The Long-Term Patterns of Regional Income Inequality in Spain (1860-2000)

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Abstract

Building upon a new estimation of regional GDP per worker from 1860 to 2000, we evaluate the long-run evolution of regional income inequality in Spain. We find that sustained economic growth and the progressive integration of national markets have been accompanied by a U-shaped evolution of regional income inequality. Regional inequality rose during the second half of the 19th century, peaked in 1900 and decreased over the following 90 years. Since 1990, Spain's membership in the European Union has generated a new upsurge of differences in labour productivity across the country that could be the basis for a new phase of regional income divergence.

Keywords: Industrialization; Market Integration; Heckscher-Ohlin Model; New Economic Geography.
JEL Codes: N93; N94; R11.

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1. Introduction

Regional income inequality is an enduring characteristic of developed and developing countries. In particular, as Puga (2002) has noted, nearly a quarter of European citizens still lived in regions with a GDP per capita that is up to 25 per cent below the European Union average. Since the 1980s, increasing European Union (EU) integration has been accompanied by reductions in personal income differences *between* EU member states, but the regional inequalities *within* countries persist. Despite the great amount of EU structural funds and other resources that have been devoted to reducing regional income differences and spurring development in poor regions, regional inequality is still a matter of concern for European policy makers. This has led to an impressive amount of research that has been unable to offer a definitive explanation for this conundrum or furnish policy makers with univocal policy recommendations.

Different strands of the theoretical literature suggest various explanations for regional economic inequality. On the one hand, Neoclassical economic models have explained regional income disparities on the basis of spatial differences in the distribution of endowments (e.g., natural resources, factors of production and infrastructure) and technology. However, this literature has been unable to establish a clear-cut prediction on the effect of the removal of obstacles to trade on the convergence of factor returns and living standards. The factor-prize-equalization (FPE) theorem, within Heckscher-Ohlin (HO) model, is optimistic about the consequences of market integration: the increase in trade and factor movements leads to factor price equalization across regions, and hence, could favour per capita GDP convergence. However, employing the same HO framework, market integration may also lead to increasing regional specialization because regions differ in factor endowments. In this situation, the standard HO model allows FPE but not income equality (Rassekh and Thompson, 1998; Slaughter, 1997).

On the other hand, as has been posed by the New Economic Geography (NEG) literature, there are relevant forces missing from the Neoclassical analysis, which can affect regional disparities and prevent convergence. NEG theoretical models suggest that the interaction between transport costs, increasing returns and market size under a monopolistic competition framework can lead to spatial agglomeration of economic activity (Krugman, 1991). In this context, firms produce more efficiently and workers enjoy higher welfare by being close to

large markets; consequently, more firms and workers relocate to large markets. This creates a cumulative causation process that tends to increase income differences. Extending the initial arguments of the NEG, Puga (1999) points that the relationship between the process of regional integration and the degree of concentration of economic activity depends greatly on whether or not workers move across regions in response to income differentials. Industrial agglomeration tends to raise local wages in regions densely populated by firms. When higher wages lead workers to relocate from de-industrializing (poor) to more industrialized (rich) regions, agglomeration intensifies but wage differentials tend to collapse; that is, market integration and industrial concentration will lead to income convergence. If workers instead do not move across regions, the interregional wage differentials tend to persist. In this latter case, the relationship between integration and agglomeration is no longer monotonic. For example, in the case of further reductions in transport (transaction) costs, a new tendency towards dispersion can emerge as a result of congestion costs. Therefore, progressive market integration can eventually lead, as traditional models predict, to income convergence.

Growth theory also offers insights about the causes of regional inequality. In the textbook Solow model, in a closed economy context, differences in capital per worker lead to slow income convergence across locations (Barro and Sala-i-Martin, 2003). If we add to the model cross-regional movements of capital, convergence rates may increase due to the fact that capital moves from capital-abundant to capital-scarce regions following differences in its relative remuneration (Barro et al 1995). Nevertheless, the new strand of growth theory, the Endogenous Growth theory, also makes contradictory predictions about the impact of cross-regional integration. In the presence of increasing returns, the basic model (Romer, 1986) predicts that increasing movements of capital will lead to regional divergence. Instead, if we consider that technology is not a public good and, hence, subject to decision-making processes of individual agents and their desire for monopoly rents, an increased scale of the economy will have a lasting positive effect on growth.

From this short review of the theoretical literature on regional income inequality, one should conclude that more empirical work is necessary because the predictions of different models are conflicting. In this respect, empirical analysis of the enduring experiences of regional inequality in countries such as Spain, France or the United States could be of great help. This approach would offer evidence on the determinants of regional inequality, both in periods characterized by growing inequality across regions and in those in which income convergence has dominated.

It should be noted that an old tradition in economic history has posited that the first phases of modern economic growth, particularly when growth went hand-in-hand with regional market integration, could be associated with increases in regional per capita income inequality. Williamson (1965) considered the evolution of incomes in a cross-section of countries and the long-term evolution of regional inequality in the US. He posed the hypothesis that regional inequality followed an inverted U-shaped pattern along the process of growth, with growing inequality during the 19th century and convergence from then on. He argued that, in the case of the US, structural change and specialization favoured increasing inequality in the first stages of economic growth, but the advance in the process of structural change and integration, with associated increases in capital movement and internal migration, could account for the further reduction in regional income inequalities. Kim (1998) confirmed Williamson's findings and showed the presence of an inverted U-shape evolution of regional inequality across regions in the US. In addition, he pointed out that specialization and divergence in economic structures could explain increases in inequality during the second half of the 19th century. During the 20th century, further progress in economic growth and national market integration was accompanied by the reduction of regional income inequality, which could be explained by the homogenization of economic structures and convergence in productivity across states. More recently, Caselli and Coleman (2001) went a step further in the study of long-term regional inequality in the US and related regional convergence to decreases in agricultural employment in the poorest locations. Finally, Combes et al. (2011) studied the long-term evolution of economic disparities across regions in France and they also observed the inverted U-curve. They argued that economic agglomeration could be a relevant factor for understanding regional inequality in France from 1860 to 1930. From then on, in a global context of decreasing inequality, regional inequality is mainly explained by regional differences in the stock of human capital.

The evolution of regional inequality in Spain is well documented since 1955 thanks to the series on regional income published by *Banco Bilbao Vizcaya* (BBV). This information has been used in a large number of studies on regional inequality, which have largely followed the widely known methodology of Barro and Sala-i-Martin (1991). The results point out the existence of convergence (both β and σ) from 1955 through the 1970s. However, in the 1980s the process of convergence came to a halt and in the last decades there is no evidence of further regional convergence across Spain.[1] Before 1955, data concerning the geographical distribution of GDP is scarce and, therefore, the study of regional inequality in the long run has been particularly

[1] Mas et al. (1994), De la Fuente (1996).

difficult. Álvarez Llano (1986) provided regional GDP data for the 19th century and the first decades of the 20th century. Nevertheless, the reliability of the figures has been seriously questioned because the author does not provide information on the methodology employed in the estimation.[2] For the period between 1930 and 1955, data on regional GDP have been compiled by Alcaide (2003). Taking the figures offered by Álvarez Llano, Carreras (1990) carried out the first attempt to analyse the evolution of regional inequality in Spain from a historical perspective. Carreras found a constant tendency towards the increase of regional inequality since 1800, reaching a climax around 1950 or 1960. From that moment onward, regional disparities began to decrease, showing an inverted U-shaped evolution in the long run. As a consequence, by 1983, regional inequality was lower than at the starting date, almost two centuries previously.[3] However, our new estimation of regional per capita incomes for the period 1860-1930 challenges this early view and points to the beginning of the 20th century as the starting point in the process of regional convergence in Spain.

In short, this article proposes that the empirical analysis of regional incomes in Spain may help us to disentangle the forces behind upsurges and downturns of regional economic inequality. The Spanish case is particularly appealing for several reasons. First, regional income inequality has not disappeared despite more than 150 years of economic and political integration. Second, the history of Spanish regional inequality fluctuates between periods of upsurges and downturns of regional inequalities and diverse regional growth paths. Finally, this long-term analysis allows us to analyse the evolution of regional inequalities along two simultaneous processes of economic integration: the construction of the national market, which started in the mid-19th century, and the integration of the country with the international economy. Interestingly, Spanish international integration has followed several phases in these 150 years: after a failed start in the second half of the 19th century, it was resumed in the middle of the 20th century and accelerated in the last decades since the ascension into the EU.

The remainder of the paper is structured as follows. In the next section, we offer a brief summary of the historical process of growth and market integration of the Spanish economy in the last 150 years. Next, we present new evidence on patterns of regional inequality in the long-run. To this end, we develop new historical estimations of GDP per worker for NUTS-2 Spanish

[2] The years considered by Álvarez Llano (1986) were 1802, 1849, 1860, 1901, 1921 and 1930. For a critical evaluation of these data, see Carreras (1990).

[3] This evolution can be completed with Martín (1996) and Domínguez (2002). As in Carreras (1990), the analyses are both based on the GDP estimates by Álvarez Llano (1986).

regions from 1860 and 1930 and link them to well-known data corresponding to the period 1930-2000 (Alcaide, 2003; BBV 1999 and FUNCAS 2006).[4] In other words, we are able to reconstruct GDP per worker series from 1860 to 2000. We present the main stylized facts on the evolution of Spanish regional GDP per worker. Section 4 is devoted to analyze the determinants of regional variation in GDP per worker and in Section 5 the main conclusions are presented.

2. Long-term market integration and economic growth in the Spanish economy

Modern Spanish economic growth started in the mid-19th century. From that time on, with the exception of the Civil War period and the early years of Franco's regime (1930-1952), per capita GDP has experienced positive and sustained growth rates. According the analysis carried out by Prados de la Escosura (2005) and Prados de la Escosura and Roses (2009), significant accelerations were registered during the periods 1921-29, 1953-58, 1959-1974 and 1987-2000.

[HERE TABLE 1]

This process of economic growth was enhanced initially by the adoption of the classical innovations of industrial production, the advance in the structural change process and the integration of national markets for goods and factors of production, as well as the increasingly globalized Atlantic economy. From a long-term perspective, Spanish internal market integration received a strong push in the middle of the 19th century. In fact, prior to the mid-19th century, Spanish regions had relatively independent economies. The presence of barriers to interregional trade and the movement of capital and labour were ubiquitous: local tariffs and regulations on domestic commerce were widespread; weights and measures differed across regions; transport costs were very high due to low public investment in transport infrastructures and the particular geography of Spain, which lacked an extensive water transport system; economic information moved slowly across regions; the banking system was underdeveloped; and many regions had

[4] The new dataset on historical regional GDP per capita has been constructed following the methodology proposed by Geary and Stark (2002) and the refinement suggested by Crafts (2005). This methodology has recently been extensively used for the estimation and analysis of the long-term patterns of regional economic inequality in some European countries such as Belgium (Buyst, 2010), Italy (Felice, 2011) and France (Combes, Lafourcade, Thisse and Toutain, 2011).

their own currencies (although all currencies were based on a bi-metallic monetary system). As a consequence, regional commodity markets were scarcely integrated—although certain interdependence in commodity prices had existed since the eighteenth century[5]—and prices of production factors differed markedly from one region to another.

Both market liberalization and transport improvements, particularly the completion of Spain's railways network, induced the creation of a national market for most important commodities during the second half of the 19th century.[6] According to the calculations of Herranz (2005), the introduction of railways in 1878 heralded an enormous 86 per cent reduction in transport prices. In addition to market liberalization and transport improvements, the successive political reforms of the 19th century gave legal support for property rights, eliminated tariffs and local restrictions on home commerce and assured the free mobility of people and capital. In turn, as several studies have emphasized, the integration of the domestic market brought about major changes in the spatial distribution of industrial activity in Spain. From the second half of the 19th century until the Spanish Civil War, there was a remarkable increase in the geographical concentration of industry, with Catalonia and the Basque Country becoming the main industrial locations.[7]

Nevertheless, the integration of the Spanish economy into the global Atlantic economy did not follow a similar pattern. Although the liberal reforms established in the mid-19th century ended the main prohibitions on foreign trade and favoured the free movement of capital and labour across Spain's borders, Spanish foreign trade policy took a protectionist turn in the late 1880s. This protectionism and the renouncement of the international monetary system based on the gold standard prevented Spain from taking advantage of the convergence effects generated in the Atlantic economy during the first wave of globalization (O'Rourke and Williamson, 2001).

The Spanish Civil War and the first years of Franco's regime put a brake on the Spanish growth process and national economic integration. The regulation of markets for goods and factors of production and government control of prices and quantities in final goods,

[5] See, for example, Ringrose (1996).

[6] Gómez Mendoza (1983) suggested that the social savings linked to the construction of the railways in Spain were significant and even higher than in other European countries. Nevertheless, Herranz (2002) revised these figures concluding that social savings were lower than previously estimated. However, the strong reduction in transport costs that came with the railways is unambiguous.

[7] There is a vast literature on the regional patterns of industrialization in Spain, including Nadal (1987), Nadal and Carreras (1990), Germán et al. (2001), Parejo (2001), Nadal (2003), Rosés (2003) and Paluzie et al. (2004).

intermediates, energy, capital markets and wages reduced the mobility of factors and resources. This created a false impression of price convergence without a significant increase in interregional trade. The movement of capital across regions slowed and labour migration came to a halt after its big first expansion in the 1920s (Silvestre, 2003). Also, the absence of investment in infrastructure did nothing to reduce transport costs during the 1940s and early 1950s. The Franco regime adoption of an autarkic policy implied the total isolation of the Spanish economy from the international market. Foreign trade and international capital movements during these years reached their lowest levels in contemporary Spanish economic history.

The economic liberalisation and stabilisation measures introduced at the end of the 1950s favoured the transition of the Spanish economy toward a new phase of economic development. This period was characterised, among other elements, by high aggregate growth rates of production and by the lead taken by the industrial sector in the country's economic activity. Linked to this, Spanish economic growth in the 1960s was also typified by advances in the construction and services sectors, stimulated by the growing mobility of the work force that was becoming increasingly concentrated in the big cities. New investments in infrastructures such as roads, railways, communication networks and energy supply and distribution led to further reductions in internal transport costs.

These liberalizing policies also affected the Spanish integration into the international economy. Although at a slow pace, Spain started to recover its position in the international markets. Spain's membership in international organisations such as GATT, World Bank and IMF, and the liberal winds regarding the regulation of international commodity and capital movements, marked the starting point for a new wave of growth in the movement of goods, capital and labour across Spanish borders. Nevertheless, the level of integration reached by the Spanish markets for goods and capital during this period cannot be considered that of a truly open economy.

The crisis of the 1970s, which in the case of Spain stretched well into the 1980s, put a brake on these upward trends, and high average GDP growth rates were not recorded again until the final years of the 20th century. This new phase in Spanish economic growth was no longer linked to the leadership of industrial production, but rather to that of the services and construction sectors. A new wave of investment in infrastructure helped to reduce further transport cost across Spanish regions and also across national borders. Huge investment programs in freeways, high-speed railway and telecommunications were developed during these years and led to major advances both in the integration of the internal Spanish market and also the integration of Spain in international markets. In this respect, the ascension of Spain to the EU

in 1986 acted as a big institutional reform that changed the framework in which the specialization of Spanish regions took place.

Given these conditions, we now need to analyse whether the evolution in the regional inequality patterns in Spain has followed a long-term trajectory in line with the changes in economic growth and internal and external market integration. It should be noted that, in broad terms, the increasing integration of the Spanish internal market could have initiated a process of geographical agglomeration of activity and divergence in regional GDP per capita levels, as well as a subsequent process of convergence as transport costs fell and the development level rose. In other words, the long-term regional inequality could have formed an inverted U-shaped curve during the process of integration and growth of the Spanish economy. Nevertheless, the experience of recent years in the integration of the Spanish economy in international markets could affect the patterns of growth and regional specialization and thereby affect the long-term evolution of regional income inequality.

3. Long-term patterns of regional income inequality: new data and stylized facts

In order to analyse the long-term evolution and determinants of regional inequality in Spain, we compute and collect data on Gross Added Value by sectors and regions and on regional employment by sectors for the years 1860-2000. Estimates of regional GDP prior to the Spanish Civil War do not exist (or are not reliable enough), so we estimate new figures for several years within the period 1860-1930. In particular, the availability of sources obliges us to estimate these figures for the years 1860, 1900, 1910, 1920 and 1930. From 1930 on, the data have been collected from various sources such as Alcaide (2003) for the years 1930-1950, BBV (1999) for the years 1955-1995 and FUNCAS (2006) for the year 2000. Because these sources of data since 1930 are well-known and extensively used by Spanish economists, we dedicate the next several paragraphs to elucidating the procedure and sources we have used to produce a new set of estimates for the period 1860-1930.

In our computation of regional GDP per worker, we primarily follow the methodology developed by Geary and Stark (2002). Their work departs from the straightforward principle that the sum of all regions' GDPs (in our case provinces, NUTS3) is equal to the country's GDP. Algebraically:

$$Y_{ESP} = \sum^{i} Y_i \quad (1)$$

However, given that provincial GDP (Y_i) is not readily available, this may be inferred by the following equation:

$$Y_i = \sum^{j} y_{ij} L_{ij} \tag{2}$$

where y_{ij} stands for the output (i.e., value added) per worker in each province *i*, in sector *j*, and L_{ij} is the number of workers in each province and sector. As direct evidence of output per worker at the provincial and sector level is not readily available, y_{ij} is computed assuming that provincial labour productivity in each sector is reflected by its wage relative to Spain's average wage (w_{ij}/w_j). Specifically, regional GDP is given by the following equation:

$$Y_i = \sum^{j} \left[y_j \beta_j \left(\frac{w_{ij}}{w_j} \right) \right] L_{ij} \tag{3}$$

where w_{ij} is the wage paid in region *i* in sector *j*, w_j is the Spanish mean wage in each sector *j*, and β_j is a scalar that preserves the relative region differences but scales the absolute values so that the regional total for each sector adds up to the Spanish totals.[8] In sum, without requiring direct evidence, Geary and Stark (2002) developed a model that makes possible an indirect estimation of regional GDPs at factor cost in current prices. The data necessary for this type of estimation are Spanish output per worker and sector, working population and nominal wages by sector and region. In our estimation, however, we improve Geary and Starks's approach in two ways. First, in several industries (see below), we compute direct estimates of provincial output. Second, we consider up to five sectors (agriculture, mining, manufacturing, construction and services) for Spain while Geary and Stark (2002) only consider three in their study of the British Isles (agriculture, manufacturing and services).[9]

Agriculture

Given the availability of data, we compute direct agricultural production estimates (nominal gross value added) for 1900, 1910, 1920 and 1930. The procedure is the following. First, we multiply the physical production of the different agrarian products (from GEHR 1991) by their transforming coefficients and relative prices (Simpson, 1994). Then, these real values are

[8] Spanish GDP was drawn from Prados de la Escosura (2003).

[9] It should be noted, however, that to make the discussion simpler, we aggregate mining, manufacturing and construction into industrial sector value added.

converted into nominal values employing data drawn from Prados de la Escosura (2003). Finally, we scale the absolute values so that the provincial total for each sector adds up to the Spanish totals for agricultural value from Prados de la Escosura (2003).

For the year 1860, given that data for constructing direct production estimates is not available, we resort to a modified version of Geary-Stark's method. In Spain, the number of working days over the year varied largely from one place to another, but the data did not include this kind of information. For this reason, we adjust the provincial agricultural production obtained with Geary-Stark's method[10] with the amount of days worked over the year in 1910, which could be easily inferred from our previous estimates.

Mining

The Spanish Statistical Yearbook (*Anuario Estadístico de España*) furnishes provincial mining production for the years 1860, 1910, 1920 and 1930.[11] Employing these figures, we distribute Spain's mining gross value added at factor cost between the different provinces. The year 1900 is estimated differently because of the absence of direct production data: we multiply the provincial workforce engaged in mining in 1900 by provincial labour productivity in 1920.

Industry: Manufacturing and Public Utilities

In the secondary sector, we use Crafts' (2005) refinement to the original Geary and Stark (2002) methodology. Specifically, we assume a production function with constant returns to scale with two production factors, labour and capital. Algebraically, industrial gross value added (GVAIND) is defined as:

$$(4)\ GVAIND_{it} = \alpha_{it} (\omega_{it} * L_{it}) + (1-\alpha_{it}) (r_{it} * K_{it})$$

where α_{it} is the share of the wage income in industrial gross value added in province *i* at time *t*, ω_{it} industrial wage in province *i* at time *t*, L_{it} the total active industrial workforce in province *i* at

[10] The source of agricultural population is the Spanish population census and the source of wages is Rosés and Sánchez-Alonso (2004).

[11] We have taken the values of 1915 for 1910 and 1931 for 1930.

time *t*, r_{it} the returns to capital in industry in province *i* at time *t*, and K_{it} the capital stock in industry in *i* at time *t*. For the Spanish case, there is information available for each of the components of equation (4) except for r_{it}. For this reason, we had to assume perfect capital mobility (that is, returns are identical in all provinces). Thus,

$$(5)\ r_{it}=r_t \qquad \forall\ i$$

The wage income included in equation (4) is computed according the following procedure. First, the population censuses of 1860, 1900, 1910, 1920 and 1930 offer information on the workforce employed in manufacturing and public utilities.[12] Second, we take information on nominal industrial wages from several sources.[13] Finally, we compute the wage income by multiplying the size of industrial workforce by nominal wages (hence, we assume that the number of working days over the years is identical in all provinces).

Several fiscal sources provide the data for constructing provincial capital income in equation (4). The *Estadística Administrativa de la Contribución Industrial y de Comercio (EACI)* collects all statistical information on the industrial tax, which was established in 1845 and consisted of a fixed rate on the main means of production in use (Nadal and Tafunell, 1992: 256). This source furnishes our data for the years 1856 and 1893. Interestingly, there were as many different rates as machinery types and industrial branches. For example, cotton ring spindles paid a different tax rate than cotton mule spindles and flax ring spindles. A problem with this data is that tax rates did not adjust immediately to changes in machinery productivity.[14] For the subsequent years, we

[12] We have also corrected for errors and underreporting of original data according to Foro Hispánico de Cultura (1957).

[13] Madrazo (1984) provided data for 1860, Sánchez-Alonso (1995) for 1900, Ministerio de Trabajo (1927) for 1920, and Silvestre (2003) for 1910 and 1930. However, this kind of data is not available for the Canary Islands; we had to assume that their wages are equal to the lowest of the Peninsula.

[14] Unfortunately for our purposes, from the year 1907 onward, the information given by the EACI is not representative of industrial activities. The coverage of industrial taxes was reduced substantially in 1907 when joint stock companies, the largest Spanish industrial firms, were exempted from industrial taxes and assigned to a new corporate tax, which was based on net profits (*Impuesto de Sociedades*). Subsequently, many firms transformed themselves into joint stock companies because the new corporate income tax resulted in lower tax payments (Nadal and Tafunell, 1992: 259). By 1921, all types of partnerships paid this corporate tax and, in consequence, many firms no longer paid the industrial tax.

employ data taken from Betrán (1999: 674-675), who reconstructed the industrial taxes paid in each province in 1913 and 1929, employing data on both industrial and corporate taxes.[15]

After computing the provincial distribution of capital income and labour, we calculate the weight of each factor's income in overall industrial gross value added. According to substantial evidence, the respective shares of labour and capital in output are relatively constant for long periods (Gollin, 2002). As a consequence, we decide to compute different factor-shares at industrial level, taking these factor shares from the Input-Output Table for Spain in 1958 (TIO1958),[16] which furnishes information for nine industrial branches.[17] We identify, for this level of aggregation, the factor-shares according to the productive structure of the industrial sector in each province and year. The same fiscal sources discussed in the previous paragraph provided us data on the provincial productive structure by each benchmark. Finally, employing this information, we estimate factor-shares for each province and benchmark, except for the Basque Country and Navarre.[18]

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[15] For 1920, due to the absence of fiscal data, capital shares were interpolated using the figures for 1910 and 1930. The addition of the Basque Country and Navarre in the second half of the 19th century relies on the data in Parejo (2001), who estimated the contributions of these regions to the Spanish total based on the historical indices of industrial production. This regional information was split by provinces according to their share of the active industrial workforce each year. The data provided by Carrión (2010) for 1856 have not been used in this study due to the different nature of the tax (an extraordinary payment for the Basque Provinces passed in order to give support to the Spanish finances during the African War in Morocco, 1859-1860) and the limited coverage of the data. However, this author suggests a higher industrial intensity for the Basque Provinces than Parejo (2001).

[16] Using this source to elaborate the factor-shares and then apply them in retrospect implies the assumption that the intensity in the use of factors in 1958 is a good proxy for previous years. However, we must point out that this assumption has also been employed in previous estimations of the Spanish Industrial Production Indices (Carreras, 1983; Prados de la Escosura, 2003).

[17] Seven industrial branches (food, textiles and footwear, metal, chemicals, paper, wood and cork, and ceramics) are considered in 1913 and 1929.

[18] Because this fiscal information is not available for the Basque Country and Navarre, and it is not possible to know their industrial structures, a labour share similar to the Spanish total is assumed for these regions. In this sense, the information gathered by Carrión (2010) for Guipúzcoa allows us to calculate the factor shares for this province in 1856. In this case, the labour share increases slightly from 35.9 per cent to 37.3 per cent, resulting in an increase in the percentage of the GVA for Guipúzcoa from 0.89 to 0.90 of the total Spanish GVA.

Construction

Residential construction and public works compose this industry and we employ different sources, but similar methodology, for estimating each of them. National residential construction is divided at the provincial level, with data on urbanization rates (the share of the inhabitants in municipalities with more than 5,000 inhabitants) drawn from Reher (1994). For public works, Herranz (2008) provides data on the provincial stock of infrastructure.[19]

Services

Most historical studies of the services industry suffer from the absence of regional wages. In particular, Geary and Stark (2002: 923), who faced the same problem in their study of the British economy, used a weighted mean of the agriculture and industry wages in each province as a proxy for services wages. We follow a slightly different strategy. First, the gross value of eleven branches of the Spanish service industry is available in Prados de la Escosura (2003). Specifically, the branches are transport, communications, trade, banking and insurance, housing, public administration, education, health services, hotels and restaurants, domestic services and professions. Second, from the population censuses, we compute workforce estimates for these eleven branches. We then scale the absolute values so that the provincial figures for each sector add up to the Spanish totals for the services workforce in Prados de la Escosura and Rosés (2009). Finally, we use different wages for each branch, with the series selected according to the skill and productivity levels of the workforce. Thus, we use urban skilled wages for banking and insurance, housing, public administration, education, health services, and professions; an average of agrarian and industry urban wages (unskilled and skilled) for transport and communications; an average of industry urban unskilled and skilled wages for trade, hotels and restaurants; and, finally, the agrarian wages for domestic service.[20]

Finally, to be able to link our regional GDP estimation for the years 1860-1930 with those existing for the years 1930-2000, we have also scaled all the original absolute figures on sectoral and regional GDP so the NUTS-3 totals add up to the Spanish total offered in Prados de la

[19] Given that Herranz's (2008) database is only available from 1870 onwards, the data for 1860 was based only on urban population.

[20] Underlining wages were drawn from Rosés and Sánchez-Alonso (2004).

Escosura (2003).[21] This new dataset allows us to carry out a preliminary description of the long-term regional income inequality in Spain.

Figure 1 depicts the long-term evolution of an index of σ-convergence: the standard deviation of the logarithms of regional (NUTS-2) GDP per worker.

[HERE FIGURE 1]

There was a trend of increasing income inequality in Spain between the first two cut-off points analysed—that is, between 1860 and 1900. After that time followed a period of gradual reduction in regional income inequality. Regional per worker income convergence accelerated during the period 1960-1990; conversely, it seems to have halted during the 20-year period following the Spanish Civil War and in the years following Spain's ascension to the former European Economic Community (the present-day European Union). Over the long term, regional income inequality followed a U-shaped pattern, with a growth in inequality between 1860 and 1900 followed by a long phase of declining regional inequalities that lasted until the 1990s. Since then, the persistence of regional inequalities seems to point to the end of this regional σ-convergence process.

In short, the descriptive evidence about the evolution of regional income inequality in Spain illustrates that its long-term evolution might have followed an inverted U shape and, thus, that its trajectory could be consistent with the existence of both kinds of forces highlighted by the theoretical literature: first, those proposed by traditional growth and trade theories that point to the reduction of regional income inequalities along the process of integration of national economies and, second, those pointed out by NEG models where growth and integration could favour agglomeration in the productive processes, which in the context of declining transaction costs could favour an initial increase in income inequalities. Nevertheless, the interruption of the process of decreasing income inequalities during the years 1990-2000 puts some caveats on the validity of these straightforward explanations.

[21] However, to simplify our further discussion we add up NUTS-3 (provinces) to generate NUTS-2 (regions).

4. The proximate determinants of regional inequality

As explained above, according to Neoclassical trade theory, differences in regional income could be caused by regional variations in relative factor prices and industrial structure. Conversely, as argued by NEG models and New Growth Theory, differences in productivity could be related to differences in the size of regions (the so-called home demand effect) and in presence of increasing returns they could last and even amplify in the long term. Therefore, the analysis of the source of labour productivity differences could be very useful in analysing regional inequality. In order to approach the overall causes of labour productivity differences across Spanish regions, in this section we compute the Theil T index (Theil, 1967) for all twelve benchmarks considered in this study.[22] This index allows us to measure regional inequality in labour productivity using GDP at the industry level and employment figures according to the following equation:

$$(6)T = \sum_{j=1}^{3}\sum_{i=1}^{n}\left(\frac{Y_{ji}}{Y}\right)\log\left(\frac{Y_{ji}/Y}{E_{ji}/E}\right) = \sum_{j=1}^{3}\sum_{i=1}^{n}\left(\log(x_{ji}) - \log(\bar{x})\right)\frac{Y_{ji}}{Y},$$

$$x = \frac{Y}{E}$$

where Y is per capita GDP, E is employment, *j* indexes industries and *i* regions. This Theil index is disaggregated into two components: the *within-sector* inequality component (T_W) and the *between-sector* inequality component (T_B). Specifically, equation (6) is disaggregated into:

$$(7)T = T_W + T_B = \sum_{j=1}^{3}\left(\frac{Y_j}{Y}\right)T_j + \sum_{j=1}^{3}\left(\frac{Y_j}{Y}\right)\log\left(\frac{Y_j/Y}{E_j/E}\right),$$

where

$$(7a)T_jW = \Sigma_j(j-1)^{\wedge}3\,(Y_ji/Y)\;\Sigma_j(i=1)^{\wedge}n\,[(\log(x_jji) - \log(x^{-}j))\,(Y_j(ji))/Y] \quad \text{for } j = 1, 2 \text{ and } 3,$$

and

[22] More specifically, we follow the approach of Akita and Kataoka (2003).

$$(7b) T_B = \sum_{j-1}^{3} \left(\frac{Y_j}{Y}\right) \log\left(\frac{Y_j/Y}{E_j/E}\right) = \sum_{i-1}^{3} \left(\log(\bar{x}_j) - \log(\bar{x})\right) \frac{Y_j}{Y}$$

where T_W is the weighted average of regional inequalities in labour productivity within each sector, while T_B is the inequality in labour productivity between sectors (agriculture, industry and services). These different Theil T indices are showed in Table 2 and Figures 2 and 3.

[HERE TABLE 2]

[HERE FIGURE 2]

As we can see in the Table 2 and Figure 2, the overall regional inequality in GDP per worker grew dramatically from 1860 to 1900, levelled off between 1900 and 1910, and decreased thereafter. However, in 1930, the levels of regional inequality still exceeded by about ten per cent those prevalent in 1860 (0.08 in 1930 versus 0.07 in 1860). Nevertheless, after 1940, overall inequality followed a decreasing path that has lasted until the final years of the sample period. As a consequence, the values of the Theil index show us that regional income inequality in 2000 (0.01) is eight times smaller than it was in 1930 (0.08) or 18 times smaller than it was at its peak in 1900.

[HERE FIGURE 3]

As we can also see in Figure 3, the *between-sector* effect accounts for the lion's share of regional inequality: with the exception of the last point in time considered, this effect explains more than 70 per cent of variation. Nevertheless, it is also interesting to note the significant role played by the *within-sector* effect, both in the first long wave of economic integration and high regional inequality (with values close to 30 per cent in 1860 and 20 per cent in 1920 and 1930), and in more recent times, where the *within-sector* effect ranges from approximately 25 per cent of overall inequality in 1990 to 40 per cent in 2000. These two results together give strong support to the hypothesis that attributes the upswing in regional inequality to the structural differences across regions emanating from the process of regional industrial concentration in the 19th century (Williamson, 1965) and that poses that convergence in sector shares across regions enhanced the

process of convergence across regions.[23] Nevertheless, the data also allow room for differences in productivity as causes of overall inequality in some periods, especially in 1860, the first year of our series, and the last years of the 20th century.[24]

Finally, it would also be interesting to revise the contributions of the different sectors to the *within-sector* component (see Table 2 above). In 1860, surprisingly, agriculture is the sector with the major regional differences in labour productivity. We believe that two reasons could account for this unexpected result. First, we do not take into account temporary labour migrations across regions, which were very important during harvest periods and reduced labour productivity differences (Silvestre, 2007). Second, the large differences in relative land endowments and climate across regions in Spain generate very different productive specialization in agriculture. For example, Western Andalusia was abundant in land and specialized in products with relatively high labour productivity, while the contrary holds for Northern regions like Galicia. The relative importance of different sectors varied after 1910 and until 1930, when industry became the main contributing sector to the *within-sector* component. This result falls in line with previous investigations that have underlined the presence of increasing returns in Spanish manufacturing during the first third of the 20th century (Martínez-Galarraga et al. 2008). It is also worth noting that during the years 1990 and 2000 productivity variation in the tertiary sector have explained most of the within sector component of the Theil inequality index. This tendency has even intensified from 1970 to 2000.

To offer some further light on the stories of individual regions, we also investigate regional inequality with a straightforward modification of the procedure developed by Hanna (1951) and also employed by Kim (1998). This methodology allows us to separate income

[23] This conclusion falls in line with the explanations offered by a great bulk of studies devoted to analysing the determinants of regional convergence in Spain during the second half of the 20th century. These studies argue that the process of convergence in regional sectoral structures was the major determinant of convergence in productivity and per capita income in Spain during the years 1960-1985. In addition, these works also contend that the end of the regional convergence process in the last years of the 20th century is related to the exhaustion of the process of convergence in regional sectoral structures and the persistence of significant differences in sectoral productivity levels across regions. See, for example, Garcia-Greciano and Raymond (1999), De la Fuente and Freire (2000).

[24] In order to check the robustness of the results of the disaggregation analysis offered in the text, an alternative procedure has been also carried out: the shift-share analysis. The results confirm the main conclusions reached in the study.

differences into industry-mix and gross value added (GVA) components.[25] The method is as follows. We construct two hypothetical regional GDPs per worker and compare them with observed GDPs per worker. The first of these hypothetical regional GDPs per worker follows the assumption that all regions have the national industry mix and GVA per worker. The second assumes that regions have the national GVA per worker but different industry mixes. The difference between these two hypothetical incomes is a measure of GDP per worker differences stemming from the differences in regional industrial structures (*industry-mix* effect). The difference between the observed GDP and the hypothetical industry-mix income is a measure of the regional GDP per worker variations due to divergence in GVA per worker (*productivity* effect).[26] The results of this exercise are presented, for selected years, in Table 3.

[HERE TABLE 3]

As Table 3 shows, variations in both the industry mix and labour productivity at the broad industry level play an important role in explaining GDP per worker differences. Interestingly, a direct correlation between the industry mix and wage effect could be observed in most cases. This result implies that a favourable industry mix accompanies higher wages. In other words, more productive industries tend to cluster where workers are more productive.

Nevertheless, in order to detect some additional factors, we summarize several relevant regional stories: on the one hand, Catalonia, the Basque Country and Madrid as examples of richer regions; and, on the other hand, Andalusia, Galicia, Estremadura and Castile La Mancha as examples of failed growth experiences in comparative terms.

Catalonia, the main industrial centre in Spain, enjoyed one of the three top-ranking positions in per-capita GDP from 1860 until 1995. Only in the last analysed point in time did this region fall to the sixth position in the ranking. At first sight, this rank was due to both a

[25] GVA per worker in industry and region *i* is: $GVA_i = (w_i L_i + r_i K_i) / L_i$. However, given the presence of perfect capital markets, $r_i K_i / L_i$ should be equal across all locations. Consequently, w_i drives GVA per worker differences across all regions.

[26] The use of one-digit industrial classification in our calculations may conceal the greater importance of productivity in explaining regional differences in income per worker than is deserved. Regional GVA per worker in manufacturing and services activities may be different due to variations in regional industrial structures at a finer industry level.

favourable industry-mix and a productivity effect. Nevertheless, since the 1970s, the values reached by these two favourable effects started to lose their sway in comparison with Madrid or the Basque Country. The positive wage-effect fell clearly behind of those attained by Madrid and the Basque County, and Catalonia lost its position in the top three in 2000. The history of the Basque Country summarizes perfectly the consequences of rapid industrialization and subsequent structural change. In 1860, the Basque Country was not among the top-ranking positions of per capita GDP in Spain.[27] Thus, the Basque Country had a highly negative productivity effect (more than 20 per cent below the Spanish average). However, only forty years later, in 1900, when Basque industrialization was well underway, this situation changed dramatically: it outperformed Spain in both industry-mix and productivity effects by more than 20 per cent in productivity and 34 per cent in industry-mix. This Basque lead was still present in 1930, although its advantage due to industry-mix had decreased to less than 20 per cent given the spread of industrialization to more regions. Nevertheless, throughout the second half of the 20th century, the Basque Country has maintained its leadership thanks to the contribution of a large and favourable productivity effect. The position held by Madrid in the Spanish per worker regional income is explained mainly by its favourable industry-mix (in this case related to the abundance of the service sector), especially before 1970, but Madrid has also managed to obtain an increasingly positive productivity-effect since 1980. It seems that the long-term process of convergence of economic structures across Spain has made it such that only the regions with highly favourable productivity effects have been able to maintain the top positions.

In a sharp contrast, Galicia, Estremadura and Castile LM have been among the low-ranking per-capita GDP regions throughout the period. Corresponding with this low income level, their industry-mix and productivity effects have been unfavourable (in other words, these regions specialized in the less productive industries, and labour productivity was below the Spanish average in all of them). Nevertheless, it is also worth noting that, in general terms, during the years 1860-1960, the main negative effect for these regions has been the industry-mix effect; since then, it has been the highly negative productivity effect which has accounted most for their position at the bottom of the ranking. The behaviour of Andalusia, the most populated region in Spain, is slightly different. In 1860, it was the second richest Spanish region, but in 1930 was in position 12 (of 17), with a per-capita income of only about 75 per cent of the Spanish average. The initial pre-eminence of Andalusia was not due to region's industry mix but to its favourable productivity effect. Forty years later, in 1900, this advantage had vanished, and its productivity was slightly below the average; in addition, its industry mix was not particularly different from the

[27] A more optimistic view would emerge with the data offered by Carrión (2010).

nation's average. Since then, it seems that the negative productivity effect has accounted for the low position of this region in the Spanish per worker income ranking.

In short, it seems that the explanation of the factors behind the successful or failing positions of regions in terms of GDP per worker has changed along the long-term national experience of growth and integration. During the initial phases, the industry-mix effect was the main factor determining the relative position of regions. Subsequently, the convergence of economic structures has meant that the top and bottom rankings are linked to the presence of markedly positive or negative productivity effects. This factor has earned increasing explanatory power during the growth experience of the 20th century. In fact, the region that has most improved its position in the ranking over the 20th century, Navarre (11th in 1900 and 3rd in 2000), never had an extremely positive industry-mix effect and its success is basically explained by the presence of a highly favourable productivity effect.

5. Conclusions

In this paper we have offered a long-term view on regional inequality in Spain and we have also tried to explain some of its proximate causes. For this purpose, we have assembled a new database on regional GDP per worker that links new estimates for the period 1860-1930 with those existing for the years 1930-2000. As a result, we have been able to analyse the long-term evolution of regional GDP per worker inequality across Spanish NUTS-2 regions and to disaggregate it into its proximate determinants. Spanish regional income inequality has followed a long-term inverted U-shaped pattern from 1860 to 1990: inequality rose until 1900 and has decreased since then. However, it is worth mentioning that during the years 1990-2000, increases in inequality have re-emerged.

Employing the Hanna-Kim decomposition, we investigate the proximate sources of regional differences in labour productivity (GDP per worker). We found that differences in economic structure (industry-mix) and productivity acted together in explaining the upswing of inequality in the second half of the 19th century. Thereafter, the growing convergence of economic structures accounted for most of the explanation of declining regional income inequalities. Nevertheless, differences in productivity have remained quite stable and they are the main mechanism at work in explaining the current increase in regional income inequality.

On the one hand, our new evidence seems to fit well with the explanations for regional inequality proposed by Neoclassical trade and growth theory in the sense that the advance in the process of national market integration could have favoured the reduction of regional income

inequality in the long term. In particular, the mobility of factors of production could have led to a regional equalisation of factor endowments and rewards. It also seems that HO forces were the main driver behind unequal regional development, given that *between-sector* differences accounted for the lion's share of regional differences in labour productivity.

On the other hand, our results could also be interpreted in the light of New Growth Theory and New Economic Geography models. Despite the long-lasting and intense process of national market integration, differences in productivity have remained. As it has been shown the *within-industry* differences in industry and services were significant in the first phase of Spanish economic growth and market integration, and they have become significant again during the current phase of economic growth and Spanish integration in the European single market.

Particular regional experiences confirm the statements of the previous two paragraphs. Factors behind the success or failure of regions in terms of GDP per worker have changed throughout the long-term national experience of sustained economic growth and integration. During the initial phases, structural change (industrialization) was concentrated in a limited subset of regions that also experienced greater increases in productivity, favouring the initial increase of inequality across Spain's regions. Since the beginning of the 20th century, further advances in the integration of the national market favoured the mobility of factors of production and, with low transport and transaction costs, a fast convergence of regional economic structures that provoked the decline in income inequality. Nevertheless, richer regions remain rich and productivity differentials did not vanish, preventing further advances in the reduction in income inequality. Finally, in the last years analysed, productivity differentials are at the forefront of the most convincing explanation of the apparent upsurge of regional inequality in the context of Spanish integration into the European Union.

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Table 1
Average logarithmic GDP per capita growth rates (1850-2000)

1850-1883	1.4
1884-1920	0.7
1921-1929	2.8
1930-1952	0.0
1953-1958	3.9
1959-1974	5.8
1975-1986	1.8
1987-2000	3.3

Source: Prados de la Escosura and Roses (2009)

Table 2
Theil Inequality Index, Spanish Regional GDP per worker, 1860-2000:
Overall and Sectoral Decomposition

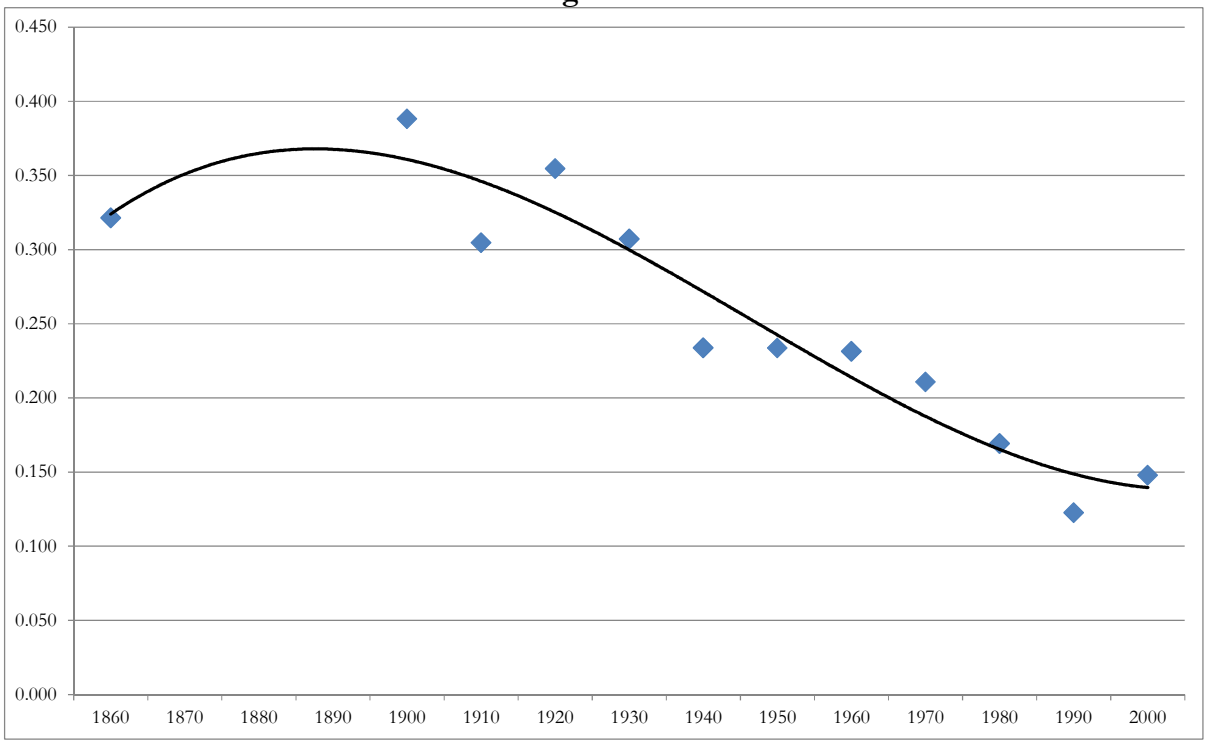
		1860	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Decomposition													
Primary	*Inequality*	0.031	0.026	0.012	0.017	0.024	0.011	0.009	0.010	0.015	0.020	0.025	0.022
	GDP share (%)	39.460	29.890	27.850	31.929	22.779	26.804	28.706	22.925	12.373	6.547	4.982	3.632
Secondary	*Inequality*	0.010	0.021	0.025	0.022	0.022	0.006	0.007	0.004	0.003	0.001	0.001	0.004
	GDP share (%)	20.442	30.277	30.732	30.197	32.247	23.259	27.024	35.178	35.995	34.700	34.234	30.516
Tertiary	*Inequality*	0.016	0.009	0.006	0.016	0.009	0.003	0.006	0.004	0.003	0.002	0.003	0.004
	GDP share (%)	40.098	39.833	41.418	37.873	44.975	49.937	44.270	41.897	51.632	58.753	60.784	65.852
Within-sector		0.021	0.018	0.013	0.018	0.017	0.006	0.007	0.005	0.005	0.003	0.003	0.005
Between-sector		0.049	0.161	0.141	0.067	0.060	0.071	0.043	0.026	0.031	0.027	0.009	0.007
Overall		0.070	0.179	0.155	0.085	0.077	0.077	0.050	0.032	0.036	0.030	0.012	0.012
Contribution (%)													
Primary		17.366	4.285	2.170	6.342	7.242	3.753	4.920	6.976	5.321	4.449	9.877	6.847
Secondary		2.910	3.535	4.893	7.826	9.309	1.943	3.823	4.550	3.209	1.637	2.201	9.945
Tertiary		9.391	2.071	1.586	7.089	5.230	2.222	4.942	5.044	4.284	4.698	12.794	24.000
Within-sector		29.667	9.891	8.649	21.257	21.781	7.917	13.684	16.571	12.814	10.785	24.871	40.792
Between-sector		70.333	90.109	91.351	78.743	78.219	92.083	86.316	83.429	87.186	89.215	75.129	59.208

Table 3. Hanna-Kim decomposition: Spain, 1860-2000

Region		1860	1900	1930	1940	1950	1960	1970	1980	1990	2000
AND	*Industry-mix*	2.3	2.7	-9.4	-5.75	-7.42	-8.48	-6.60	-6.05	-3.67	-3.12
	Wage-effect	30.9	-6.7	-10.7	-8.01	-12.18	-16.08	-10.48	-8.10	-8.57	-11.02
ARA	*Industry-mix*	-4.1	-3.3	-4.7	-5.59	-8.54	-3.80	-4.62	-1.37	-0.70	-0.68
	Wage-effect	8.2	0.5	0.7	3.34	-3.71	0.24	2.08	2.04	1.16	4.46
AST	*Industry-mix*	-15.4	-24.4	4.6	0.67	1.16	2.03	-5.09	-5.26	-2.80	-1.53
	Wage-effect	-47.8	-8.8	-2.3	14.33	7.06	-4.53	2.14	1.25	-6.95	2.26
BAI	*Industry-mix*	-5.1	1.5	6.2	7.18	5.87	3.99	7.78	6.72	3.73	3.58
	Wage-effect	-19.5	-38.1	2.2	2.32	-0.50	0.68	-2.67	-2.28	2.04	-18.18
BAC	*Industry-mix*	4	34.4	19.4	13.14	9.59	11.07	8.35	6.50	3.80	1.57
	Wage-effect	-21	21.8	26.9	16.72	27.76	19.29	18.50	9.95	7.53	18.80
CAI	*Industry-mix*	-2.3	0.1	14.3	2.86	-9.99	-9.76	1.36	1.76	1.22	0.41
	Wage-effect	-26.6	-46.7	-33.8	-8.45	-3.68	-5.70	-6.49	-3.48	1.18	-11.32
CAN	*Industry-mix*	-1.6	0.9	8	3.83	5.09	0.81	-4.23	-4.96	-2.05	-1.53
	Wage-effect	-19.3	-10.4	11.3	-10.11	-2.63	4.83	5.82	1.45	-4.92	9.87
CLM	*Industry-mix*	2.8	-12.7	-17.5	-26.44	-16.32	18.13	16.85	-11.90	-4.00	-4.52
	Wage-effect	6.3	9.6	-17.8	-10.91	-10.77	12.08	10.99	-12.37	-9.85	-13.73
CLE	*Industry-mix*	-1.6	-18.9	-9.1	-13.01	-9.23	12.61	14.00	-10.13	-4.57	-2.25
	Wage-effect	-10.6	-0.3	-13.8	-0.29	2.02	11.12	-7.89	-7.83	-7.43	0.61
CAT	*Industry-mix*	9.8	30.8	15.1	15.66	15.05	11.84	9.12	7.13	3.93	2.44
	Wage-effect	6.8	28.9	19.4	10.69	11.85	14.18	9.58	8.01	6.20	5.58
EST	*Industry-mix*	-3.8	-19.6	-13.1	-37.01	-27.28	24.16	26.01	-17.86	-9.05	-7.91
	Wage-effect	-18.2	-19.7	-37	-20.70	-22.26	22.82	26.97	-18.52	-14.56	-24.19
GAL	*Industry-mix*	-14.7	-35.5	-18.8	-25.10	-21.11	24.34	30.75	-28.80	-15.25	-9.10
	Wage-effect	-69.4	-50.1	-37.7	-13.97	-17.51	28.63	25.98	-19.79	-18.39	-14.06
MAD	*Industry-mix*	29.1	58.7	36.5	34.70	26.26	16.24	15.69	11.34	4.77	3.87
	Wage-effect	14.7	0.9	22.4	-1.75	4.97	13.84	8.74	9.59	11.39	14.43
MUR	*Industry-mix*	0.8	-11	-0.9	-8.99	-6.09	-4.32	-1.49	-3.75	-2.52	-4.02
	Wage-effect	12.8	-18.5	-5.3	-12.29	-22.99	15.82	10.71	-10.18	-5.21	-10.42
NAV	*Industry-mix*	3.8	-0.1	-11.9	-5.09	-2.42	-0.73	-0.79	1.33	2.48	0.20
	Wage-effect	5	-10.5	11	10.74	4.34	7.87	6.41	5.79	3.14	16.25
RIO	*Industry-mix*	2.2	7.3	0.4	-4.22	-2.16	-5.95	-8.80	-3.65	-1.13	-2.56
	Wage-effect	-3.2	6.6	-15.4	15.99	2.53	4.82	1.03	4.24	1.83	1.15
VAL	*Industry-mix*	-0.9	1.9	0.6	-3.62	-2.94	0.32	1.76	2.70	1.50	1.37
	Wage-effect	7.4	11.5	15.4	1.54	-0.38	0.88	-2.18	-2.38	-1.67	-15.03

Notes: AND: Andalusia; ARA: Aragon; AST: Asturias:; BAI: Balearic I.; BAC: Basque C.; CAI: Canary I.; CAN: Cantabria; CLM: Castile L.M.; CLE: Castile L.; CAT: Catalonia; EST: Estremadure; GAL: Galicia; MAD: Madrid; MUR: Murcia; NAV: Navarre; RIO: Rioja; VAL: Valencia.

Figure 1
Long term regional GDP per worker σ- convergence. Spanish NUTS-2
Standard Deviation of Logarithms



Source.- see text

Figure 2

Evolution of Theil T-Index, 1860-2000

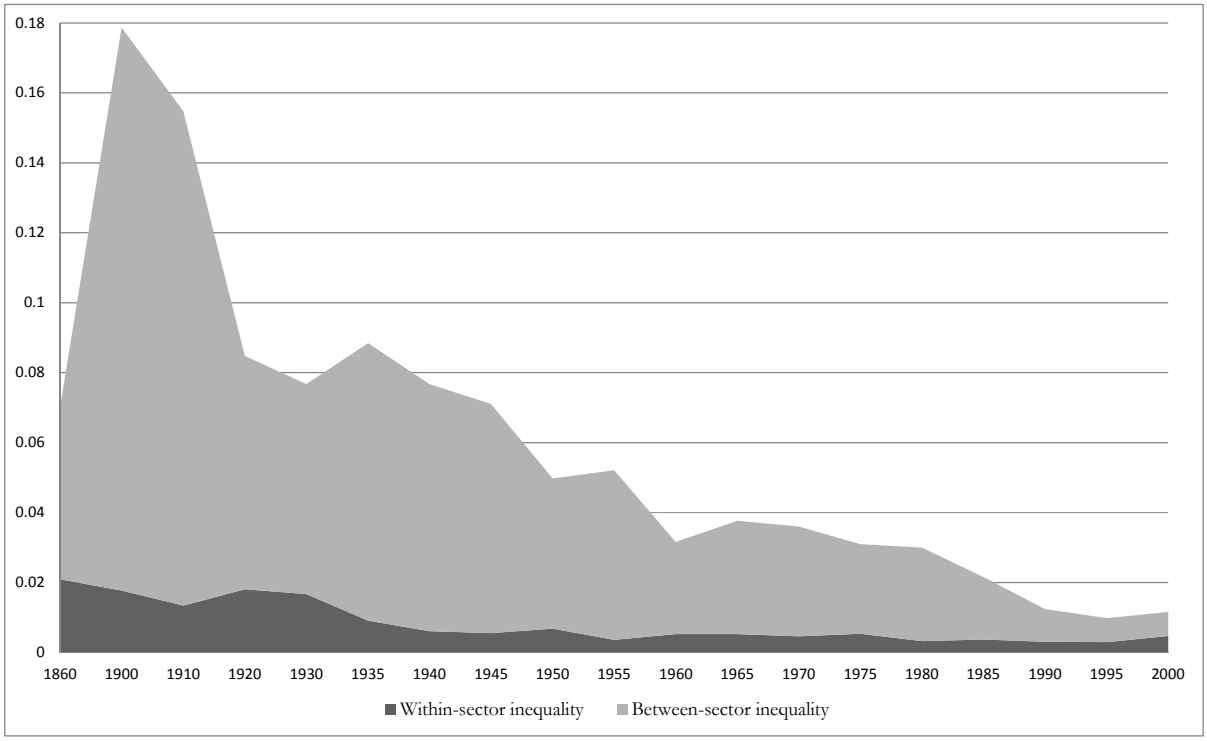


Figure 3
Share (percent) of Between and Within Sectors Components of Theil T-index