: 493), in the special case where there are no within-industry labour productivity gaps ($LP_{jt}^{i} = LP_{jt}^{Mx}$), labour reallocation contributes to convergence if and only if region *i* transfers a larger share of the labour force than does *Mx* towards the high-productivity sectors. If there are within-industry labour productivity gaps, this effect may be diminished. More specifically, if sector *j* in *Mx* is much more productive than in region *i*, labour reallocation may lead to divergence even if *Mx* is moving fewer workers towards this sector. Finally, the third line of the equation represents the between-sector convergence component. This measures the contribution to convergence of inter-sectoral labour productivity convergence. Then, if labour productivity of sector *j*, in which region *i* had a relatively high share of the labour force, converges to the overall productivity of *Mx*, this component will contribute to global convergence. The last two components are therefore closely related to the process of regional structural change.

Table 4.2 presents the sources of the Mexican macro-regions' labour productivity convergence with *Mx* for the entire period (1900-2000). Generally speaking, and with the exception of the Gulf macro-region, which tended to diverge from *Mx* in the long-run, the results indicate a low rate of regional convergence. The main determinant of this convergence has been the between-sector component. This indicates that labour productivity has grown more in those sectors that had a higher presence in regions with lower productivity than *Mx*. It is surprising to see that the contribution of labour reallocation to convergence has been negative for most regions. The only exceptions are the North (because of the intense modernization of its economic structure during the entire period) and the Gulf (due to the evolution of Quintana Roo, with a huge transfer of labour from agriculture to mining and services). In all other cases, either *Mx* has reallocated relatively faster its labour force from low to high productivity sectors, or the productivity gaps between the macro-regions and *Mx* has made the reallocation of labour from low to high productivity sectors in the former insufficient to contribute to convergence. This could particularly describe the cases of the North-Pacific and South regions, where labour reallocation has actually had a large negative impact on overall convergence.

On the other hand, the North-Pacific has been the only region where the within component has had a positive influence on convergence with *Mx*. This is explained by the convergence in the productivity of agriculture and services productivity with their levels in Mexico City. By contrast, industrial labour productivity in all macro-regions has diverged from *Mx*, due to the dynamism of Mexico City's industrial activity since the end of the 19th century (see Haber, 1989; Cerutti, 1992; Marichal and Cerutti, 1997).[99]

Table 4.2 Convergence decomposition, 1900-2000

	Total	**Within-industry**					**Labour reallocation**	**Between-industry**
		Overall	Agriculture	Mining	Industry	Services		
North	0.035	-0.281	0.082	-0.071	-0.153	-0.139	0.102	0.215
	100%	-795%	-29%	25%	54%	50%	288%	607%
North-Pacific	0.026	0.021	0.072	-0.011	-0.160	0.121	-0.136	0.141
	100%	80%	342%	-53%	-762%	574%	-514%	535%
Centre-North	0.031	-0.173	0.104	-0.090	-0.126	-0.062	-0.017	0.221
	100%	-568%	-60%	52%	72%	36%	-55%	723%
Gulf	-0.117	-0.361	-0.041	0.000	-0.108	-0.212	0.121	0.124
	100%	309%	11%	0%	30%	59%	-103%	-106%
Centre	0.068	-0.096	0.048	-0.018	-0.152	0.026	-0.015	0.179
	100%	-140%	-50%	19%	158%	-27%	-21%	262%
South	0.034	-0.037	0.059	-0.003	-0.109	0.016	-0.088	0.159
	100%	-110%	-159%	9%	292%	-42%	-259%	469%

Source: See text.

The next section presents the same decomposition for 3 sub-periods, which coincide with the main phases of overall regional convergence or divergence and also with the alternation of different development models in Mexican economic policy. The first period (1900-1930) correspond to the last stage of the primary export-led growth model and to a process of divergence of all regions from *Mx*. Divergence was mainly led by the labour reallocation component, i.e., by a spatially unequal process of structural change between *Mx* and the rest of macro-regions. The next period (1930-1980), characterized by State-led Industrialisation, is the only phase of generalized convergence, led by both the within-sector and between-sector components. Finally, from 1980 to 2000, increasing economic openness has been accompanied by divergence. This has been largely the result of the within-sector

[99] The northern state of Nuevo León has also had a very dynamic industrial sector since the late 19th century. However, this has not been enough to pull the overall macro-region's productivity up to the levels of Mexico City.

component, since both labour reallocation and the between-sector component have contributed to convergence with *Mx*. The next section aims at linking these results with some of the main features of the evolution of the Mexican economy over the 20th century.

4.4 Explanatory factors of regional labour productivity inequality

4.4.1 The export-led growth period: 1900-1930

As I have pointed out in previous chapters, since the late 19th century the Mexican economy undertook substantial transformations and started modern economic growth. The construction of the railroad network, together with several institutional changes, boosted the integration of the domestic market and the internationalization of the economy. As in many Latin American economies, primary export activities, such as mining and agro-export sectors, explain the Mexican economic dynamism until the 1929 Great Depression.[100] The growth of exports intensified regional specialisation and structural change both the whole national economy and the different regional economies. This process was complemented with an increase in national and international investment, which enlarged the prevailing interregional disparities in capital-labour ratios. This is particularly true for *Mx* (Mexico City),[101] which had a yearly rate of labour productivity growth of 1.8% during this period, much higher than the national average of 0.7%.

[100] Although the mining sector had been very dynamic since colonial times, after the liberal reforms it undertook a process of modernization, increasing both its value added and productivity. This was especially intense from 1890 when, encouraged by a strong Mexican fiscal stimulus and US protectionism, some US companies moved its production plants to Mexico, largely increasing the capital-labour ratios of the sector.

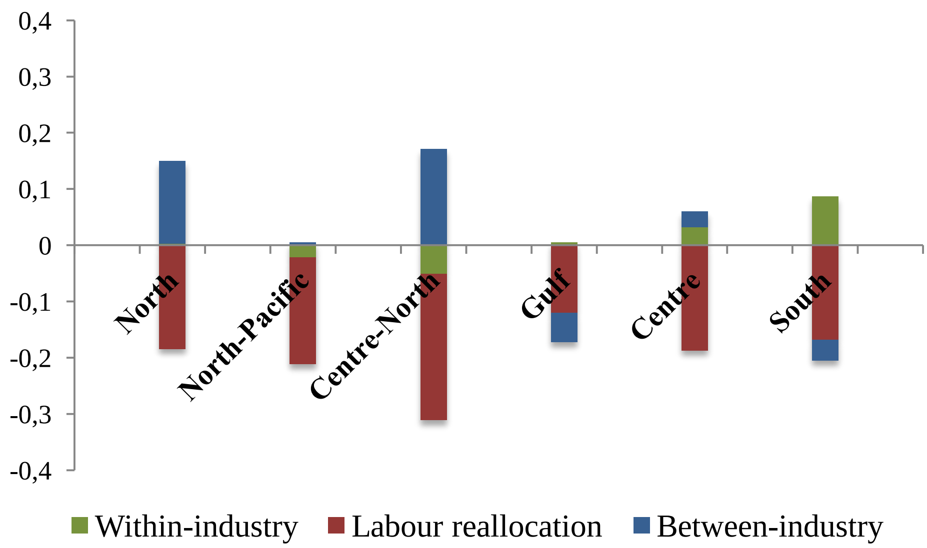
[101] Another illustrative case is Aguascalientes which had, after the arrival of the Guggenheim Company at the end of the 19th century, one of the most modern mining plants in America. For a detailed analysis of the industrial and capital sectors in Mexico during this period see Haber (1989, 2010).

Table 4.3(a) Convergence decomposition, 1900-1930

	Total	**Within-industry**					**Labour reallocation**	**Between-industry**
		Overall	Agriculture	Mining	Industry	Services		
North	-0.034	0.003	0.115	-0.098	0.020	-0.033	-0.184	0.147
	100%	-10%					543%	-433%
North-Pacific	-0.206	-0.021	0.087	-0.046	-0.070	0.008	-0.190	0.005
	100%	10%					92%	-3%
Centre-North	-0.141	-0.051	0.110	-0.109	-0.032	-0.020	-0.260	0.171
	100%	36%					185%	-122%
Gulf	-0.166	0.005	0.074	0.000	-0.008	-0.061	-0.120	-0.052
	100%	-3%					72%	31%
Centre	-0.126	0.032	0.123	-0.052	-0.048	0.010	-0.187	0.028
	100%	-26%					148%	-22%
South	-0.118	0.087	0.148	-0.013	-0.042	-0.005	-0.168	-0.037
	100%	-74%					143%	31%

Source: See text.

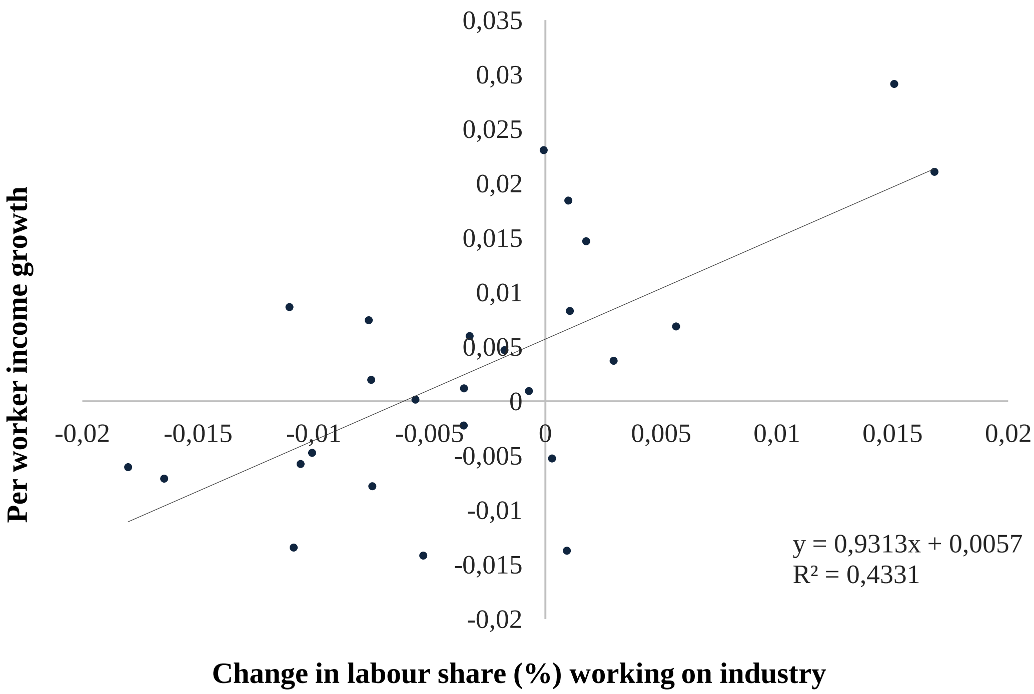
Figure 4.3(a) Convergence decomposition, 1900-1930



Source: See text.

As mentioned above, Table 4.3(a) shows that all regions diverged from *Mx* during this period. The North had, by far, the lowest rate of divergence, thanks to its relative specialization in high-value added activities, not only those linked to the international markets, such as mining, cattle, rubber and cotton, but also industry (Kuntz, 2014). In fact, it was the only region in which industrial productivity converged to *Mx* levels. The industrial sector in the North was prompted by both local capital accumulation (derived from mining, agriculture, and commerce), and the arrival of foreign capital (particularly from the US to Nuevo León) (Haber, 2010: 422). By contrast, in other regions the negative sign of the within-sector component in the case of industry can be explained by the increasing capital-labour ratio differentials between *Mx* and the rest of the country.[102]

Figure 4.4 Structural change and labour productivity growth (1900-1930): Industrial labour reallocation.[103]



Source: See text

[102] In the case of the mining sector, divergence with *Mx* is associated to the low size of this sector in Mexico City during the first part of this period and the further growth of metal processing activities in the capital. In the historical mining regions (North, North-Pacific and Centre-North), productivity growth was very high before 1900 but slowed down thereafter, which explains the negative sign of the mining within-sector component in these regions.

[103] The states of Coahuila, Yucatán, Chiapas, and Guerrero have been removed from the graph, because of some specific features that make them outliers. First, in Coahuila and Yucatán the growth of income per worker was relatively high thanks to mining and agro-export activities respectively. By contrast, Chiapas and Guerrero had a very low growth rate of productivity despite the significant increase in their industrial labour share, which can be explained by the very low level of this share at the beginning of the period.

The components that made the largest contribution to divergence from 1900 to 1930 were those related to structural change, and especially labour reallocation. This means that the reallocation of labour towards the most productive economic activities was much more intense in *Mx* than in the rest of the country, which was, to a large extent, the result of the prominent role played by *Mx* in the first wave of the modern Mexican industrialisation. In addition, the emergence of a modern services sector (the most productive sector in Mexico City during this period) also attracted a high amount of workers from other sectors. In order to illustrate the role of structural change on labour productivity growth during this period, Figure 4.4 shows the simple correlation between these variables. As expected, this figure indicates that the spatially uneven structural change, concentrated in those regions that could take advantage of the first globalisation, had a central role in the divergence pattern observed during this period.

Another interesting result is the fact that, in the Gulf macro-region, labour productivity in agriculture did not contribute at all to convergence. This may be surprising, given the importance in this macro-region of some primary exports such as vanilla, coffee, sugar, and the most successful one, henequen. However, these products were very sensitive to external conditions, changes in international demand and prices volatility, and the estimates in the table reflect the significant fall in the demand and price of some export commodities that took place at the end of the period (Kuntz, 2014: 99).

This was a period when regional development was completely off the economic policy agenda, leaving the market as the main explanatory force for economic activity location. Moreover, although there were some migration flows, these were limited by the relatively high (economic and social) costs of migration, hindering therefore labour productivity growth in poor regions (such as the Centre, the Gulf and the South).[104] These conditions dramatically changed in the following

[104] Although substantial political efforts were addressed to the national (cultural) integration, they were only partially successful. For instance, 16% of national population still used their native language as the main communication tool by 1910. This percentage was much higher in the southern and Gulf states, such as Chiapas, Oaxaca and Yucatán, where 33%, 50% and 65% of population respectively used their native language as their main communication tool in 1910. Something similar occurred in literacy, with southern states (such as Chiapas, Guerrero and Oaxaca) having a literacy rate around 9% (Kuntz and Speckman, 2011: 532). This represented a strong limitation for the population in poor regions to migrate no only across regions but also to relatively more skilled economic activities.

period, in which migration flows seem to have been at the core of regional income convergence.

4.4.2 State-led industrialisation: 1930-1980

After the 1929 Great Depression, most Latin American economies changed their economic development model. The export-led growth model was replaced by an inward-oriented one, focused on industrialisation and State intervention (Bértola and Ocampo, 2013: 170).[105] Mexico was not an exception. After 1929, Mexican industrialisation made substantial progress in the context of intense government interventionism and commercial protectionism. During this period, Mexico experienced its highest rates of yearly GDP growth in history, reaching 5.24% from 1932 to 1949 and 6.38% from 1949 to 1981 (Márquez, 2010: 553). This process had significant effects on the country's economic geography, as it encouraged an intense process of concentration of activity in Mexico City. However, as can be seen in Figure 4.1, this was accompanied by a significant convergence in regional labour productivity levels.

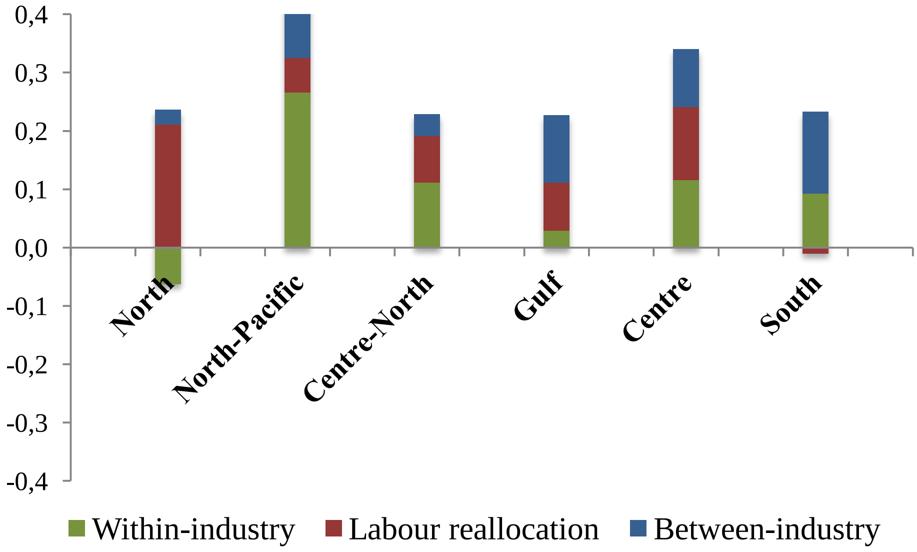
Table 4.3(b) Convergence decomposition, 1930-1980

	Total	**Within-industry**					**Labour reallocation**	**Between-industry**
North	0.174	-0.062	0.031	0.028	-0.119	-0.002	0.211	0.025
	100%	-35%					121%	14%
North-Pacific	0.418	0.266	0.060	0.029	0.045	0.132	0.059	0.093
	100%	64%					14%	22%
Centre-North	0.229	0.112	0.029	0.031	0.004	0.048	0.080	0.037
	100%	49%					35%	16%
Gulf	0.228	0.029	-0.036	0.020	-0.009	0.054	0.083	0.115
	100%	13%					37%	51%
Centre	0.341	0.116	-0.012	0.025	0.057	0.045	0.125	0.099
	100%	34%					37%	29%
South	0.223	0.093	-0.015	0.020	0.019	0.069	-0.010	0.140
	100%	42%					-5%	63%

Source: See text

[105] This model is commonly known as ISI (Import Substitution Industrialisation). However, recent literature has argued that import substitution was not a central element during this period. Instead, the most important defining feature was a strong process of industrialisation led by state intervention. See Cárdenas et al. (2003), and Bértola and Ocampo (2013).

Figure 4.3(b) Convergence decomposition, 1930-1980



Source: See text

Figure 4.3(b) shows that all macro-regions converged to *Mx* during the state-led industrialisation period. In general terms, as can be seen in Table 4.3(b), all three components had a positive contribution to convergence. However, the contribution of each component to convergence varied among the macro-regions. In the North, convergence with *Mx* was driven by structural change (labour reallocation) and, more specifically, to the movement of labour from mining and agro-export sectors to industry after the decline of the export-led growth model (see Table A-4.12 in Appendix). On the other hand, the North's rate of convergence was the lowest in Mexico, since it was the region that had the lowest productivity gap with *Mx* before 1930. At the same time, the North was the only region where the within-sector component provoked divergence, due to the evolution of the industrial sector. This can be largely explained by the fact that this region was, only after Mexico City, the main recipient of migrants from 1930 to 1980.

In contrast, in the North-Pacific states, the within-industry component was the most relevant factor of convergence. This was mainly the result of the economic performance of one single city, Guadalajara, the capital of Jalisco. This city accomplished, only after Mexico City, Nuevo León and the State of Mexico, the most intense process of industrialisation in the country. Industrial labour force in the state of Jalisco was 12.2% of the total labour force in 1930 and 33.6% in 1980 (Table A-4.12). This phase of industrialisation was accompanied by a strong productivity convergence in the services sector. The productivity of industry and services in Jalisco grew by 3.3% and 1.7% respectively per year, while the equivalent rates in *Mx* were 1.2% and 0.4% respectively (see Tables A-4.3-A-4.9). However, this remarkable process of industrialisation was not representative for all North-Pacific states and, as a result, the labour reallocation component had a small contribution to convergence in the region.

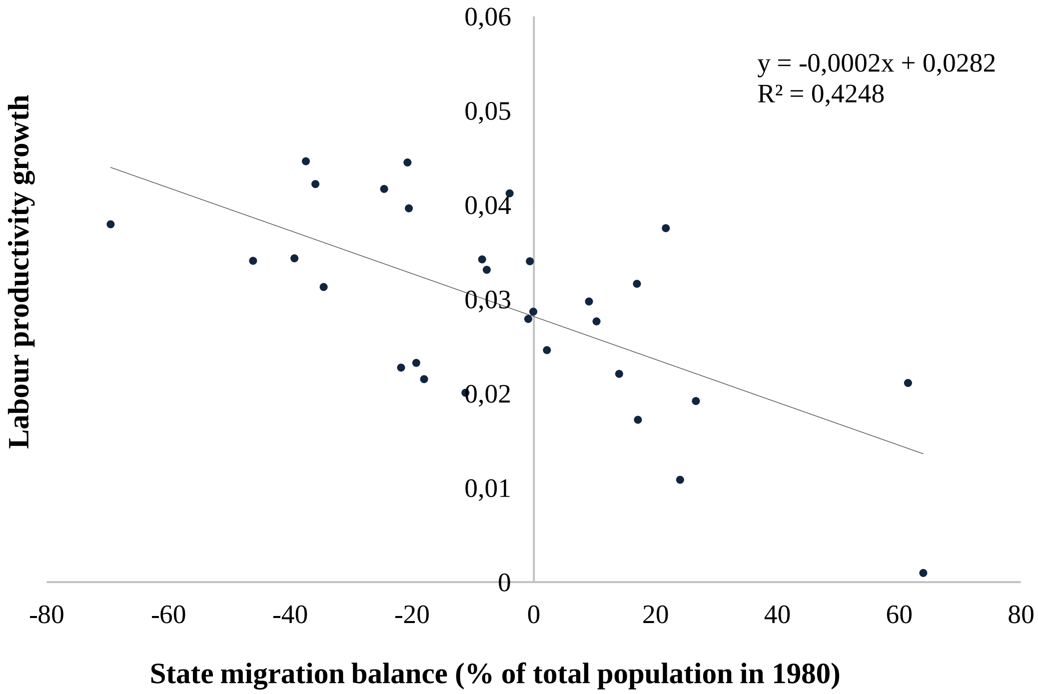
Labour reallocation made a great contribution to convergence in the North states, due to the intense labour reallocation to high value-added activities in this region, especially in Baja California and Nuevo León. Agricultural labour force in those two states represented 62.9% and 70.8%, respectively, of the total active population in 1930, and just 25.1% and 5.3% in 1980. In the Centre region, labour reallocation had also a significant contribution to convergence. This reflects its proximity to Mexico City, and the diffusion of the industrial growth of the capital to the State of Mexico and Morelos. In all other regions, convergence was the joint outcome of all three components, which can in turn be related to the intensity of interregional migration during this period, as is reflected in Figure 4.5.

Figure 4.5 presents the correlation between labour productivity growth and migration balances (as the share of total population in 1980) at the state level from 1940 to 1980.[106] In a context of high expectations of improving the living standards and decreasing (economic and social) migration costs, migration from the poor to the most developed regions of the country grew to unprecedented levels. As a result, it was during this period when the Mexican urban population became larger than the rural one, increasing from 6.9 millions in 1940 to 44.2 millions in 1980 (Márquez and Silva, 2014:145). The main sources of migrants were the central and southern states, and the main destinations were the North and Mexico City and its surrounding states (State of Mexico and Morelos); see Table A-4.23 in the Appendix (A-4).[107]

[106] Contrary to the previous period, structural change is not correlated to labour productivity growth during the state-led industrialisation period. See Figure A-4.1 in the Appendix.

[107] The direction of migration flows in the State of Mexico was reversed since the 1960s, when congestion costs in Mexico City pushed out a great amount of population. The state of Mexico had a net balance of -86,368 migrants from 1940 to 1960, but received 3,354,078 people from 1960 to 1980 (INEGI, 2000). On the other hand, Quintana Roo was the only state out of the North and the area of Mexico city that attracted migration in significant numbers. It had been a pole of attraction of migrants since the 1930s, and especially since the 1970s, due to the expansion of tourism. Given its

Figure 4.5 Labour productivity growth and migration: 1940-1980.[108]



Source: Own estimates for labour productivity growth and INEGI (2000) for migrations figures.

In Mexico City, for instance, immigrants represented 24%, of its 1980 population, and in Baja California, they accounted for an impressive 64% of its 1980 population. On the contrary, out-migrants (from 1940 to 1980) in southern states as Guerrero, Michoacán and Oaxaca represented 20.7%, 35.9% and 37.4%, respectively, of their 1980 population.

Migration flows were closely correlated to labour productivity growth rates. Thus, Guerrero, Michoacán and Oaxaca had, only after the State of Mexico, the highest rates of labour productivity growth from 1940 to 1980. By contrast, México City had, together with Baja California, the lowest yearly rates: 1.08% and 0.10%, respectively, well below the national average of 2.95%.[109] Those regions with higher

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low demographic density at the beginning of the period, migrants represented 61.5% of the total population in 1980.

[108] Durango and the State of Mexico excluded. Migration flows from 1930 to 1940 are not available.

[109] In Chapter 1 I describe that despite the intense decentralisation policies that were applied during this period, and which aimed at stopping the spatial concentration of both economic activity and migration in the so-called "special areas" (Mexico City, Monterrey and Guadalajara), these policies had a very limited impact. For instance, trying to encourage the industrial activity, the government

out-migration had a faster labour productivity growth because the size of the less productive activities within each sector decreased substantially, while in those regions that attracted migrants, technical change and productivity growth were jeopardized by the massive labour force inflow. As a result, the concentration of activity in the regions that received migrants was accompanied by an overall process of labour productivity convergence among regions.[110]

By contrast, unlike what happened with industry (with the exception of Gulf) and services, the agriculture within-sector component made a negative contribution to convergence in Gulf, Centre and South regions. This can be explained because the productivity of traditional agriculture activities stagnated during this period (Cárdenas, 2010), which had a particularly negative impact on the central and southern regions, since they had the largest portion of labour force working in those activities. On the other hand, the capital-labour ratio in the agricultural sector of the northern regions experienced a huge increase during this period because of the Green Revolution (Sonnenfeld, 1992), which enhanced labour productivity relative to the rest of the regions (See Table 4.1).

4.4.3 Economic openness, 1980-2000

After the debt crisis of the early 1980s, Mexico was gradually transformed from a closed economy with high government intervention to an open one with very limited government involvement.[111] In 1986 Mexico joined the General Agreement on Tariffs and Trade (GATT) and in 1994 it started a profound international regional integration through the signature of the North American Free Trade Agreement (NAFTA). This change has had large implications in regional income performance, which has been specially reflected in the increasing importance of the North at the expense of Mexico City. In the latter, while 38% of labour force was employed in the industrial sector in 1980, this percentage had fell down to 21.8% in 2000. By contrast, and with the exception of Nuevo León (see Table A.12), the opposite

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promoted the creation of industrial parks in several states, but this strategy, as many others, completely failed (Aguilar, 1993).

[110] The impact of migration on Mexican regional income convergence during this period had already been suggested by Sánchez-Reaza and Rodríguez-Pose (2002).

[111] Moreover, economic policy after the 1980s has not been oriented by regional redistribution criteria. Rodríguez-Oreggia and Rodríguez-Pose (2004) have shown that the regional allocation of public investment since 1970 neither has affected regional growth, nor has followed regional income redistribution criteria. Rather, pork-barrel policies are more likely to explain the distribution of public investment.

process took place in the Northern border states. This has been mainly due to the expansion of *maquiladora* production.[112]

There has been substantial research on the evolution of Mexican regional income inequality since the 1980s, although it has mainly focused on income per capita levels, rather than labour productivity disparities. Among this literature, Jordaan and Rodriguez-Oreggia (2012) suggest that FDI and agglomeration economies have had an important impact on regional income growth. Human and physical capital endowments have also been pointed out as determinants of regional income disparities during this period (Sánchez-Reaza and Rodríguez-Pose, 2002; Rodríguez-Oreggia, 2005; Chiquiar, 2005). Broadly speaking, these authors stress that Mexico City and the north-border states have taken advantage of these factors, while the rest of the states have fallen behind.

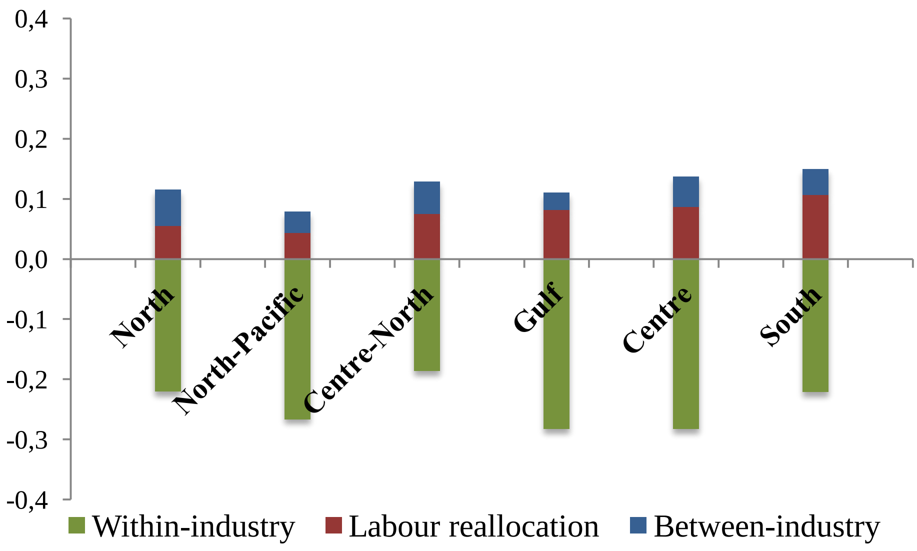
Table 4.3(c) Convergence decomposition, 1980-2000

	Total	**Within-industry**					**Labour reallocation**	**Between-industry**
1980-2000								
North	-0.105	-0.220	-0.003	-0.014	-0.117	-0.085	0.055	0.060
	100%	210%					-53%	-57%
North-Pacific	-0.186	-0.266	-0.015	-0.003	-0.126	-0.121	0.044	0.035
	100%	143%					-24%	-19%
Centre-North	-0.058	-0.186	0.011	-0.021	-0.086	-0.090	0.075	0.054
	100%	323%					-130%	-93%
Gulf	-0.170	-0.282	-0.041	0.004	-0.118	-0.128	0.082	0.029
	100%	166%					-48%	-17%
Centre	-0.146	-0.282	-0.007	-0.004	-0.168	-0.103	0.087	0.050
	100%	193%					-60%	-34%
South	-0.071	-0.221	-0.027	-0.003	-0.074	-0.117	0.107	0.043
	100%	312%					-151%	-61%

Source: See text

[112] Hanson (1997) has shown that the largest increases in Mexican border regions' manufacturing employment during the first stage of the openness period have taken place in textiles and metal products, which are the two main *maquiladora* industries.

Figure 4.3(c) Convergence decomposition, 1980-2000



Source: See text

In the same line as the previous literature, Table 4.3(c) shows that all regions have diverged from *Mx* in labour productivity during this period. This has happened despite the positive contribution to convergence of Structural change forces (especially labour reallocation), due to the initial conditions of *Mx*, which had a very small margin to reallocate work force towards industrial activity. However, this positive contribution has been overcome by the negative impact of the within-sector component, particularly in the case of industry and services. In the case of industry, Mexico City has suffered a huge contraction of its manufacturing labour force share during this period (Table A-4.20-A-4.22) and, at the same time, has received substantial FDI flows, accounting for nearly 65% of Mexican FDI inflows from 1989 to 2000 (Jordaan and Rodríguez-Oreggia, 2012: 182). This has significantly increased the capital-labour ratio and labour productivity in *Mx* compared with the rest of the country.[113] Together with this process, labour productivity in services also experienced a relatively good performance in Mexico City (especially in the financial and commercial sectors), compared to the national average. So, even though, the northern states are usually considered as the winners of this process, my result seems to point to a different direction, and to stress the importance of FDI and agglomeration economies (as suggested by Jordaan and Rodríguez-Oreggia, 2012),

[113] During this period, FDI reached unprecedented levels, and the stock of FDI capital increased from 8.5% of GDP in 1990 to 27% in 2006 (Jordaan and Rodríguez-Oreggia, 2012: 182).

as well as regional differentials in human and physical capital endowments (Sánchez-Reaza and Rodríguez-Pose, 2002; Rodríguez-Oreggia, 2005; Chiquiar, 2005), on the productivity advantage of Mexico City.

In the same line, the North's divergence process looks surprising at first sight. However, as can be seen in Tables A-4.9-A-4.11, industrial labour productivity has stagnated in the north-border states (with the exception of Nuevo León), due to the specialisation of the region in *maquiladoras*, a sector with very low value-added.[114] The north-border states had the largest portions of labour force employed in *maquiladoras* during the 1990s, led by Chihuahua, Baja California and Tamaulipas. On the other hand, in the case of services, the negative contribution of the within-sector component is due to the increase in informal activities with very low labour productivity in the poorest regions. For instance, in the Southern states of Chiapas, Guerrero, Michoacán and Oaxaca labour productivity in services decreased by 35%, 35.4%, 40.5 and 39.6% respectively (Tables A-4.9 – A-4.11).[115] Moreover, neither domestic nor international outmigration flows have contributed significantly to labour productivity growth during this period, probably due to the increase in international migration as a factor overcoming the effects of domestic migration.[116]

The Centre-North is the region that has had the lowest divergence rate, thanks to advances in industrialization. At the start of period, in 1980, all Centre-North states had a industrial labour share lower than the national average (29%). By contrast, in 2000, 3 out of 4 states of the region had a higher share than the national one (28.3%). More concretely, in Aguascalientes and Durango, industrial labour share went from 28.9% and 18.6% in 1980, to 35.9% and 30.5% in 2000 respectively. Nevertheless, this process was not enough to allow for convergence with *Mx* because, as in the rest of the regions, the within-sector component had a very high contribution to divergence.

[114] Nuevo León (North region), has not been an important centre for *maquiladoras* production. In fact, this state had fewer workers in this sector in 1994 than some states in the South of the country, such as Oaxaca and Michoacán (OECD, 1997: 49).

[115] In recent decades, regional income disparities have increased in several countries, especially high-income ones. This process has been driven by the growth of metropolitan areas, thanks largely to the concentration there of knowledge-intensive services and industries, which are the new engines of economic growth (Enflo and Rosés, 2015: 2014).

[116] See Hanson (2007) for an analysis of the international migration impact on regional labour market in Mexico.

4.5 Concluding remarks

This chapter aims at contributing to the historical literature on the determinants of regional inequality in peripheral countries by providing evidence on the Mexican case. I have analysed the main determinants of the long-term evolution of Mexican regional inequality in labour productivity between 1900 to 2000 through a convergence decomposition exercise. This is the first time that such a long-term analysis has been undertaken for the Mexican case. I have decomposed changes in convergence into a 'within-sector' component, 'labour-reallocation' and a 'between-sector' component, on the basis of a new labour productivity database.

Several stages can be distinguished in the evolution of Mexican regional inequality, which largely coincide with the main periods of recent Mexican Economic History. To start with, the last decades of the export led-growth period (1900–1930) were characterized by intense regional divergence. This trend was reversed during the State-led Industrialisation period (1930–1980), but a new divergence phase started from 1980 onwards. The main forces explaining those convergence and divergence trends have also changed over time and across space. Broadly speaking, the early divergence observed until the 1930s was driven by structural change forces, and especially by differences in the intensity of labour reallocation among regions. By contrast, during the State-led Industrialisation period, domestic migration flows from poor to rich regions led to a strong process of regional convergence, based on the reduction in productivity differences among regions. Finally, after 1980, the increasing divergence has been driven by neoclassical forces and, more specifically, by labour productivity differentials within each sector, which were boosted by the spatially uneven introduction of FDI, and by the spatial concentration of high value-added services in Mexico City. Thus, it seems that the openness of the economy has benefited just a few states, causing stagnation in labour productivity growth in most regions.

This chapter sheds some light on the explanations of domestic disparities in peripheral economies. For instance, the Mexican case illustrates the importance of differences in social structures, which could jeopardize labour mobility and therefore development in the poorest regions. The analysis of Mexican regional inequality, therefore, points at the importance of collecting new historical evidence on middle-and low-income countries, in order to get a better understanding of the causes of regional inequality. These countries not only have greater levels of inequality in comparison to the developed ones, but also have an uneven economic structure that makes the study of this issue more complex, and allows testing different interpretations of regional disparities.

APPENDIX A-4

Labour productivity (GDP per worker) per sector at regional level, 1900-2000

As mentioned in section 4.2, this chapter is based on a new database of GDP per worker of the Mexican states. In the following lines I present the estimation methods and the main characteristics of this database. Regional GDP is obtained by distributing the national GDP taken from the Maddison's project database (http://www.ggdc.net/maddison/maddison-project/home.htm). In order to distribute the national GDP among states, I use my estimates for 1900-1930 and Germán-Soto's (2005) shares for 1940-2000. The number of regions is the main difference between these estimates. While I present a database with 30 regions (merging Yucatán and Quintana Roo, and Baja California Norte and Baja California Sur), Germán-Soto (2005) offers a database with the actual 32 states.

State GDP figures are disaggregated into 5 economic sectors: agrarian, mining, oil, industrial, and services. Each sector's production for each region and year was obtained from several sources. From 1900 to 1930 all data come from my new estimates (see Chapter 2). From 1940 to 1960 each sector's production comes from Appendini (1978). However, Appendini's industrial sector includes the mining and oil sectors, and I used Ruiz's (2010) estimates to disaggregate Appendini's industrial sector into mining, oil and industry (which includes manufacturing, construction and electricity). Data from 1970 to 2000 come from the INEGI (1985, 2002).

Each sector's labour force has been estimated on the basis of Population Census data. For the period 1900-1940, domestic service figures (which, unlike those from the 1950 and subsequent Population Censuses, was not yet divided between paid and unpaid workers), 'unspecified occupations' and 'unproductive occupations' were not considered. From 1950 to 2000, unpaid domestic workers and 'unspecified occupations' were excluded. The 1921 Population Census does not offers sectoral labour force figures at the regional level but only at the national one. Therefore, I have used a weighted average of the 1910 and 1930 sectoral labour shares to distribute the national data among the states. I have given a two-thirds weight to the 1910 share and a one-third weight to the 1930 one. Thus, I assume that the 1921 labour force structure was closer to the 1910 one than to that of 1930. This is based on recent literature suggesting that the 1910 Revolution's impact on economic activity was not totally destructive (Haber, 2010: 432). Estimates for 1930 are based on the VI Population Census. Data for 1980 are a weighted average of the 1970 and 1990 estimates, with weights of two-thirds and one-third respectively, due to the problems of the 1980 Population Census figures, which include too large amounts of "insufficiently specified services". I adopt a higher 1970 weight on account of the significant effects that the economic reforms adopted since the mid-1980s had on the labour productivity structure at the regional level.

As 1990 is the only year for which there are data available on the regional distribution of the oil sector labour force I have estimated each state's share of the national labour force for all the remaining years. National oil labour force (i.e. the amount of workers employed in the extraction of crude oil and natural gas) has been taken from Rubio (2002: 309) for 1921-1980 and has been distributed among states on the basis of each state's share of national oil production in each benchmark year. Thus, oil workers' productivity is assumed to be the same across states. The estimated oil labour has been removed from the mining labour force given in the Population Censuses. For 1990, the oil labour force has been taken directly from the Population Census of this year. Finally, for the year 2000 I assume that interregional differences in oil labour productivity were the same as in 1990.

The complete database is presented in Tables A-4.1 – A-4.11, while Tables A-4.12 – A-4.22 offer each sector's labour force figures for the benchmark years.

Table A-4.1
Sectoral labour productivity, 1900 (1990 Int. GK$), Oil excluded

	Primary	Mining	Industries	Services	TOTAL
Aguascalientes	4692	58190	6992	13308	8626
Baja California	6362	19337	9555	31424	12299
Campeche	1337	0	6075	20617	4011
Coahuila	2992	10623	6007	18859	6178
Colima	1961	0	3625	15190	3697
Chiapas	2465	40409	4062	19249	3506
Chihuahua	2486	14564	5276	27080	5590
Mexico City	3732	0	6611	21132	11649
Durango	3470	15009	5379	21553	6476
Guanajuato	1746	4273	6850	11375	3542
Guerrero	1301	14194	4128	16549	2050
Hidalgo	1281	8311	6728	13009	3481
Jalisco	2232	8573	6560	9738	3952
México	1529	8782	6209	14069	2964
Michoacán	1639	11063	7047	10472	3174
Morelos	3384	6860	6438	28716	5520
Nayarit	4744	9088	9144	13162	6245
Nuevo León	2181	49437	8615	29808	8921
Oaxaca	1026	4051	4129	16791	1998
Puebla	2156	35211	6324	14215	3942
Querétaro	1267	8562	6766	11914	3398
San Luis Potosí	911	15762	5803	15122	3049
Sinaloa	3180	18989	9244	16642	6208
Sonora	4704	21558	9269	16823	8557
Tabasco	2016	0	5674	22595	3955
Tamaulipas	1947	11492	5944	25180	4616
Tlaxcala	1795	0	6431	18757	3985
Veracruz	2596	0	6661	24977	4497
Yucatán	6101	0	5868	19691	7363
Zacatecas	1719	6557	5958	20145	3967
MEXICO	***2140***	***12757***	***6449***	***16668***	***4441***

Table A-4.2
Sectoral labour productivity, 1910 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	2013	168424	9879	17810	13933
Baja California	6041	5331	14321	34304	10865
Campeche	2242	0	7652	24788	5305
Coahuila	3088	31646	7722	23676	7454
Colima	6493	0	6158	20319	7753
Chiapas	4345	0	6216	19561	5247
Chihuahua	3122	26227	7980	31686	7883
Mexico City	3443	0	8044	27249	14650
Durango	1901	22612	7675	21395	4482
Guanajuato	2375	9826	8498	13995	4584
Guerrero	2180	90401	5992	22923	3227
Hidalgo	1518	11437	8793	17983	3925
Jalisco	1934	5459	8386	11590	3699
México	2838	30939	8634	18303	5097
Michoacán	2474	44686	8448	13896	4459
Morelos	3022	6856	8331	27873	5315
Nayarit	3643	36155	15824	19052	6796
Nuevo León	1598	135910	14593	18242	7155
Oaxaca	1684	4125	6626	18094	2824
Puebla	1603	22760	8547	19446	4283
Querétaro	1538	43748	8325	17499	3804
San Luis Potosí	962	57410	8617	20156	3897
Sinaloa	2847	27195	17218	25823	6034
Sonora	4183	38354	14227	22520	10198
Tabasco	1868	0	8133	23377	3823
Tamaulipas	2126	91260	10471	27997	5092
Tlaxcala	1973	0	8477	23104	4440
Veracruz	2421	0	8571	31700	5024
Yucatán	12510	0	7894	23066	13410
Zacatecas	1819	7394	9178	22270	4218
MEXICO	***2518***	***27054***	***8686***	***21132***	***5467***

Table A-4.3
Sectoral labour productivity, 1921 (1990 Int. GK$), Oil excluded

	Primary	Mining	Industries	Services	TOTAL
Aguascalientes	1202	127552	7441	23833	7379
Baja California	8687	29113	25764	33797	15521
Campeche	1734	0	7563	36594	6550
Coahuila	3026	21479	9593	25228	7302
Colima	3809	0	7057	29983	7109
Chiapas	2271	0	5466	19014	3403
Chihuahua	1973	70058	7868	26388	6855
Mexico City	1276	128223	14298	34005	20656
Durango	1114	45313	8034	14896	3292
Guanajuato	1236	15076	8304	11146	3184
Guerrero	1143	59936	4338	10698	1652
Hidalgo	1136	58563	8979	23086	4519
Jalisco	1552	45737	8259	15445	3862
México	1632	37890	8141	17957	3701
Michoacán	1674	33780	7227	13495	3303
Morelos	1420	0	4613	7347	2104
Nayarit	2328	11694	13314	14923	4796
Nuevo León	1392	508099	20062	17166	7809
Oaxaca	1012	3065	4940	15741	1953
Puebla	1209	10764	11159	23899	4437
Querétaro	1738	9378	7796	16370	3654
San Luis Potosí	870	56008	8487	16485	3230
Sinaloa	2368	26119	15892	22371	5145
Sonora	2569	81147	13416	19826	8351
Tabasco	1585	0	9118	22198	3537
Tamaulipas	1448	0	20075	49110	8905
Tlaxcala	1344	0	9714	20081	3880
Veracruz	1862	0	11960	32125	5118
Yucatán	6033	427	9361	46160	12178
Zacatecas	1354	49464	7092	15708	3940
MEXICO	***1665***	***55681***	***10185***	***23730***	***5218***

Table A-4.4
Sectoral labour productivity, 1930 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	1062	28931	3834	22190	5634
Baja California	12410	27749	61242	37581	23127
Campeche	2344	0	2461	21409	5141
Coahuila	4225	39823	19916	24103	10426
Colima	2248	0	3322	16093	4540
Chiapas	1774	0	6366	11993	2705
Chihuahua	2762	106807	10788	27548	11159
Mexico City	1661	89156	15314	28809	20238
Durango	1963	59078	15317	15051	5397
Guanajuato	1404	15327	5272	17350	3556
Guerrero	819	46070	1539	17311	1579
Hidalgo	1301	48143	8777	18578	4509
Jalisco	1635	24917	3547	12410	3125
México	1382	8288	6869	14208	3069
Michoacán	1507	21147	3590	12008	2752
Morelos	2293	32275	7613	13187	3686
Nayarit	2730	1458	5218	13703	4134
Nuevo León	1828	495494	29591	21901	10263
Oaxaca	944	3186	1890	16687	1705
Puebla	1497	31197	6862	22847	4052
Querétaro	1139	7731	3693	16001	2743
San Luis Potosí	1272	73017	6637	18877	4736
Sinaloa	3140	21001	10884	15006	5219
Sonora	4303	58027	9853	20207	10234
Tabasco	2895	0	3087	19798	4192
Tamaulipas	2199	0	9871	41503	11060
Tlaxcala	2006	0	4897	16839	3724
Veracruz	2092	0	16410	18705	5024
Yucatán	4385	2288	10467	18138	7308
Zacatecas	1365	69790	3492	18736	4956
MEXICO	***1856***	***56270***	***9689***	***21435***	***5604***

Table A-4.5
Sectoral labour productivity, 1940 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	2733	0	29748	7541	7947
Baja California	8152	3009	64690	45345	25916
B. C. Sur	3969	11131	8211	7767	6380
Campeche	5343	0	6808	5655	5603
Coahuila	5471	15519	25261	15254	10911
Colima	3035	12039	20753	13160	7813
Chiapas	1705	0	8896	7892	2570
Chihuahua	3299	26579	18218	13107	8194
Mexico City	5823	3513	18277	25317	21715
Durango	3510	14214	37444	16406	9117
Guanajuato	1646	8611	7072	7865	3228
Guerrero	1432	12107	5087	11644	2314
Hidalgo	1084	23192	7571	7684	3261
Jalisco	1950	9707	6070	9615	4035
México	1623	9383	13000	6798	3170
Michoacán	1602	12859	4475	4890	2426
Morelos	3147	0	15881	13309	5454
Nayarit	2952	15011	6051	7217	4039
Nuevo León	2467	1132	25525	25754	11571
Oaxaca	945	12115	2995	4223	1386
Puebla	1107	585	7896	6892	2618
Querétaro	3784	27223	17597	21907	7269
Quintana Roo	13524	0	7963	3430	11038
San Luis Potosí	1683	17471	4868	10406	3767
Sinaloa	2750	7811	9780	17365	5981
Sonora	4718	11383	9050	21564	9250
Tabasco	3946	0	5875	8608	4648
Tamaulipas	3091	4284	11899	30529	10898
Tlaxcala	1870	0	7488	4856	2843
Veracruz	2247	0	7974	11390	4199
Yucatán	2413	31558	10235	17950	6750
Zacatecas	1693	16877	4201	6648	3098
MEXICO	***2143***	***14720***	***13115***	***16491***	***6422***

Table A-4.6
Sectoral labour productivity, 1950 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	2191	5240	3974	8270	4243
Baja California	11053	2056	27276	40557	23795
B. C. Sur	3321	19357	20229	17554	10428
Campeche	4505	280067	5809	10995	7166
Coahuila	5452	11201	17718	19355	11458
Colima	4748	32383	4834	11642	6673
Chiapas	2819	1000	2674	7555	3391
Chihuahua	4755	34957	33941	14949	12665
Mexico City	3488	577	14979	26466	21009
Durango	3772	20698	18288	10465	6576
Guanajuato	2173	18874	5671	9602	3958
Guerrero	2192	42631	6577	8700	3394
Hidalgo	2007	7599	11250	5912	3618
Jalisco	2953	8592	8223	13736	6152
México	1977	4975	18866	6963	4452
Michoacán	2349	32502	6172	7974	3707
Morelos	3207	878	17246	12735	6483
Nayarit	5409	0	4554	10676	6235
Nuevo León	4722	49258	23903	18821	13985
Oaxaca	2220	4736	3699	8352	2961
Puebla	1735	1177	8225	11845	4285
Querétaro	1516	16061	7720	9981	3558
Quintana Roo	15717	16315	19257	15864	16111
San Luis Potosí	2586	29573	15837	10748	5875
Sinaloa	4653	24237	13096	19847	8430
Sonora	5943	7411	17907	27880	13327
Tabasco	3645	0	4827	14848	5321
Tamaulipas	5772	673	10079	22895	10866
Tlaxcala	2126	0	5934	5706	3139
Veracruz	4486	0	21305	14428	8151
Yucatán	2785	16769	12945	15849	7274
Zacatecas	2579	21275	19133	9543	4915
MEXICO	***3135***	***17278***	***13536***	***18046***	***8237***

Table A-4.7
Sectoral labour productivity, 1960 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	3036	6317	6981	8522	5418
Baja California	9533	4039	15181	36320	20845
B. C. Sur	6237	17662	20453	14341	10402
Campeche	4733	1596	12440	11867	7949
Coahuila	5468	28374	20734	20241	13847
Colima	5808	5134	8772	9280	7249
Chiapas	3181	3029	6150	8815	4104
Chihuahua	8595	61009	12299	18722	14046
Mexico City	4610	1966	22658	29858	26202
Durango	4664	21258	16250	8144	6705
Guanajuato	2286	7496	8410	15914	5765
Guerrero	2698	32119	8706	13383	4520
Hidalgo	2571	8549	11755	6751	4358
Jalisco	2774	4023	10856	13487	7293
México	2177	2092	26996	7199	7912
Michoacán	2085	4333	7328	8230	3550
Morelos	2603	5637	13411	16095	7466
Nayarit	4172	11623	7805	11964	6030
Nuevo León	4487	90346	22935	34109	21352
Oaxaca	1586	4542	6346	5932	2389
Puebla	1930	3660	9962	8191	4212
Querétaro	1999	3989	9783	10414	4397
Quintana Roo	3312	1613	16979	6238	5157
San Luis Potosí	2194	22098	11468	10347	5066
Sinaloa	5614	3037	22496	23132	11611
Sonora	10034	5836	14159	24229	14854
Tabasco	4042	0	6423	12122	5739
Tamaulipas	4833	2516	10481	16357	9343
Tlaxcala	2133	0	7122	3851	3208
Veracruz	5551	15385	15378	12512	8257
Yucatán	5432	5735	15522	11335	8453
Zacatecas	3089	12688	8130	8679	4307
MEXICO	***3565***	***18541***	***16846***	***20026***	***10429***

Table A-4.8
Sectoral labour productivity, 1970 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	7592	17344	12987	26240	15763
Baja California	9999	10596	30647	37843	29115
B. C. Sur	15016	51267	29262	30819	25604
Campeche	9132	9708	15830	23804	15019
Coahuila	7169	29243	28075	32956	23390
Colima	8652	13996	16618	24549	15672
Chiapas	3892	3028	25292	25952	8903
Chihuahua	7532	63516	20207	28433	19821
Mexico City	3464	5965	26040	32666	29313
Durango	6578	28758	25340	29065	15260
Guanajuato	5888	13103	16239	32740	14597
Guerrero	3208	22641	16416	32507	10967
Hidalgo	2651	21959	24033	27147	10677
Jalisco	9095	31768	20001	29038	19237
México	4027	12993	34476	24906	21310
Michoacán	4461	33348	13064	31505	11502
Morelos	6891	23326	20658	25331	15738
Nayarit	6993	10871	24038	27868	14147
Nuevo León	12635	50104	11936	50486	28666
Oaxaca	2340	11562	10797	29604	6824
Puebla	2844	6141	19338	27492	11421
Querétaro	5282	12752	25568	27522	15208
Quintana Roo	10480	18310	21124	28231	17439
San Luis Potosí	3401	19927	15410	26738	11513
Sinaloa	9164	30723	22539	29424	17366
Sonora	19483	71518	25681	33043	26951
Tabasco	4453	0	17666	26066	10986
Tamaulipas	8193	8838	22729	31278	20937
Tlaxcala	1817	12565	12215	26700	9062
Veracruz	5288	21889	27248	28426	14836
Yucatán	2727	18050	24712	31708	13615
Zacatecas	4988	33388	10904	31010	11361
MEXICO	***5504***	***25698***	***23210***	***31293***	***18555***

Table A-4.9
Sectoral labour productivity, 1980 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	7851	15750	14880	27064	17743
Baja California	9615	42964	27101	36103	26938
B. C. Sur	14810	60116	25351	33271	28638
Campeche	8973	40372	17301	39181	18428
Coahuila	8184	31512	27549	31677	25807
Colima	8745	29457	19793	25461	18901
Chiapas	3700	22058	23872	26636	9669
Chihuahua	8765	48444	19106	31349	21923
Mexico City	5167	24105	29294	36981	33515
Durango	8517	25372	23308	28717	18293
Guanajuato	6225	13655	15031	30909	17110
Guerrero	3551	21826	15274	31066	13726
Hidalgo	3034	21035	24141	26596	12747
Jalisco	9940	38873	19303	29205	20996
México	4521	20614	29612	24137	21545
Michoacán	5250	52793	12509	28781	13129
Morelos	8402	24941	20353	25429	19333
Nayarit	7545	14633	21016	27150	15880
Nuevo León	10911	48382	16033	47912	24945
Oaxaca	2794	16278	11811	29155	8262
Puebla	3042	13416	18691	27821	12782
Querétaro	5465	11887	24760	30137	18424
Quintana Roo	7897	41089	18141	33783	25689
San Luis Potosí	4292	19825	17116	26053	14878
Sinaloa	9675	30617	19708	28995	18839
Sonora	18172	60545	25252	32530	27960
Tabasco	4513	51169	19037	29747	14194
Tamaulipas	9150	41841	22018	30000	21697
Tlaxcala	2726	24655	13212	26086	9943
Veracruz	4688	29182	25662	27321	16378
Yucatán	3383	37483	20863	29471	16768
Zacatecas	6523	29593	10244	29507	14138
MEXICO	***5577***	***29425***	***22721***	***31474***	***20513***

Table A-4.10
Sectoral labour productivity, 1990 (1990 Int. GK$), Oil excluded

	Primary	Mining	Industries	Services	TOTAL
Aguascalientes	8370	12536	18665	28712	22081
Baja California	8845	107631	20010	32625	25953
B. C. Sur	14399	77769	17529	38173	30441
Campeche	8655	102037	20242	69935	38535
Coahuila	10214	36048	26498	29121	25996
Colima	8932	60372	26142	27285	23093
Chiapas	3315	66165	21033	28005	12361
Chihuahua	11231	18294	16905	37182	25047
Mexico City	8572	60380	35803	45614	42666
Durango	12396	18593	19244	28021	21025
Guanajuato	6899	14758	12614	27247	17161
Guerrero	4237	20189	12991	28186	16452
Hidalgo	3800	19188	24358	25493	16727
Jalisco	11631	53082	17908	29539	22880
México	5509	35853	19885	22599	20047
Michoacán	6828	91675	11397	23333	14602
Morelos	11425	28149	19744	25626	21012
Nayarit	8648	22118	14972	25714	16947
Nuevo León	7462	44928	24226	42765	32929
Oaxaca	3700	25707	13841	28258	12547
Puebla	3437	27956	17396	28481	16126
Querétaro	5832	10155	23144	35366	25139
Quintana Roo	2731	86579	12171	44885	30788
San Luis Potosí	6075	19618	20529	24684	17556
Sinaloa	10696	30367	14047	28138	19015
Sonora	15551	38586	24393	31504	26094
Tabasco	4635	153145	21778	37110	21926
Tamaulipas	11065	107809	20596	27446	22700
Tlaxcala	4543	48616	15206	24857	15634
Veracruz	3487	43767	22489	25112	15677
Yucatán	4696	76298	13164	24996	16511
Zacatecas	9593	22000	8923	26502	15976
MEXICO	***6321***	***33486***	***21028***	***31917***	***22848***

Table A-4.11
Sectoral labour productivity, 2000 (1990 Int. GK$), Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	15426	12532	24582	29436	26573
Baja California	12819	107676	21366	35465	28553
B. C. Sur	14678	77758	15125	27534	23942
Campeche	5119	0	5703	22106	14421
Coahuila	21483	36048	27957	30786	29222
Colima	10716	60368	24086	20252	20330
Chiapas	3315	66224	15465	17292	10311
Chihuahua	19618	18294	19719	42456	30357
Mexico City	9494	60392	51442	45660	46712
Durango	20630	18593	16813	22359	20319
Guanajuato	9552	14759	14128	23997	18313
Guerrero	5351	20188	8896	20081	13754
Hidalgo	4927	19189	17905	17309	14333
Jalisco	14467	53075	16960	23570	20491
México	9756	35855	21216	16839	17906
Michoacán	10135	91692	12439	17105	14310
Morelos	13351	28146	19831	19282	18627
Nayarit	9011	22112	10144	16103	13037
Nuevo León	13116	44932	29326	40556	35272
Oaxaca	3676	25706	9616	17601	10295
Puebla	3601	27959	16825	23012	15695
Querétaro	9540	10155	28377	29091	26955
Quintana Roo	2410	86625	9586	36278	28336
San Luis Potosí	6700	19619	22121	20386	17865
Sinaloa	12394	30372	14643	21553	17704
Sonora	15986	38587	22328	31004	26067
Tabasco	3414	0	14109	17062	12561
Tamaulipas	12619	107797	20605	25859	22784
Tlaxcala	4579	48611	11258	16474	12261
Veracruz	3770	43798	18580	16943	12958
Yucatán	5329	76348	13485	20757	16032
Zacatecas	18412	21999	7966	18693	15912
MEXICO	***7526***	***30808***	***21604***	***26545***	***22061***

Table A-4.12
Sectoral labour force, 1900 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	63.9	4.4	18.3	13.3	100
Baja California	62.7	18.2	5.5	13.6	100
BCS	nd	nd	nd	nd	nd
Campeche	76.0	0.0	13.4	10.6	100
Coahuila	60.9	5.1	20.2	13.8	100
Colima	76.7	0.0	11.7	11.6	100
Chiapas	88.2	0.0	6.3	5.5	100
Chihuahua	76.2	8.2	7.9	7.7	100
Mexico City	27.2	0.0	32.8	40.1	100
Durango	69.5	10.0	11.4	9.0	100
Guanajuato	72.2	3.7	13.6	10.5	100
Guerrero	92.0	0.3	3.8	3.9	100
Hidalgo	73.3	7.0	9.5	10.1	100
Jalisco	70.5	0.9	15.2	13.4	100
México	82.3	1.1	9.3	7.3	100
Michoacán	77.9	0.1	12.2	9.8	100
Morelos	84.6	0.7	7.2	7.5	100
Nayarit	76.4	2.0	10.1	11.5	100
Nuevo León	67.6	3.5	13.7	15.2	100
Oaxaca	86.8	0.6	8.1	4.5	100
Puebla	76.8	0.1	13.0	10.2	100
Querétaro	72.8	0.3	14.6	12.3	100
Quintana Roo	nd	nd	nd	nd	nd
San Luis Potosí	79.5	3.4	8.5	8.6	100
Sinaloa	71.8	4.1	11.7	12.5	100
Sonora	65.1	7.0	9.5	18.5	100
Tabasco	84.3	0.0	7.7	8.1	100
Tamaulipas	82.2	0.2	7.5	10.1	100
Tlaxcala	75.6	0.0	15.8	8.6	100
Veracruz	84.7	0.0	8.3	7.0	100
Yucatán	80.1	0.0	10.4	9.5	100
Zacatecas	72.1	11.3	9.6	7.0	100
MEXICO	**75.2**	**2.3**	**11.8**	**10.6**	**100**

Table A-4.13
Sectoral labour force, 1910 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	65.9	5.2	15.6	13.4	100
Baja California	66.1	11.4	7.3	15.2	100
BCS	nd	nd	nd	nd	nd
Campeche	77.7	0.0	11.5	10.8	100
Coahuila	68.6	3.9	15.1	12.4	100
Colima	77.6	0.0	13.0	9.4	100
Chiapas	89.2	0.0	5.6	5.2	100
Chihuahua	72.6	7.6	11.2	8.6	100
Mexico City	25.8	0.0	33.6	40.6	100
Durango	80.7	4.2	9.0	6.1	100
Guanajuato	74.1	3.2	12.2	10.5	100
Guerrero	92.7	0.3	3.8	3.3	100
Hidalgo	79.3	5.5	7.0	8.2	100
Jalisco	77.5	0.8	11.3	10.4	100
México	81.6	1.9	8.6	7.9	100
Michoacán	80.7	1.0	9.6	8.7	100
Morelos	85.1	0.1	7.2	7.7	100
Nayarit	78.4	0.6	8.7	12.3	100
Nuevo León	75.5	1.6	11.0	11.9	100
Oaxaca	87.1	0.6	7.8	4.5	100
Puebla	77.6	0.5	12.3	9.6	100
Querétaro	80.0	0.2	10.7	9.1	100
Quintana Roo	nd	nd	nd	nd	nd
San Luis Potosí	81.0	1.0	9.5	8.5	100
Sinaloa	83.9	2.7	6.3	7.1	100
Sonora	68.5	7.0	10.6	13.9	100
Tabasco	86.4	0.0	6.4	7.2	100
Tamaulipas	84.9	0.1	5.8	9.2	100
Tlaxcala	76.9	0.0	16.5	6.6	100
Veracruz	84.4	0.0	8.4	7.1	100
Yucatán	73.7	0.0	12.3	13.9	100
Zacatecas	77.9	7.2	8.0	6.9	100
MEXICO	**77.6**	**1.8**	**10.6**	**9.9**	**100**

Table A-4.14
Sectoral labour force, 1921 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	69.0	1.4	14.1	15.4	100
Baja California	69.2	4.4	8.6	17.8	100
BCS	nd	nd	nd	nd	nd
Campeche	77.2	0.0	10.8	12.0	100
Coahuila	71.0	1.5	13.5	14.0	100
Colima	76.7	0.0	12.1	11.1	100
Chiapas	87.9	0.0	6.6	5.5	100
Chihuahua	77.7	2.7	9.5	10.0	100
Mexico City	22.4	0.2	31.6	45.8	100
Durango	83.2	1.4	8.3	7.1	100
Guanajuato	77.6	0.9	10.7	10.8	100
Guerrero	93.0	0.1	3.6	3.3	100
Hidalgo	83.4	1.9	6.5	8.2	100
Jalisco	78.5	0.3	10.4	10.8	100
México	83.5	0.6	7.5	8.5	100
Michoacán	82.4	0.4	8.5	8.7	100
Morelos	85.6	0.0	6.2	8.2	100
Nayarit	79.3	0.2	8.5	12.0	100
Nuevo León	74.6	0.4	11.8	13.2	100
Oaxaca	88.4	0.2	6.9	4.5	100
Puebla	79.6	0.2	10.9	9.4	100
Querétaro	81.5	0.1	9.1	9.3	100
Quintana Roo	nd	nd	nd	nd	nd
San Luis Potosí	81.6	0.5	8.8	9.2	100
Sinaloa	84.0	0.9	7.1	8.0	100
Sonora	72.9	2.8	9.3	15.1	100
Tabasco	86.9	0.0	5.7	7.4	100
Tamaulipas	80.0	0.0	7.1	12.9	100
Tlaxcala	78.9	0.0	13.6	7.5	100
Veracruz	83.6	0.0	8.5	7.9	100
Yucatán	73.5	0.1	12.1	14.3	100
Zacatecas	83.0	2.3	7.3	7.3	100
MEXICO	**78.7**	**0.6**	**9.9**	**10.8**	**100**

Table A-4.15
Sectoral labour force, 1930 (%). Oil excluded

	Primary	**Mining**	**Industries***	**Services**	**TOTAL**
Aguascalientes	65.1	1.0	15.6	18.3	100
Baja California	62.9	7.8	9.1	20.2	100
BCS	nd	nd	nd	nd	nd
Campeche	71.6	0.0	13.9	14.6	100
Coahuila	68.6	2.8	11.8	16.8	100
Colima	70.7	0.0	13.9	15.5	100
Chiapas	86.9	0.0	7.3	5.8	100
Chihuahua	75.7	4.7	7.9	11.7	100
Mexico City	15.3	0.2	33.7	50.7	100
Durango	81.9	2.4	6.6	9.1	100
Guanajuato	77.7	0.7	11.5	10.1	100
Guerrero	92.1	0.4	4.1	3.4	100
Hidalgo	82.8	3.1	6.9	7.3	100
Jalisco	76.6	0.4	12.2	10.8	100
México	81.8	0.6	8.4	9.2	100
Michoacán	81.7	0.9	9.0	8.5	100
Morelos	85.4	0.5	5.2	8.9	100
Nayarit	78.6	0.5	10.4	10.5	100
Nuevo León	70.8	0.3	13.0	15.8	100
Oaxaca	87.3	0.1	8.2	4.3	100
Puebla	78.6	0.2	12.7	8.5	100
Querétaro	81.8	0.1	8.9	9.2	100
Quintana Roo	nd	nd	nd	nd	0
San Luis Potosí	79.1	1.6	9.0	10.4	100
Sinaloa	80.2	1.3	8.5	10.0	100
Sonora	70.2	5.5	8.6	15.7	100
Tabasco	86.3	0.0	6.1	7.6	100
Tamaulipas	67.9	0.0	11.8	20.2	100
Tlaxcala	76.9	0.0	14.3	8.8	100
Veracruz	81.1	0.0	9.1	9.8	100
Yucatán	71.0	0.0	13.8	15.2	100
Zacatecas	81.8	3.1	7.7	7.3	100
MEXICO	***76.0***	***1.0***	***11.0***	***12.1***	100

Table A-4.16
Sectoral labour force, 1940 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	54.9	0.0	13.7	31.4	100
Baja California	55.7	1.9	10.8	31.6	100
BCS	50.7	14.8	9.6	25.0	100
Campeche	63.6	0.0	12.7	23.8	100
Coahuila	58.0	5.8	13.2	23.0	100
Colima	61.7	0.4	12.0	25.9	100
Chiapas	86.8	0.0	4.7	8.5	100
Chihuahua	65.1	7.9	8.0	19.0	100
Mexico City	6.6	0.8	30.3	62.3	100
Durango	74.3	2.8	11.2	11.8	100
Guanajuato	73.1	1.4	12.6	12.9	100
Guerrero	88.6	1.0	4.4	6.1	100
Hidalgo	77.1	4.4	6.2	12.3	100
Jalisco	66.5	0.5	13.7	19.4	100
México	79.5	1.0	7.4	12.1	100
Michoacán	76.7	1.2	8.6	13.5	100
Morelos	78.9	0.0	6.5	14.6	100
Nayarit	75.1	1.5	7.7	15.8	100
Nuevo León	59.5	1.2	16.7	22.6	100
Oaxaca	85.6	0.7	7.0	6.7	100
Puebla	75.6	0.2	11.2	13.0	100
Querétaro	78.7	0.2	8.8	12.4	100
Quintana Roo	72.6	0.0	6.1	21.3	100
San Luis Potosí	73.9	3.6	8.1	14.4	100
Sinaloa	71.9	2.6	8.3	17.3	100
Sonora	62.1	8.2	8.1	21.6	100
Tabasco	81.6	0.0	5.7	12.7	100
Tamaulipas	60.5	5.1	9.1	25.3	100
Tlaxcala	77.7	0.0	11.7	10.6	100
Veracruz	75.5	0.0	8.4	16.1	100
Yucatán	67.0	0.1	10.5	22.5	100
Zacatecas	80.0	5.4	5.7	8.8	100
MEXICO	***67.3***	***1.7***	***11.4***	***19.6***	**100**

Table A-4.17
Sectoral labour force, 1950 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	52.6	0.4	19.0	28.0	100
Baja California	48.6	0.6	16.7	34.2	100
BCS	53.3	8.9	11.4	26.4	100
Campeche	59.6	0.4	18.3	21.8	100
Coahuila	52.2	4.2	18.1	25.5	100
Colima	60.4	0.3	12.6	26.7	100
Chiapas	79.8	0.2	7.5	12.4	100
Chihuahua	58.0	4.9	13.9	23.2	100
Mexico City	5.1	0.6	36.0	58.3	100
Durango	72.9	2.4	9.5	15.1	100
Guanajuato	69.0	0.9	15.4	14.6	100
Guerrero	82.3	0.6	7.4	9.7	100
Hidalgo	73.0	2.5	9.6	14.9	100
Jalisco	61.5	0.3	17.0	21.2	100
México	75.8	0.6	10.8	12.8	100
Michoacán	75.3	0.6	10.2	13.9	100
Morelos	70.2	0.2	10.3	19.3	100
Nayarit	72.6	0.0	10.1	17.3	100
Nuevo León	45.2	0.8	25.1	28.9	100
Oaxaca	79.3	0.4	11.1	9.2	100
Puebla	69.3	0.4	14.3	16.1	100
Querétaro	72.9	0.3	11.8	15.0	100
Quintana Roo	65.1	0.1	10.1	24.6	100
San Luis Potosí	71.1	2.0	10.8	16.2	100
Sinaloa	70.7	0.5	10.2	18.5	100
Sonora	57.3	2.9	14.0	25.9	100
Tabasco	78.6	0.0	7.2	14.2	100
Tamaulipas	56.1	3.7	12.5	27.7	100
Tlaxcala	72.7	0.0	14.9	12.4	100
Veracruz	70.7	0.0	11.0	18.2	100
Yucatán	62.1	0.2	15.9	21.8	100
Zacatecas	80.7	3.5	6.1	9.8	100
MEXICO	***61.1***	***1.1***	***15.5***	***22.4***	**100**

Table A-4.18
Sectoral labour force, 1960 (%). Oil excluded

	Primary	Mining	Industries	Services	TOTAL
Aguascalientes	50.2	0.5	22.0	27.3	100
Baja California	41.7	0.5	19.7	38.2	100
BCS	58.2	4.8	10.1	27.0	100
Campeche	55.6	0.6	19.0	24.9	100
Coahuila	46.2	4.1	20.3	29.3	100
Colima	55.1	1.2	13.6	30.1	100
Chiapas	80.1	0.3	6.7	12.9	100
Chihuahua	50.6	3.6	16.5	29.4	100
Mexico City	2.7	0.7	38.6	58.0	100
Durango	70.7	1.9	9.6	17.9	100
Guanajuato	64.6	1.0	16.8	17.6	100
Guerrero	81.5	0.6	5.7	12.1	100
Hidalgo	71.2	1.9	11.0	15.9	100
Jalisco	52.2	0.6	20.5	26.6	100
México	61.6	0.9	19.5	18.0	100
Michoacán	74.3	0.7	10.0	15.1	100
Morelos	60.7	0.5	14.2	24.5	100
Nayarit	70.9	0.7	9.7	18.6	100
Nuevo León	32.4	0.7	31.9	34.9	100
Oaxaca	82.1	0.5	7.4	9.9	100
Puebla	67.2	0.5	14.2	18.1	100
Querétaro	69.9	0.9	11.4	17.8	100
Quintana Roo	69.3	0.5	9.0	21.2	100
San Luis Potosí	69.0	1.9	11.0	18.1	100
Sinaloa	64.8	0.5	11.6	23.2	100
Sonora	53.7	1.8	14.2	30.4	100
Tabasco	72.1	0.0	9.7	18.1	100
Tamaulipas	50.5	1.3	17.1	31.0	100
Tlaxcala	68.9	0.0	16.5	14.6	100
Veracruz	66.3	0.4	12.3	21.0	100
Yucatán	59.1	0.6	15.3	25.0	100
Zacatecas	80.2	3.5	5.4	10.8	100
MEXICO	***54.8***	***1.0***	***17.9***	***26.4***	**100**

Table A-4.19
Sectoral labour force, 1970 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	40.0	0.8	22.3	37.0	100
Baja California	24.0	0.5	26.3	49.1	100
BCS	36.5	3.8	15.2	44.5	100
Campeche	49.2	0.5	18.9	31.5	100
Coahuila	31.6	4.3	25.6	38.4	100
Colima	47.8	1.0	14.8	36.4	100
Chiapas	76.5	0.5	7.7	15.3	100
Chihuahua	38.8	3.1	19.2	39.0	100
Mexico City	2.3	0.8	37.4	59.5	100
Durango	59.1	2.5	13.9	24.5	100
Guanajuato	52.5	1.5	22.8	23.2	100
Guerrero	66.8	0.6	11.9	20.8	100
Hidalgo	64.9	2.2	14.5	18.3	100
Jalisco	36.3	0.5	28.6	34.7	100
México	32.6	0.6	34.4	32.4	100
Michoacán	63.8	0.5	14.9	20.8	100
Morelos	47.0	0.5	19.5	32.9	100
Nayarit	63.4	0.3	11.5	24.8	100
Nuevo León	18.2	0.6	38.7	42.4	100
Oaxaca	75.6	0.5	11.0	12.9	100
Puebla	58.8	0.6	17.8	22.8	100
Querétaro	51.7	2.8	20.5	25.0	100
Quintana Roo	55.8	0.1	12.3	31.8	100
San Luis Potosí	56.8	2.8	15.7	24.7	100
Sinaloa	54.9	0.5	13.8	30.9	100
Sonora	40.8	1.8	16.8	40.6	100
Tabasco	65.6	0.0	10.7	23.7	100
Tamaulipas	36.5	1.0	19.9	42.7	100
Tlaxcala	57.9	0.2	22.2	19.8	100
Veracruz	57.5	1.8	14.3	26.4	100
Yucatán	58.6	0.4	15.0	26.0	100
Zacatecas	67.9	4.0	10.4	17.8	100
MEXICO	***42.0***	***1.1***	***23.0***	***34.0***	**100**

Table A-4.20
Sectoral labour force, 1980 (%). Oil excluded

	Primary	Mining	Industries	Services	TOTAL
Aguascalientes	29.5	1.1	28.9	40.5	100
Baja California	25.1	0.1	28.0	46.8	100
BCS	24.5	4.5	16.6	54.5	100
Campeche	53.6	0.1	20.8	25.5	100
Coahuila	19.3	4.7	32.1	43.8	100
Colima	35.5	6.9	16.0	41.6	100
Chiapas	72.5	0.6	11.2	15.7	100
Chihuahua	30.2	3.4	26.1	40.4	100
Mexico City	1.6	0.3	38.0	60.1	100
Durango	46.0	3.7	18.6	31.7	100
Guanajuato	34.1	3.2	30.3	32.3	100
Guerrero	55.3	2.0	12.4	30.4	100
Hidalgo	55.7	2.9	23.0	18.4	100
Jalisco	25.6	0.7	33.6	40.1	100
México	22.8	0.5	34.5	42.3	100
Michoacán	52.4	0.5	21.2	25.9	100
Morelos	26.0	0.6	32.9	40.5	100
Nayarit	51.0	0.4	19.9	28.7	100
Nuevo León	5.3	0.3	65.9	28.5	100
Oaxaca	69.1	0.6	15.1	15.3	100
Puebla	51.8	0.3	23.6	24.3	100
Querétaro	38.4	3.0	31.8	26.9	100
Quintana Roo	22.3	0.2	14.9	62.6	100
San Luis Potosí	39.5	2.2	27.4	30.9	100
Sinaloa	42.9	0.4	20.1	36.6	100
Sonora	26.5	3.3	23.3	46.8	100
Tabasco	53.9	0.1	18.3	27.7	100
Tamaulipas	30.2	0.1	25.5	44.2	100
Tlaxcala	55.6	0.1	24.4	19.8	100
Veracruz	47.0	1.2	19.5	32.3	100
Yucatán	41.6	0.2	21.7	36.5	100
Zacatecas	49.7	5.4	20.5	24.4	100
MEXICO	***32.42***	***1.13***	***29.05***	***37.41***	**100**

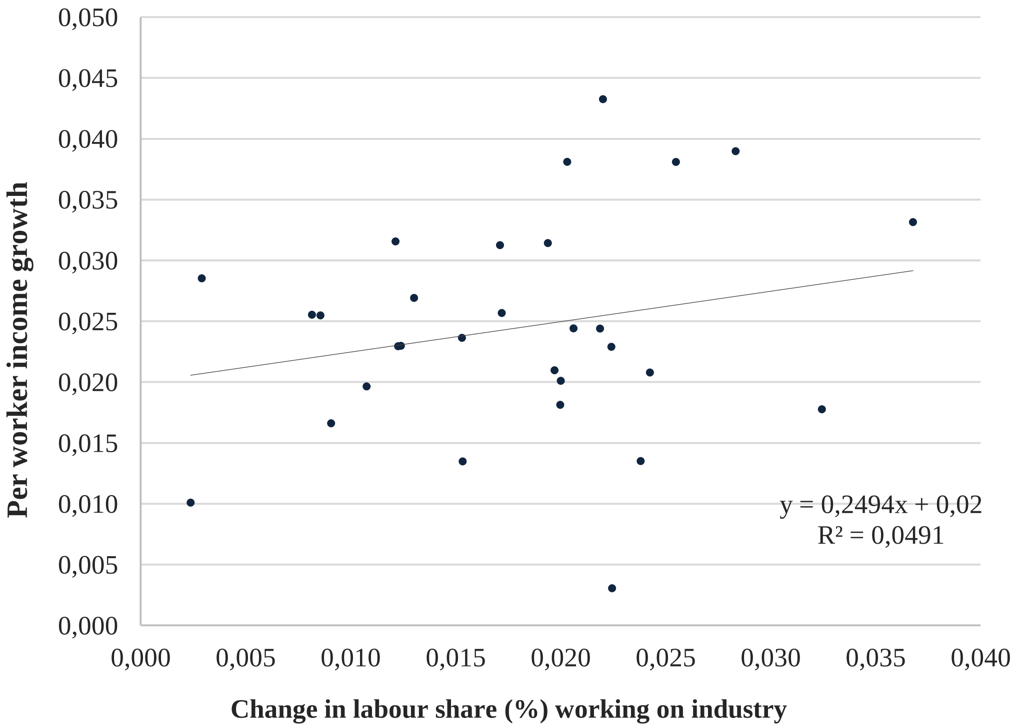
Table A-4.21
Sectoral labour force, 1990 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	15.3	0.4	34.4	49.9	100
Baja California	10.8	0.1	32.9	56.3	100
BCS	19.0	1.3	18.1	61.6	100
Campeche	36.7	0.1	18.1	45.2	100
Coahuila	12.5	2.7	36.0	48.8	100
Colima	24.8	1.8	20.0	53.4	100
Chiapas	60.3	0.1	11.2	28.4	100
Chihuahua	17.7	1.3	36.0	45.0	100
Mexico City	0.7	0.1	27.6	71.7	100
Durango	29.4	1.8	25.5	43.4	100
Guanajuato	24.0	0.5	35.2	40.4	100
Guerrero	38.0	0.4	17.2	44.5	100
Hidalgo	38.8	1.2	24.4	35.6	100
Jalisco	15.6	0.2	33.6	50.5	100
México	9.0	0.1	37.8	53.0	100
Michoacán	36.0	0.2	24.3	39.6	100
Morelos	20.9	0.3	28.2	50.6	100
Nayarit	39.9	0.2	18.1	41.7	100
Nuevo León	6.4	0.2	41.0	52.4	100
Oaxaca	54.7	0.2	15.8	29.3	100
Puebla	38.2	0.3	25.2	36.3	100
Querétaro	18.5	0.6	37.8	43.1	100
Quintana Roo	20.9	0.1	16.4	62.6	100
San Luis Potosí	32.3	1.1	25.6	41.0	100
Sinaloa	38.2	0.2	17.5	44.1	100
Sonora	23.4	1.3	24.7	50.6	100
Tabasco	39.4	0.1	16.7	43.7	100
Tamaulipas	17.3	0.1	29.3	53.2	100
Tlaxcala	29.1	0.1	34.4	36.4	100
Veracruz	41.6	0.3	19.1	39.0	100
Yucatán	27.6	0.1	24.8	47.5	100
Zacatecas	41.1	2.5	19.7	36.7	100
MEXICO	***23.6***	***0.4***	***27.8***	***48.1***	**100**

Table A-4.22
Sectoral labour force, 2000 (%). Oil excluded

	Primary	**Mining**	**Industries**	**Services**	**TOTAL**
Aguascalientes	7.6	0.4	35.9	56.1	100
Baja California	6.7	0.1	38.6	54.7	100
BCS	12.2	1.0	20.3	66.5	100
Campeche	26.1	0.0	19.8	54.1	100
Coahuila	5.4	2.3	41.7	50.5	100
Colima	17.1	2.4	19.4	61.1	100
Chiapas	48.4	0.1	13.4	38.2	100
Chihuahua	9.1	0.9	43.0	46.9	100
Mexico City	0.6	0.1	21.8	77.6	100
Durango	15.3	2.2	30.5	52.0	100
Guanajuato	13.6	0.5	37.2	48.7	100
Guerrero	27.4	0.3	20.4	51.8	100
Hidalgo	25.6	1.2	28.5	44.7	100
Jalisco	10.4	0.1	32.8	56.8	100
México	5.4	0.2	32.3	62.0	100
Michoacán	24.4	0.1	25.4	50.2	100
Morelos	13.9	0.3	26.5	59.4	100
Nayarit	28.3	0.1	17.8	53.8	100
Nuevo León	3.4	0.3	38.9	57.4	100
Oaxaca	41.8	0.7	19.3	38.2	100
Puebla	28.5	0.2	29.0	42.3	100
Querétaro	8.9	0.6	37.8	52.7	100
Quintana Roo	10.7	0.1	16.4	72.8	100
San Luis Potosí	21.8	1.4	27.1	49.8	100
Sinaloa	29.1	0.2	17.4	53.2	100
Sonora	16.4	1.1	29.5	53.0	100
Tabasco	29.4	0.0	16.5	54.1	100
Tamaulipas	9.6	0.0	34.5	55.9	100
Tlaxcala	18.6	0.0	38.5	42.9	100
Veracruz	32.7	0.0	19.2	48.1	100
Yucatán	17.4	0.1	28.4	54.1	100
Zacatecas	21.1	2.3	26.1	50.5	100
MEXICO	**16.3**	**0.4**	**28.3**	**55.0**	**100**

Figure A-4.1 Structural change and labour productivity growth (1930-1980): Industrial labour reallocation



Source: See Appendix A-4

Table A-4.23
Migration balance 1940-1980 (% of 1980 total population)

Mexico City	24.0
Baja California	64.0
Nuevo León	26.6
North	
Chihuahua	2.2
Coahuila	-18.0
Sonora	10.3
Tamaulipas	17.1
North-Pacific	
Baja California S	21.7
Colima	14.0
Jalisco	-4.0
Nayarit	-8.5
Sinaloa	-0.1
Centre-North	
Aguascalientes	-11.2
Durango	-36.6
San Luis Potosí	-39.3
Zacatecas	-69.5
Gulf	
Campeche	9.1
Tabasco	-0.9
Quintana Roo	61.5
Veracruz	-0.6
Yucatán	-21.8
Centre	
Guanajuato	-24.6
Hidalgo	-46.1
Morelos	16.9
Puebla	-20.5
Querétaro	-19.3
State of Mexico	43.2
Tlaxcala	-34.5
South	
Chiapas	-7.7
Guerrero	-20.7
Michoacán	-35.9
Oaxaca	-37.4

Source: INEGI (2000) for migrations figures.

APPENDIX B-4

Table B-4.1

Convergence decomposition, 1900-2000. Sub-periods

Considering the North macro-region as benchmark

	Total	**Within-industry**					**Labour reallocation**	**Between-industry**
1900-1930		*Overall*	Agriculture	Mining	Industry	Services		
DF	0.103	0.017	-0.061	0.004	-0.106	0.179	0.323	-0.237
	100%	17%					314%	-231%
North-Pacific	-0.328	-0.219	-0.065	-0.041	-0.165	0.052	-0.008	-0.102
	100%	67%					2%	31%
Centre-North	-0.212	-0.126	-0.034	-0.001	-0.087	-0.003	-0.133	0.047
	100%	59%					63%	-22%
Gulf	-0.254	-0.218	-0.103	0.000	-0.044	-0.071	0.114	-0.149
	100%	86%					-45%	59%
Centre	-0.194	-0.121	-0.016	-0.031	-0.121	0.047	-0.002	-0.072
	100%	62%					1%	37%
South	-0.188	-0.098	0.004	-0.010	-0.101	0.010	0.030	-0.120
	100%	52%					-16%	64%
1930-1980								
DF	-0.426	0.255	-0.005	-0.005	0.268	-0.004	-0.353	-0.328
	100%	-60%					83%	77%
North-Pacific	0.493	0.594	0.047	0.036	0.251	0.259	-0.266	0.166
	100%	120%					-54%	34%
Centre-North	0.206	0.275	0.008	0.005	0.153	0.109	-0.224	0.155
	100%	133%					-109%	75%
Gulf	0.197	0.154	-0.096	0.027	0.104	0.119	-0.224	0.268
	100%	78%					-114%	136%
Centre	0.388	0.356	-0.046	0.027	0.265	0.109	-0.162	0.194
	100%	92%					-42%	50%
South	0.258	0.246	-0.055	0.025	0.141	0.136	-0.376	0.388
	100%	95%					-146%	150%
1980-2000								
DF	0.228	0.377	0.000	0.003	0.165	0.209	-0.083	-0.066
	100%	165%					-36%	-29%
North-Pacific	-0.159	-0.154	-0.018	0.007	-0.068	-0.075	-0.017	0.012
	100%	97%					11%	-7%
Centre-North	0.017	-0.031	0.019	0.007	-0.013	-0.045	0.026	0.022
	100%	-180%					150%	130%
Gulf	-0.161	-0.238	-0.067	0.013	-0.087	-0.098	0.038	0.039
	100%	148%					-24%	-25%
Centre	-0.113	-0.179	-0.014	0.006	-0.107	-0.065	0.044	0.022
	100%	158%					-39%	-19%
South	-0.038	-0.187	-0.048	0.004	-0.038	-0.105	0.073	0.077
	100%	497%					-192%	-204%

Source: See text.

Chapter 5

Conclusions

This thesis aimed to contribute to the international literature on the causes of the long-term evolution of regional inequality by analysing the case of Mexico from 1895 to 2010. Even though previous research on Mexican regional disparities is very abundant, this is the first analysis to cover the period from the late 19^{th} century to the present. Thus, it provides a new case study to an increasing historical literature on the long-term determinants of regional inequality. While this literature has mainly focused on the experience of industrialised economies (the US and Western Europe), much more evidence is required on low and middle-income economies, where regional disparities may have very different determinants (with, for instance, a much higher influence of natural resource endowments and the dynamics of international markets or primary products). In this regard, this thesis joins a few previous works focusing on the main explanatory factors of the long term evolution of regional inequality in developing countries.

To achieve the aims of the thesis, I have applied some quantitative methods recently developed in the Economic History literature. This has allowed me to offer new evidence and interpretations on the evolution of Mexican regional inequality, not only for the period after 1940 (as most previous works), but also for the late 19^{th} and early 20^{th} century. This has allowed me to present the current Mexican regional disparities, not only as the outcome of recent institutional and economic changes (as most recent research) but as a result of a long-term historical process. So, one of the main contributions of this thesis is the evidence that it provides on regional disparities for the period of the first globalization (1895-1930), for which there was no previous systematic analysis. In Chapter 2 I have presented a new GDP per capita database at the state level between 1895 and 1930, which has been linked to the previous available estimates for 1940 to provide a complete picture of Mexican regional inequality in the long term. From the empirical point of view, this database is complemented in Chapter 4 by estimates of labour productivity for the Mexican states and sectors from 1900 to 2000. Both databases, which are among the main contributions of this thesis and can be used for further research on the topic, are used in Chapter 3 and 4 to carry out, a detailed analysis of the long run trends of Mexican regional inequality, and an exploration of its main determinants. In the following paragraphs I summarize the main results of the different analyses presented in those chapters.

1. The study of the Mexican case confirms the idea that regional inequality in low and middle-income economies may have different trends and determinants from those of the industrialised economies. In the latter, it is frequent to find that regional inequality has followed an inverted-U trend in the long term, mainly associated to changes in the location of the industrial activity and agglomeration effects. By contrast, in the Mexican case, as in other developing countries, other determinants, such as comparative advantages associated to natural resources, changes in international markets, FDI location, differences across regions in economic structure and in the productivity level of the primary sector, and institutional change, may have also played a central role. This complexity makes it difficult to explain the evolution of regional inequality in peripheral economies on the basis of a single theoretical framework. The results of this thesis reinforce the importance of combining different theoretical approaches, and the centrality of History in the explanation of the current levels of regional inequality.

2. The evolution of Mexican regional inequality has followed an N-form in the long term, which largely reflects the alternation of different development strategies in the country since the late 19^{th} century. Thus, during the periods

of highest international integration, such as the agro-export-led growth model (1895-1930) or the most recent period of economic openness (from the 1980s to the present), regional inequality has increased. In fact, the strongest phase of regional divergence in Mexico took place during the period of the First Globalization. It was also in this period when the regional structure that has characterized the Mexico economy during the 20th century, with a strong concentration of activity in Mexico City and a clear division between the rich northern regions and the poor southern regions, was established. By contrast, the ISI period (19430-80) was characterized by regional convergence, although accompanied by persistence in the geographical concentration of industry. Finally, regardless of these trends, from a comparative point of view, regional inequality has always been very high.

3. The study of different dimensions of inequality that has been carried out in Chapter 3 has provided several interesting results. Firstly, the early divergence among the Mexican regions (1895-1930) was driven by the richest states becoming richer and, correspondingly, by the poorest regions becoming relatively poorer. The following period of regional convergence (1930-1980) was characterised, on the contrary, by the fall of the richest states' relative income levels towards the national average. The latest period of divergence (1980-2010) has been led by some of the northern and central states, and specially Mexico City, moving far away from the national average. Moreover, I have found a very low rank mobility among the states throughout the entire period, with the richest and poorest regions remaining mostly the same. Finally, the spatial clustering analysis confirms such persistence by showing a permanent and statistically significant income cluster of poor southern states. By contrast, there has been no significant spatial clustering in the north during the period under study, which confirms that the northern states' good economic performance has been exclusively associated with its integration with the US market, and has not spread to the neighbouring states.

4. The main determinants of regional inequality changes have been different in each period. During the first globalization, a spatially uneven process of

structural change explains the increase in regional inequality. Those regions that could benefit from the international integration of the country (mainly Mexico City and the northern states) achieved faster rates of structural change, higher capital/labour ratios, and therefore, higher levels of labour productivity and income *per capita*. By contrast, regional convergence during the State-led industrialisation period was led by an intense process of factor mobility (and, particularly, labour flows) among the Mexican states. Finally, since the mid-1980s divergence has been mainly driven by labour productivity differentials within each sector. As in the early 20th century, inequality increase was associated to differences in the states' ability to take advantage of the international integration of the country. In this period, the uneven spatial distribution of FDI (once again, largely concentrated in Mexico City and the northern states), and the spatial concentration of high value-added services in Mexico City, appear to be the main determinants behind the regional divergence.

Further research agenda

This thesis opens some lines for further research. Firstly, it would be interesting to analyse earlier periods, especially from the 1870s, when Mexico started its process of economic modernisation. Although this possibility is restricted by the scarcity of statistical information at the regional level, this should be a research priority for the future. Secondly, it is necessary to study in more detail the impact of some specific explanatory factors of Mexican regional income inequality (such as economic openness, market potential, human capital or institutions). Finally, this dissertation studies only one among several regional inequality components, by considering only productivity levels at the state level represented by GDP *per capita* and GDP *per worker* figures. Further research will aim to extend this analysis to different living standards dimensions.

More generally speaking, it would be important to go on providing additional evidence and new hypothesis on the long-term evolution of regional disparities in developing economies, not only as an input for the Economic History literature but also to contribute to explain the current situation of increasing regional divergence in many of those countries. Indeed, this is when research with historical scope may become really useful, helping policymakers to develop effective regional policy instruments.

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