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JEL classification: O10, N13, N14, I30

Keywords: Inequality, economics growth, economic history, Spain, Kuznets curve

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1. Introduction

The relationship between inequality and economic development has been widely approached in the social sciences. A large bulk of the literature addresses Kuznets' (1955) hypothesis that inequality grows during the first stages of modern economic growth to drop afterwards as the economy develops further. This issue is nonetheless far from being settled. While some cross-country studies focusing on the second half of the 20th century seem to confirm the empirical regularity of the Kuznets curve, others do not find enough support for the inverted U curve (Barro 2000, 2008; Deininger and Squire 1998; Gallup 2012)[1]. In long-term longitudinal studies focusing on particular countries, the inverted U-shape relationship does clearly appear, although stagnating or even a new wave of increasing inequality has been detected for recent decades (Lindert and

[1] Other authors argue that this relationship weakens over time (Li *et al* 1998).

Williamson 1985; Lindert 2000)[2]. Similarly, an expanding literature, mostly auspiced by the World Bank, questions whether economic growth is pro-poor (Ravallion and Chen 2003; Bourguignon 2004; Ravallion 2004; Kraay 2006; Ferreira and Ravallion 2008). In this regard, although growing incomes usually translates into poverty reduction, that relationship is mediated by the intensity of growth and its capacity to reduce inequality, as well as by pre-existing inequality level. The links between economic growth, inequality and poverty reduction nonetheless remain subject to an open debate.

One of the big problems regarding these issues is measurement. Moreover, while research that estimates the evolution of contemporary inequality is relatively abundant, the number of studies dealing with historical inequality and poverty from a quantitative point of view is scarce[3]. Some attempts have nonetheless been made to correct this situation. Two studies led the way by measuring the distance between unskilled wages and farm rents per acre, on the one hand, and the income earnings of the average citizen, on the other, for different countries during the late 19th and early 20th century (O'Rourke *et al* 1996; Williamson 1997). More recently, other authors have updated previous work on estimating changes in world income inequality from the 1950s using household surveys and extended them back to the beginning of the 19th century (Bourguignon and Morrison 2002; Van Zanden *et al* 2011; Milanovic 2011)[4]. Likewise, Milanovic *et al* (2011) have examined this issue even further and inferred inequality employing social tables for different pre-industrial societies such as the Roman Empire, Byzantium, England in 1688, Moghul India in 1750 or China in 1880, only to mention some examples[5]. Alternatively, Atkinson *et al* (2011) estimate top income shares for 22 countries using income tax data which sometimes goes back to the 19th century.

[2] Inequality between regions over the long run has been explored for a number of developed countries. In this instance, the seminal paper of Williamson (1965) identified a Kuznets-type U inverted relationship between national economic development and the evolution of regional inequalities.

[3] For some examples on the evolution of contemporary inequality see Deininger and Squire (1998), Chen and Ravallion (2001) and Milanovic (2002). Baumol *et al* (1994) and Pritchett (1997) approach historical inequality from a more qualitative perspective.

[4] This strand of the literature examines long-term world inequality. Recent research finds that inequality among world citizens increased between 1820 and 1950 when that trend seems to stop and remains high but relatively stable from then on (Bourguignon and Morrison 2002, 731-733; Van Zanden *et al* 2011; Milanovic 2011; 2012). According to these authors, global inequality has been increasingly driven by between-country inequality. However, when measuring world inequality using life expectancy, there seems to be clear evidence of the Kuznets curve as world inequality on this dimension significantly declined from the 1930s onwards (Bourguignon and Morrison 2002, 741).

[5] Soltow and Van Zanden (1998) have also traced inequality levels in the Netherlands back to the 16th century. From a different perspective, Hoffman *et al* (2002) compare the evolution of the living standards of different social groups in England, France and Holland from the 16th century onwards.

However, by focusing only on top income shares, they do not show how inequality evolves elsewhere in the distribution. Apart from contemporary poverty lines, the most significant effort regarding historical poverty is the computation of welfare ratios based on subsistence baskets (Allen 2001; Allen et al. 2005, 2011). This line of research shows that, before 19th century, workers in central and Eastern Europe and in Asia earned just enough to keep a minimal living standard[6]. Important as it is, country-level inequality and poverty hide significant differences at more disaggregated levels but this issue has been hardly explored.

This paper attempts to address these questions employing the Spanish experience between 1860 and 1930 as a case study. The lack of information regarding inequality and poverty in 19th and early 20th century Spain has similarly long troubled historians and impeded to follow its evolution, as well as a proper assessment of the relationship between these variables and economic development. The unequal distribution of land ownership has been usually considered one of the main causes of the poor performance of Spanish agriculture and the lack of a more rapid industrialisation (Nadal 1975; Tortella 2000)[7]. However, as Tortella (2000, 56) has pointed out, these arguments have not been able to be tested empirically due to the lack of information. Recent work has begun to fill this gap by constructing long-term series of inequality and poverty at the national level (Prados de la Escosura 2008)[8]. This research shows that inequality increased between the mid-19th c. and the First World War and decreased afterwards. Although this downward trend was interrupted during the autarkic decades (1940s-1950s), the decrease in inequality continued up to the 1980s, when a new increase in inequality was recorded, especially pronounced since the beginning of the 1990s. As for poverty, a long run decline is found, being 1850-1880, the interwar years and the 1960s-1970s the periods where the reduction of poverty levels occurred at a higher pace.

[6] See Allen (2013) for a review of this literature and how it relates to contemporary poverty lines.

[7] In Southern Spain, large states relying on cheap labour had no incentives to modernise and, since the non-agricultural sector was not dynamic enough, this kept waged labour in the agricultural sector. In some areas of Northern Spain, on the contrary, the small size of the farms and the lack of capital prevented the adoption of new methods and techniques (Clar and Pinilla 2009, 313). It is argued that both social structures reduced mass consumption, reducing thus the incentives to modernise. A broader access to land is also likely to have directly benefited standards of living (Pérez Picazo 2010, 48). Inequality may have also affected well-being through the political process and the willingness to provide public goods and Spanish restricted franchise and political practices assured that economic inequality implied political inequality (Prados de la Escosura 2008, 290).

[8] Prados de la Escosura (2008) has calculated a set of inequality measures for the period going from 1850 to 2000. Álvarez del Nogal and Prados de la Escosura (2012) have extended it backwards from 1850 to 1280. Although silent about changes in the lower or middle part of the distribution, Alvaredo and Saez (2009) also provide series on top shares of income and wealth in Spain using individual tax statistics from 1933 to 2005.

However, given the sharp regional differences that characterized the Spanish economy, a more disaggregated measure of inequality taking into account that variety would significantly improve our understanding of the patterns behind the evolution of inequality and destitution.

In order to expand our knowledge about these issues, this paper provides two main contributions. Firstly, building on earlier work by Williamson (1997), it constructs the Williamson Index and a Poverty Ratio at the provincial level in Spain between 1860 and 1930[9]. The debate about the quality of the sources used in the construction of inequality measures is a hot topic (see e.g., Deininger and Squire 1998; Gallup 2012). However, our database presents a series of advantages. Most of the international studies employ country-level information, so internal differences at lower levels of aggregation is overlooked. Besides, by focusing on just one country, we avoid the problems that different legal and political regimes impose in cross-country comparisons. In addition, our analysis, unlike other empirical exercises within this literature, is conducted for a historical period that corresponds with the early stages of modern economic growth as stated by Kuznets. This is particularly relevant because cross-country studies have mainly focused, due to data scarcity, on the last decades of the 20th century or on the period after WWII. Likewise, distributional policies where almost non-existent during this period, thus enhancing the role of economic forces in explaining the trends in inequality and poverty. Lastly, by employing underlying data coming from the same statistical agencies, our study also avoids problems of comparability between different economies, especially acute when comparing data originated in developed and developing countries (Atkinson and Brandolini 2001; Banerjee and Duflo 2003, 281), or the troublesome conversions of incomes across countries using the purchasing parity power.

Secondly, a model assessing the different causes behind the evolution of these indicators is developed and empirically tested. The results confirm the presence of a Kuznets' curve. However, although growing incomes do not directly contribute to reducing inequality, at least during the early stages of modern economic growth, other processes associated with economic growth significantly improved the situation of the bottom part of the population. In this sense, the population shift from rural areas to

[9] A total of 49 provinces are included (the two provinces within the Canary Islands are counted here as one). Our spatial unit thus corresponds to the NUTS3 level of aggregation according to the Eurostat definitions.

urban and industrial centers, the demographic transition and the spread of literacy, among others, all partly counterbalanced the initial negative impact of economic growth and helped building a more equal society. The analysis of the determinants of poverty levels is conducted, as the recent literature suggests, taking into account the close relationship existing between growth, inequality and poverty. Our results show that economic growth and lower levels of inequality played a role in improving the economic condition of the most disadvantaged.

The paper is structured as follows. Section 2 offers a brief description of the economic context for the Spanish economy in the period under study. In section 3, the new regional measures of inequality and poverty are presented and a first approach to the relationship between these indicators and early economic growth in Spain is conducted. The determinants of inequality and poverty are then empirically examined in sections 4 and 5. The final section concludes.

2. Early economic growth, inequality and poverty in Spain

Economic growth in Spain progressed at a slow pace during the early stages of development and only after WWI did the GDP growth rates show a significant increase (table 1). Likewise, structural change in the Spanish economy was also limited. The gradual diffusion of industrialization across Europe in the 19th c. allowed the countries which joined this process to enter the path of what Simon Kuznets defined as 'modern economic growth' (Kuznets 1971). Although Spain, a middle-sized country lying in the geographical periphery of Europe, strived from the early decades of the 19th c. to foster its industrial sector, these attempts mostly failed (Nadal 1975). In 1860, the workforce employed in the agrarian sector still accounted for two-thirds of the total active population. By 1910, this share remained almost unchanged (even increased slightly). Then, the reallocation of resources from agriculture to other economic sectors accelerated and a substantial reduction in the share of the agrarian population took place in the interwar years reaching a 45.5% in 1930 (Nicolau 2005).

Economic historians have argued that one of the main reasons that explains why the Spanish economy experienced difficulties to converge with the core European countries was the limited industrialization of the country. Indeed, during the 19th c. and up to the Civil War (1936-39), Spain lagged behind the major economic powers in Europe and, on balance, the Spanish economy had not witnessed the profound transformations that industrialization implies. In parallel to these developments, the

demographic transition in Spain was delayed when compared to the core European countries (Livi-Bacci 1988), limiting potential improvements in living standards. The picture was not better in terms of the educational levels attained by the population. Although literacy levels increased from 26 to 71 per cent of the adult population between 1860 and 1930 (Núñez 1992), this figure was still below the levels registered in countries like France or England sixty years before (75 and 80 per cent respectively in 1870).

TABLE 1. Real GDP, population and per capita GDP growth, 1850-1929

	GDP	Population	Per capita GDP
1850-1883	1.8	0.4	1.4
1884-1920	1.3	0.6	0.7
1921-1929	3.8	1.0	2.8

Source: Prados de la Escosura (2008, 288). Annual average logarithmic rates.

This general description of the Spanish economy as a whole hides nonetheless widely diverse regional experiences. Firstly, three regions escaped from this general view of economic backwardness: Catalonia, the Basque Country and Madrid. In the first two cases, a considerable degree of industrial development was achieved, even for European standards. Structural change advanced more rapidly in these regions which developed a modern manufacturing sector (table 2). In Catalonia, Barcelona witnessed a remarkable increase in the active population enrolled in industrial activities between 1860 and 1930 (being close to a 60% of the total active population in 1930). Similarly, in the Basque provinces of Guipúzcoa and Vizcaya, industrial active population doubled and tripled, respectively, almost reaching a 40% of the total active population. Likewise, the growth of Madrid, the capital city, brought about an expansion of the manufacturing, construction and service sectors. As a result, by 1930, while their population represented 11.8%, 5.9% and 3.8%, the contribution of Catalonia, Madrid and the Basque Country to Spanish industrial output was 34.6%, 9.3% and 9.2%, respectively (Tirado and Martinez-Galarraga 2008). In this context, the divergent paths followed by the Spanish regional economies and their timing to join 'modern economic growth' led initially to an upswing in regional inequality during the second half of the 19th c. (Rosés *et al* 2010). However, as industrialization spread into an increasing number of provinces in the first decades of the 20th c., a process of convergence between regions began.

TABLE 2. Distribution of the active population in selected provinces by sector.

	Agrarian population (%)			Industrial population (%)		
	1860	1900	1930	1860	1900	1930
Barcelona	37.15	38.65	12.50	31.51	35.45	58.62
Vizcaya	62.30	51.59	21.49	12.34	27.04	37.82
Guipúzcoa	54.28	43.49	25.05	18.63	30.99	37.87
Madrid	29.72	34.23	9.03	21.10	20.66	30.94
Spain	63.05	66.30	45.50	12.46	16.00	27.20

Source: Population Censuses for the different provinces and Nicolau (2005) for Spain. Industry includes manufacturing, mining and construction.

In a mainly agrarian country, the situation of the agricultural sector also greatly differed between regions. The existence of market incentives, together with the social and environmental conditions that characterised the different rural societies influenced the crop-mix and agricultural productivity. While the Southern half of the country and the Castilian plateau, based on a traditional dry-farming cereal agriculture, expanded arable land without significantly increasing yields, other regions were able to raise productivity through the employment of more intensive techniques and a more diversified agriculture (Simpson 1995; Gallego 2001)[10]. Such differences were also present in the distribution of land. On the one hand, while large states relying on cheap labour were the norm in Southern Spain, small family farms predominated in Northern Spain and some areas of the Mediterranean coast. On the other hand, although the liberal state promoted the privatisation of the commons throughout the 19th century, the outcome of the process was geographically diverse (GEHR 1994; Beltrán 2014a).

In a similar vein, important regional differences in educational levels were also present (Núñez 1992). Not only the transition to universal literacy was delayed with respect to other European countries, but also the spread of literacy was geographically uneven. A dual structure was configured during the period under study with the Northern provinces reaching higher rates of literacy than those in the South of the country.

[10] Even though the expansion of cultivated land was also widely practised in the Ebro valley and the Mediterranean strip running from Castellón to Murcia, these regions were able to complement this strategy by extending irrigation systems and applying increasing doses of chemical fertilisers. The productive orientation of dry Spain was not exclusively based on cereal crops, but also on stockbreeding, vineyards and olive groves. However, all of these crops were produced on un-irrigated land cultivated through extensive systems (Gallego 2001, 46).

Lastly, it should be noted that the early stages of modern economic growth in Spain coincided with political transformations that are likely to have an influence on the levels of inequality. Liberal reforms were implemented during a period plagued with social instability and political conflict[11]. This period was followed by the Bourbon Restoration (1874-1923). A parliamentary monarchy was established and under this system, two dynastic political parties, the liberals and the conservatives, alternated in power. However, it appears that, despite the establishment of universal male suffrage in 1890 and its potential effect on the expansion of political participation, the ruling elites managed to keep disproportionate power during this period (Moreno-Luzón 2007; Curto-Grau *et al* 2012). The Restoration ended in 1923 when it was replaced by a military dictatorship leaded by Primo de Rivera (1923-1930). Interestingly, the Second Republic (1931-1936), which in addition brought about the extension of suffrage to women, attempted to undermine the power of the elites, especially of the large landowners, was followed by a coup d'etat organised by the same threatened elites, which triggered the Civil War and eventually overthrew the democratic government.

3. Measuring inequality and poverty

The analysis of income distribution usually relies on the information provided by household surveys. In particular, most recent studies are interested in the evolution of disposable income which considers the household income once the taxes paid have been deducted and government transfers received. In general, the data contained in household surveys usually serves as the basis for the computation of Gini coefficients and poverty lines[12]. Unfortunately, such information is all too often not available for historical periods: household surveys only began to be published after World War II and they were produced mostly in rich countries and not on a regular time basis. Thus, the limited time coverage of the household surveys implies that studies focusing on periods far in the past have to rely on alternative measures. Therefore, historical indicators of inequality and poverty are normally constructed using alternative sources which offer scattered and more fragmentary data.

[11] The liberal agenda was mostly enacted during the "Revolución Liberal" (1836-1840), the "Bienio Progresista" (1854-1856) and the "Sexenio Revolucionario" (1868-1974).

[12] It is also usual to find in the literature several entropy indices such as the Theil (Theil 1967; Milanovic 2011). Poverty lines are usually computed in relation to the World Bank's international poverty line of 1$ or 2$ a day (at 1993 international PPP exchange rates).

Building on earlier work by Williamson (1997; 2002), two different indicators are developed here. Firstly, the Williamson Index is an indirect index of inequality defined as the ratio between nominal income per worker (y) and the nominal unskilled wage (w_{unsk})[13]:

$$Williamson\ Index = \frac{y}{w_{unsk}} \quad [1]$$

By dividing the returns to all factors of production per worker by the returns to unskilled labour, the WI compares the bottom of the distribution to the average income[14]. Examining the Spanish economy as a whole, Prados de la Escosura (2008, 299) has shown that, before 1950, the evolution of the Gini and the Williamson index was closely correlated[15]. In particular, the decomposition of the Gini coefficient reveals that inequality in Spain was driven by the gap between the average returns of proprietors and workers, thus justifying the comparison between average income and unskilled wages as the basis for developing these indexes[16]. Likewise, income taxes and social transfers were negligible during the period under study, which also supports the adequacy of these indicators (Prados de la Escosura 2008, 291).

Secondly, we construct a measure of absolute deprivation which is calculated in reference to a fixed subsistence line, understood as the income required to purchase a minimum standard of living. In particular, comparing unskilled wages and subsistence levels allows for computing a crude poverty ratio[17]:

$$Poverty\ Ratio = \frac{w_{subs}}{w_{unsk}} \quad [2]$$

[13] The components are normalised by the number of hours worked. See the statistical appendix for details.
[14] This indicator exploits the right-skewness of the income distribution, which implies that the mean is higher than the median. An alternative way of calculating inequality indexes is the wage-rental ratio, an indicator which has also been widely used. See Williamson (1997) for an example.
[15] In addition, Milanovic *et al* (2007, 23) argue that the y/w ratio is highly correlated with the Gini indexes and therefore it is a good proxy for inequality in the nineteenth and twentieth centuries.
[16] Between-group inequality dominated over within-group mainly up to the First World War, which remained stable during this period. Prados de la Escosura (2008, 298) shows that, in fact, the evolution of inequality in Spain up to 1950 follows a similar pattern when unskilled or average wages are used, which indicates that skilled labour represented a really small proportion of the total labour force (292). This is consistent with the fact that around 96 per cent of the total years of schooling of the labour force corresponded to primary education (Núñez 2005, 140).
[17] For the calculation of the subsistence level, see the Statistical Appendix.

Although the lack of enough information on commodity prices prevents us from being able to compute a subsistence basket as in Allen (2001), we computed a fixed subsistence wage of 300 $PPP per capita at 1990 prices following Milanovic et al (2011). The subsistence wage is then divided by the unskilled wage to see how far it stands from the earnings of the bottom part of the population.

The indicators defined above have been computed for the Spanish provinces during the period of analysis (see the Statistical Appendix for methodology and sources). As shown in table 3, the evolution of income inequality and poverty at the national level during this period differs. While the Williamson Index presents a relatively stable trend, the Poverty ratio witnessed a significant decline. According to these figures, it seems that economic growth, while hardly affecting inequality levels, clearly contributed to reducing poverty.

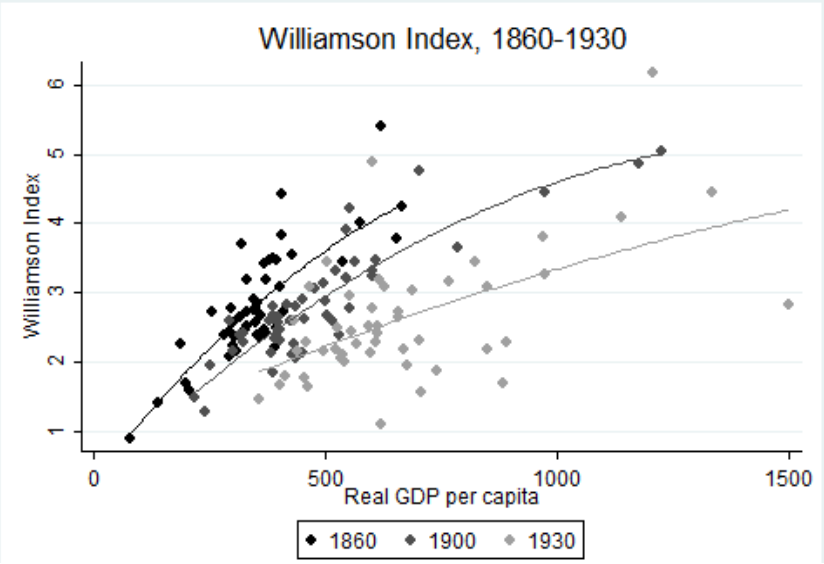
TABLE 3. Evolution of inequality and poverty in Spain, 1860-1930

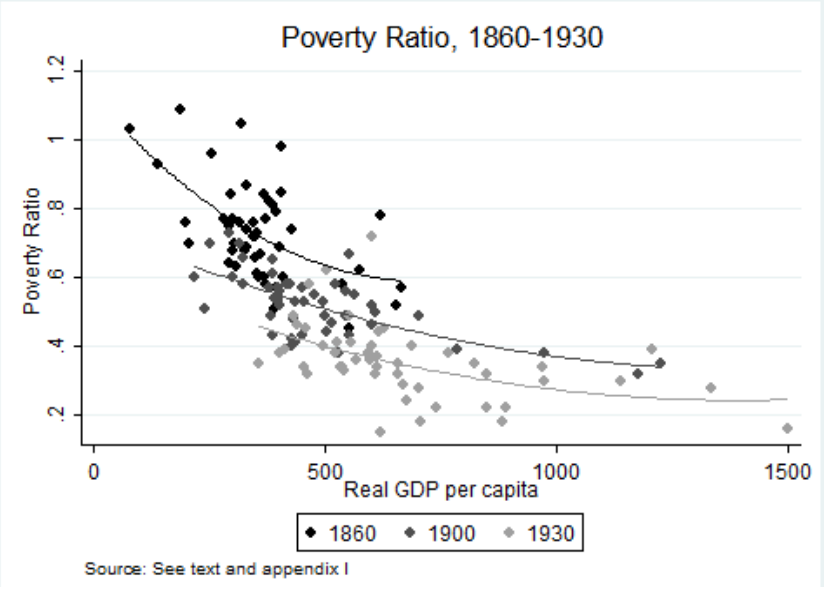
	Williamson Index	Poverty Ratio	Real GDP per capita
1860	2.85	0.72	369.9
1900	2.92	0.52	501.0
1910	2.85	0.48	519.5
1920	2.86	0.44	625.3
1930	2.79	0.35	745.9

Note: Population-weighted mean.

However, a much more complex picture appears when the disaggregated information is considered. First, Maps 1 and 2 in Appendix I portray the regional picture and its evolution over time. Second, Figures 1 and 2 plot each province's inequality and poverty indexes against their level of real income per capita in 1860, 1900 and 1930. In order to provide a representation of the relationship between economic growth and these variables over time, a quadratic function is fitted to the observations by period.

FIGURES 1-2. Inequality, poverty and real income per capita in Spain, 1860-1930





Economic growth does not appear now to be beneficial for inequality, at least during the first stages of economic growth analysed here. According to the Kuznets' hypothesis, the Williamson index seems to have increased as incomes grew, a relationship which weakened over time as the Spanish economy developed. In turn, higher incomes per capita are clearly related with lower poverty levels, thus depicting a more positive image of economic development. This positive association however almost vanishes at higher levels of income per capita.

Next sections exploit this regional variation to fully assess the distinctive impact of growing incomes on inequality and poverty levels. In order to do so, other potential factors influencing these processes are also taken into account.

4. The determinants of inequality

As explained in the introduction, since the pioneering article by Kuznets (1955), the relationship between economic growth and inequality has received considerable attention (Lindert and Williamson 1985; Deininger and Squire 1998; Li *et al* 1998; Barro 2000, 2008; Lindert 2000; Morrison 2000; Allen 2009; Milanovic *et al* 2011; Gallup 2012)[18]. While some of these studies defend that inequality grows during the early stages of modern economic growth to drop afterwards as the economy develops further, others claim that this connection is far from clear. In this section, we test the Kuznets' hypothesis and examine the potential determinants of inequality using the indicators developed above. Relying on a panel data set at the Spanish provincial level at 1860, 1900, 1910, 1920 and 1930, we estimate the following model:

$$Y_{it} = \beta_1 GDPpc_{it} + \beta_2 GDPpc(squared)_{it} + \gamma' X_{it} + a_t + u_{it} \qquad [3]$$

While Y_{it} denotes the level of inequality in province *i* at time *t*, $GDPpc_{it}$ and its square attempt to capture the inverted U-relationship between real income per capita and inequality[19]. The term X_{it} refers to a set of variables which tries to account for other potential determinants of inequality suggested by the literature and a_t introduces fixed time effects [20].

Firstly, Kuznets (1955) itself theorises that, during the early stages of development, inequality is driven up by the shift of the population from agriculture to the urban and industrial sectors where incomes and inequality tend to be higher, so the

[18] Recent research by Bourguignon and Morrison (2002), Van Zanden *et al* (2011) and Milanovic (2011) has focused on estimating long-run trends in global inequality. See also Bourguignon (2005, 1732-1742) and Kanbur (2000) for a detailed review of the literature on the Kuznets curve and the determinants of inequality.

[19] We are aware of the potential endogeneity arisen from the fact that the independent variable, income per capita, is also employed when computing the Williamson Index. However, using urbanisation rates as a proxy for income per capita does not change the results reported here, thus mitigating that concern. The results are available on request.

[20] The selection of variables is a critical issue in this kind of exercises. On the one hand, the more regressors are included, the lower would be the potential problem of omitted variables (although this can be partially solved using an IV approach as explained below). On the other hand, a large number of variables could imply that some of them may be statistically correlated therefore capturing similar effects.

fraction of the working force employed in the agriculture is included in the model. Likewise, increasing market opportunities, which can be accounted for not only by income per capita but also by urbanisation and population density, may promote inequality due to larger potential gains and risks. However, by providing working opportunities, both the industrial and the urban sector may exert a beneficial influence on wages, potentially decreasing inequality levels[21].

Apart from these structural changes, demographic pressures may have also played a role in this process because population growth, by expanding the labour force supply, tends to prevent wages from rising (Lindert and Williamson 1985, 354-355). Similarly, demographic growth in rural areas may entail an increase in land prices and in the number of landless peasants (Morrison 2000, 253). In this sense, during the early stages of economic development, household behaviour underwent fundamental transformations such as the increase in female labour force participation, which led to a decline in fertility rates and the onset of demographic transition, thus potentially alleviating demographic pressures (Galor 2011a, 123-124). The shift from 'quantity to quality' in the patterns of fecundity resulted in increasing levels of human capital which may also have affected inequality levels (Becker *et al* 2010). In an era where primary education was the main source of human capital differences (Núñez 2005, 140), the spread of schooling and literacy reduced the high concentration of human capital in the top part of the distribution and, therefore, may have levelled off the playing field (Morrison 2000, 252; Galor 2005, 212-214). According to Rajan and Zingales (2006), elites tried to block the diffusion of education so as to prevent both large-scale reforms and a reduction of the rents accruing to the already educated. However, Galor (2011a) suggests that, as the industrialization process advanced, physical capital accumulation was replaced by human capital accumulation as the prime engine of economic growth. In that context, while landowners would favour policies aimed at depriving the masses from education in order to reduce the mobility of rural workers and keep rural wages low, capitalists or industrialists benefited from human capital accumulation and thus had incentives to support education policies.

[21] It should be noted that these variables also capture the effect of changes in international trade. Although declining transport costs were supplemented with tariff reductions from 1869, Spain returned to strict protectionist policies from 1892 onwards (O'Rourke and Williamson 1999; Tena 1999). See Tirado *et al* (2013) for a recent review of the Spanish trade policy, one of the most protectionist countries in the world, and its effects on regional economic activity during this period.

The period under analysis also coincides with a massive privatisation of common lands in Spain (Iriarte 2002; Beltrán 2014a). By providing pasture, wood, and fuel, among other products, including the possibility of temporary cropping, the commons constituted an important source of complementary income. The disrupting impact of the British enclosures on the living standards of the bottom part of the rural population has been repeatedly stressed (Humphries 1990; Allen 1992; Neeson 1993), although these claims have been contested (Shaw-Taylor 2001; Clark and Clark 2001). Spanish historiography has also argued that the loss of these collective resources negatively affected rural households but the lack of information on inequality has prevented drawing stronger conclusions (Tortella 2000; Jiménez Blanco 2002). Interestingly, although enclosure was highly intense in some regions, other areas were able to preserve large tracts of the commons (GEHR 1994). This heterogeneity therefore allows for empirically testing the effect of the persistence of common lands on inequality.

Lastly, a set of time dummies accounts for other changes, apart from the economic transformations already considered, which may have affected the Spanish economy, such as the establishment of universal male suffrage in 1890. Recent literature on institutions has stressed that the transition from an oligarchy run by the elites to a more democratic political system involved wide-ranging effects on the economies undergoing those institutional changes (Acemoglu and Robinson 2000; Engerman and Sokoloff 2002; Lindert 2003). The Spanish literature argues, however, that, despite legal changes, economic and political elites were able to keep the political system under their control through different mechanisms such as widespread vote buying, coercion and mass fraud, among other practices, at least until well into the 20th century (Moreno-Luzón 2007; Curto-Grau *et al* 2012). Trade unions, nonetheless, began to exert an important influence on the labour markets during this period (Prados de la Escosura 2008, 303). Given the difficulty of constructing indicators that may capture regional differences in the quality of institutions, the potential impact of these political developments on inequality will therefore be assessed by the time dummies.

TABLE 4. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Williamson Index	245	2.75	0.86	0.91	6.16
Poverty Ratio	245	0.51	0.17	0.15	1.09
Real GDP per capita	245	0.52	0.22	0.08	1.59
Urbanisation	245	0.34	0.26	0.02	0.91
Industrialisation	245	0.19	0.09	0.03	0.55
Agrarian population	245	0.70	0.14	0.15	0.93
Population density	245	48.2	36.3	12.5	233.0
Fertility	245	0.63	0.10	0.31	1.0
Literacy	245	0.53	0.22	0.14	1.0
Commons	234	0.19	0.16	0	0.61

Source: See text and appendix.

Table 5 reports the results using the Williamson Index as a measure of inequality. Estimated by OLS, column (1) presents the baseline specification and columns (2) and (3) add the set of controls and the time dummies explained above, respectively[22]. Despite the inclusion of different factors potentially explaining inequality trends, a potential bias coming from unobserved heterogeneity and simultaneity is worrisome. Therefore, an instrumental variable approach is conducted using the lagged values of the explanatory variables as instruments, thus allowing us to alleviate endogeneity issues[23]. Columns (4) to (6) therefore repeat the previous exercise but employing now the IV specification[24]. Admittedly, by following this approach, we lose one time-period and our sample is reduced to years 1900, 1910, 1920 and 1930. However, due to the lack of a different instrument, this is the best available strategy to test the robustness of our results. Moreover, despite the increase in standard errors resulting from both implementing the instrumental variable approach itself and the loss of observations, the IV estimates hardly change and remain highly significant[25].

The estimated relation strongly confirms the presence of the Kuznets curve in the early stages of modern economic growth in Spain[26]. Inequality tended to rise as the economy grew but this relationship gradually became weaker and eventually reversed.

[22] Estimating a Random Effects model does not alter the results reported above.
[23] This is an usual procedure in the literature. See, for instance, Wolf (2007), and Martínez-Galarraga (2012) and Klein and Crafts (2012).
[24] All instrumental variables are highly statistically significant in the first stage regressions. The endogenous regressors pass the Angrist-Pischke tests of underidentification and weak identification.
[25] The Hausman test cannot actually reject at the 5 per cent significance level that there is no systematic differences in the OLS and IV estimates (p-value=0.0965).
[26] All reported results do not change when alternative definitions of the agrarian active population are used. See Appendix I for details. The results are available from the authors upon request.

According to the estimates in column (4), the inflexion point is reached at an income per capita around 1,272 pesetas and the WI tended to decline thereafter. It is worth noting that the average real GDP per capita went from 359 pesetas in 1860 to 487 and 672 pesetas in 1900 and 1930, respectively. Interestingly, in spite of focusing on a period which only captures the initial stages of modern economic growth, this exercise is able to identify the changing trend in the relationship between income and inequality. Using a long-term longitudinal data at the country level from 1850 to 2000, Prados de la Escosura (2008, 300) also detects the presence of a Kuznets curve in Spain. In that case, the Williamson Index suggests that the upswing of inequality ends after World War I.

TABLE 5. Determinants of inequality: the Kuznets curve

	Dependent variable: Williamson Index					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
GDPpc	3.27***	6.41***	7.07***	4.91***	10.92***	11.02***
	(0.87)	(1.00)	(0.95)	(1.50)	(2.69)	(2.27)
GDPpc squared	-0.81	-2.38***	-2.83***	-1.93**	-5.15***	-5.23***
	(0.65)	(0.59)	(0.56)	(0.93)	(1.19)	(0.98)
Urbanisation		-0.67***	0.08		-1.35*	-0.24
		(0.24)	(0.20)		(0.76)	(0.45)
Industrialisation		-2.31***	-2.95***		-3.77	-5.56**
		(0.78)	(0.76)		(2.69)	(2.29)
Agrarian Population		-1.22**	0.12		-1.97	-0.11
		(0.61)	(0.71)		(2.70)	(1.71)
Population density		0.01***	0.01***		0.01***	0.02***
		(0.00)	(0.00)		(0.00)	(0.00)
Fertility		3.69***	2.56***		4.58***	2.98***
		(0.58)	(0.54)		(1.15)	(0.85)
Literacy		-1.54***	0.31		-1.78	0.49
		(0.29)	(0.35)		(1.16)	(0.72)
Commons		-1.32***	-1.29***		-1.80***	-1.70***
		(0.34)	(0.32)		(0.50)	(0.46)
d_1900			-0.63***			
			(0.13)			
d_1910			-0.78***			-0.14
			(0.15)			(0.12)
d_1920			-0.96***			-0.52***
			(0.17)			(0.16)
d_1930			-1.44***			-1.10***
			(0.18)			(0.21)
Observations	245	234	234	196	186	186
R-squared	0.30	0.48	0.58	0.33	0.44	0.53

Robust standard errors between brackets; *, **, or *** denotes significance at 10, 5 or 1 per cent level. For simplicity, the intercept is not reported.

It should be stressed that the relationship between income and inequality does not disappear when other potential determinants of inequality are included in the model, even though being highly correlated with economic development. This means that, apart from the economic, social and political transformations which usually accompany this process, and that also involve distributional consequences, income still exerts an independent effect. Given that the coefficient actually more than doubles in size when these variables are introduced, it can be inferred that these other factors were partly offsetting the effect of economic growth on inequality[27]. The positive dimension of this relationship is likely to be due to the expanding opportunities and risks brought about by increasing incomes. Milanovic *et al* (2011) indeed stress that economic growth expands the maximum feasible inequality. Explaining the negative dimension attached to the coefficient on GDP squared is more challenging. Bourguignon (2005, 1739-1740) argues that, in developing economies, markets function very imperfectly, especially credit markets, resulting in 'unbalanced' growth. As the economy develops and markets become better integrated, the impact of growth upon social structures becomes less disrupting and may facilitate that larger parts of the population benefit from expanding opportunities (Dercon 2009).

The rest of the variables also tell a coherent story and mostly confirm what other research has stressed. Regarding structural change, although the shift from agriculture to industry has often been linked to increasing inequality following Kuznets' seminal contribution (1955), our results show that other processes correlated with the emergence of an industrial sector, such as urbanisation or increasing population density, may explain that trend[28]. Analysing the British case, Lindert and Williamson (1985, 367) were indeed very cautious about the supposed effect of the Industrial Revolution on inequality levels. Industrialisation, on the contrary, at least in the Spanish case, appears to have reduced inequality by opening up new job opportunities for the lower classes, not only consequently raising their salaries but also increasing their room to manoeuvre

[27] Studying Brazil, Ferreira and Paes de Barros (1998) find that the fact that inequality did not increase between 1976 and 1996 was not because economic growth did not have an impact on income distribution, but because there were other socio-demographic forces, such as a decline in fertility and average family size, as well as an expansion of education, obscuring that relationship.

[28] Interestingly, Martínez-Galarraga *et al* (2008), following an economic geography approach, have provided evidence in support of the existence of an 'agglomeration effect' linking the spatial density of economic activity and interregional differences in the productivity of industrial labour in Spain for the period 1860 to 1999. In line with Ciccone and Hall (1996) and Ciccone (2002), the study shows that the estimated elasticity of employment density with respect to labour productivity, as the agglomeration effect has been defined, played a key role during the early stages of industrialisation.

in their relationships with the well-off (Gallego 2007). The availability of industrial jobs meant, for instance, that peasants could threaten to 'exit' if their landlords did not provide better wages or rents. Likewise, industrialization may have reduced underemployment in rural areas (Morrison 2000, 255).

Alternatively, demographic pressures, as shown by the coefficients on population density and fertility, together with expanding economic opportunities, do explain rising inequality trends. In this sense, Kuznets' intuition (1955, 18) that higher birth rates would be unfavourable to the relative economic position of lower-income groups is strongly validated by the data. Also, by affecting the distribution of population and the labour force supply, migration processes are likely to have had opposite effects: releasing demographic pressures in sending areas but exacerbating them in receiving regions (O'Rourke and Williamson 1999; Betrán and Pons 2011). There is indeed evidence that internal and international migration gradually increased during the period under analysis (Sanchéz Alonso 2000; Silvestre 2005; 2007).

On the other hand, and as expected, increasing educational levels also help reducing inequality (Barro 2000, 21)[29]. The diffusion of literacy seems to have facilitated reducing the concentration of human capital in narrow segments of the population (Morrison 2000). Although its effect disappears when time dummies are added in column (6), this may be due to the association between the spread of political voice, state intervention and the provision of schooling, what would imply multicollinearity problems. In this sense, Lindert (2003) finds a significant link between the expansion of voting rights and increasing schooling enrolment rates. There is indeed evidence that the implementation of a public schooling system largely explains most of the growth in literacy levels in Spain between 1860 and 1930 (Beltrán 2013, 20-22)[30].

Likewise, the stock of common lands shows a negative and highly significant influence on inequality. The commons seem to have been a crucial asset for the rural population. Not only did these collective resources complement households' incomes by supplying a variety of goods and services, but also their existence influenced the

[29] Its loss of significance in column (5) when the IV approach is conducted is likely to be due, as explained above, to the increase in standards errors resulting from both implementing the IV approach itself and the loss of observations caused by the use of lagged values of the regressors and instruments (its p-value is only 0.130). Also, Barro's specification does not include fertility rates, which, being correlated with literacy levels, may explain why that variable is not significant here (or, alternatively, why it is significant in his model).

[30] Another potential complementary explanation may be that the effect of education on inequality is not contemporaneous but lagged. See Núñez (2003; 2005) and Beltrán (2013) for an analysis of the regional patterns in the transition to universal literacy in Spain.

standards of living of the rural working classes by increasing their bargaining power in the labour market (Jiménez Blanco 2002; Gallego 2007)[31]. Those regions where large tracts of common lands survived actually enjoyed higher levels of life expectancy and heights (Beltrán 2014b). The link between the commons and inequality is consistent with anecdotal evidence and the historiography on the driving forces behind the privatisation of these resources, which stresses how powerful elites promoted this process and became the main beneficiaries from it, especially after 1860 (Jiménez Blanco 2002)[32]. A similar story appears evident from the English Parliamentary enclosures where a vast redistribution of agricultural income from the rural poor to the landowners occurred (Humphries 1990; Allen 1992).

Lastly, it should be stressed that the time dummies show that, holding everything else fixed, inequality decreased under the period of analysis. Although this timing coincides with the modernisation of the economy and the increasing importance of dynamic urban centers, their effect is already accounted for by the control variables. The independent effect of the time dummies may therefore be linked to other factors. On the one hand, the literature has pointed to the effects derived from the transition from an oligarchy run by the elites to a more democratic political system (Acemoglu and Robinson 2000; Engerman and Sokoloff 2002; Lindert 2003). The importance of enfranchisement and electoral dynamics within semi-democratic political systems has actually been stressed for the Spanish case during the monarchic 'Restoration' (1874-1923), in which the two dominant parties alternated in office (Curto-Grau *et al* 2012). Although economic and political elites firmly controlled the Spanish political system by widespread vote buying, coercion and mass fraud, together with promises of individual favours and pork barrel politics, the ability to do so weakened over time as elected candidates from third parties began to gradually gain importance in the political arena from the end of the 19th century onwards. In this sense, not only the establishment of universal male suffrage in 1890 may have opened new paths for mass political

[31] According to Gallego (2007, 165), the level to which privileged groups subordinated peasant exploitations to their own interests depended on the array of possibilities that peasant families could lean on, which apart from access to the commons, include access to other resources such as land or credit, or to alternative sources of income such as urban wages or remittances. The greater labour market dependence caused by the disappearance of collective user-rights left peasants in a more vulnerable position, since they were doomed to a compulsory submission to work conditions that benefited their employers (López Estudillo 1992, 93).

[32] The widespread social unrest and resistance that privatisation generated, especially among the least favoured groups, speaks clearly about its negative impact on living standards (Cobo *et al* 1992; De la Torre and Lana 2000).

participation, but also may have partially corrected some of the malfunctions of the system[33]. Likewise, the political reforms that a wider political representation usually involves, such as social reforms, increased taxation or the extension of education, are likely to need time to begin making an impact (Lindert 2003, 342). Inequality also seems to have been significantly reduced during the 1910s and 1920s coinciding with the disruptive effects of the WWI and the increasing role of trade unions in fostering relative wages (Prados de la Escosura 2008, 303). Other processes, such as the trade policy or the effect of technological innovation, nonetheless may have also contributed to explaining these trends. Further research is needed to be able to disentangle between these competing explanations[34].

5. The determinants of poverty

There seems to be a consensus among economists that economic growth is beneficial for reducing poverty. Dollar and Kraay (2002) and Dollar et al. (2013) argue that growth in average incomes and growth in average incomes in the bottom quintile of the income distribution are highly correlated, thus concluding that economic growth is pro-poor and therefore central to improve the living standards of the lower segments of the population. Another strand of the literature, however, recognises the importance of both growth and distribution in determining poverty levels (Ravallion 1997; Bourguignon 2004; Ferreira and Ravallion 2008). As Bourguignon (2004, 10) puts it, 'it is important to consider growth and income distribution simultaneously, and to recognize that income distribution matters as much as growth for poverty reduction'. Accordingly, and relying again on our panel data set at the Spanish provincial level between 1860 and 1930, we estimate the following model:

$$Y_{it} = \beta_1 GDPpc_{it} + \beta_2 INEQ_{it} + \gamma' X_{it} + a_t + u_{it} \qquad [4]$$

[33] Although elections became increasingly competitive, this process was nonetheless limited (Curto-Grau *et al* 2012, 778-779). Members of Parliament from third parties only accounted for about 20 percent of the chamber by the early 1920s. However, weakened by an increasingly challenging environment, this political system actually collapsed in 1923 and a military dictatorship was established which lasted until 1930. Despite all its shortcomings, historiography has considered that the political regime in place between 1874 and 1923, based on the peaceful (but corrupted) alternation in power of the two dynastic parties, succeeded in achieving institutional stability, especially after the previous turbulent decades, thus contributing to fostering economic growth. See Moreno-Luzón (2007) for a detailed synthesis of the functioning of this political regime and the interpretations of the historiography.

[34] The loss of one time period when employing the IV approach also prevents us from drawing a stronger assessment of what happened between 1860 and 1900.

While Y_{it} denotes the poverty ratio in province i at time t, $GDPpc_{it}$ and $INEQ_{it}$ aim to measure the relationship of both economic growth and inequality with poverty levels. In order to capture potential non-linearities, both terms are also squared. Additionally, the term X_{it} includes the set of variables which were introduced in the previous exercise to test whether they present a direct link with poverty apart from the one via inequality. Lastly, a_t introduces fixed time effects. It can be argued, however, that the cost of living may have differed across provinces and over time. Hence, the subsistence wage may also vary. In order to control for these differences in the cost of living, we have also considered the price of wheat as another control variable. The results from that analysis do not alter the image presented in table 6[35].

Table 6 shows the results of estimating equation [4][36]. While column (1) presents the baseline specification, column (2) includes other potential determinants of poverty and column (3) adds the time dummies. Columns (4) to (6) repeat the same exercise using one-period lags of the independent variables as instruments[37]. However, given that Hausman test shows that the endogenous regressors can be safely treated as exogenous, the OLS specification is preferred. The reported results mostly confirm the findings of the literature reviewed above. On the one hand, economic development seems to have opened up new opportunities to wider layers of the population, thus reducing the Poverty Ratio, at least during the period under analysis. It is true, however, that the positive relationship between economic growth and poverty reduction tends to disappear, or even become negative, as income per capita grow, as evidenced by the positive sign of its square term. On the other hand, and as expected, inequality is positively associated with poverty: high levels of inequality were detrimental for poverty reduction.

[35] Results available upon request.
[36] Again, instead of estimating an OLS model, a Random Effects model was also tested and results did not change.
[37] Again, all instrumental variables are highly significant in the first stage regressions and the endogenous regressors pass the underidentification and weak identification tests.

TABLE 6. Economic growth, inequality and poverty

	Dependent variable: Poverty Ratio					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
GDPpc	-1.83***	-1.77***	-1.65***	-1.34***	-1.04***	-1.05***
	(0.11)	(0.16)	(0.13)	(0.11)	(0.38)	(0.40)
GDPpc squared	0.71***	0.75***	0.68***	0.48***	0.42**	0.44**
	(0.07)	(0.10)	(0.08)	(0.05)	(0.19)	(0.19)
Ineq. (WI)	0.24***	0.25***	0.25***	0.27***	0.29***	0.28***
	(0.04)	(0.04)	(0.03)	(0.09)	(0.08)	(0.05)
Ineq. squared	-0.01**	-0.01**	-0.01***	-0.02	-0.03*	-0.03***
	(0.01)	(0.01)	(0.00)	(0.02)	(0.02)	(0.01)
Urbanisation		-0.04**	-0.00		-0.01	-0.03
		(0.02)	(0.02)		(0.06)	(0.04)
Industrialisation		-0.10	0.04		-0.30	-0.36
		(0.07)	(0.07)		(0.20)	(0.27)
Agrarian Population		-0.06	0.19***		0.16	0.08
		(0.04)	(0.05)		(0.15)	(0.11)
Population density		-0.00***	-0.00		0.00	0.00
		(0.00)	(0.00)		(0.00)	(0.00)
Fertility		-0.08	-0.01		0.11	0.12
		(0.05)	(0.05)		(0.13)	(0.10)
Literacy		-0.06***	-0.01		0.00	-0.03
		(0.02)	(0.02)		(0.07)	(0.05)
Commons		0.08**	0.04		-0.04	-0.02
		(0.03)	(0.03)		(0.06)	(0.05)
d_1900			-0.09***			
			(0.01)			
d_1910			-0.09***			-0.01
			(0.01)			(0.01)
d_1920			-0.04**			0.01
			(0.02)			(0.02)
d_1930			-0.03**			-0.01
			(0.02)			(0.04)
Observations	245	234	234	196	186	186
R-squared	0.90	0.91	0.94	0.88	0.89	0.90

Robust standard errors between brackets; *, **, or *** denotes significance at 10, 5 or 1 per cent level.
For simplicity, the intercept is not reported.

The shift from agriculture to more productive sectors also appears to have entailed lower poverty levels. Other processes at play, however, do not have a direct impact on destitution once the time dummies are included. It is only through their indirect effect via inequality, as shown in table 5, that demographic pressures, increasing educational levels or the privatisation of the commons had an impact on poverty. It is interesting to

note that, even when the effect of the other variables in taken into account, the time dummies show a significant effect on the independent variable. In this regard, as shown in column (3), although poverty clearly decreased between 1860 and 1900, this downward trend ended at the turn of the century[38]. It seems that poverty levels even increased between 1910 and 1920, coinciding with the disrupting impact of the First World War. This temporary effect, however, is no longer visible when the explanatory variables are instrumented in column (6)[39]. Although tempting, it is difficult to establish a clear link between the poverty reduction captured by the time dummy between 1860 and 1900 and particular institutional developments or other unmeasured processes correlated with the modernisation of the economy. As explained in the previous section, some steps towards an expansion of political rights were taken in the late 19th century. However, this period also witnessed some progress towards trade liberalisation beginning in 1869 but, in response to the grain invasion of the 1880s, protectionism was re-established with the 1891 tariff (Serrano 1987).

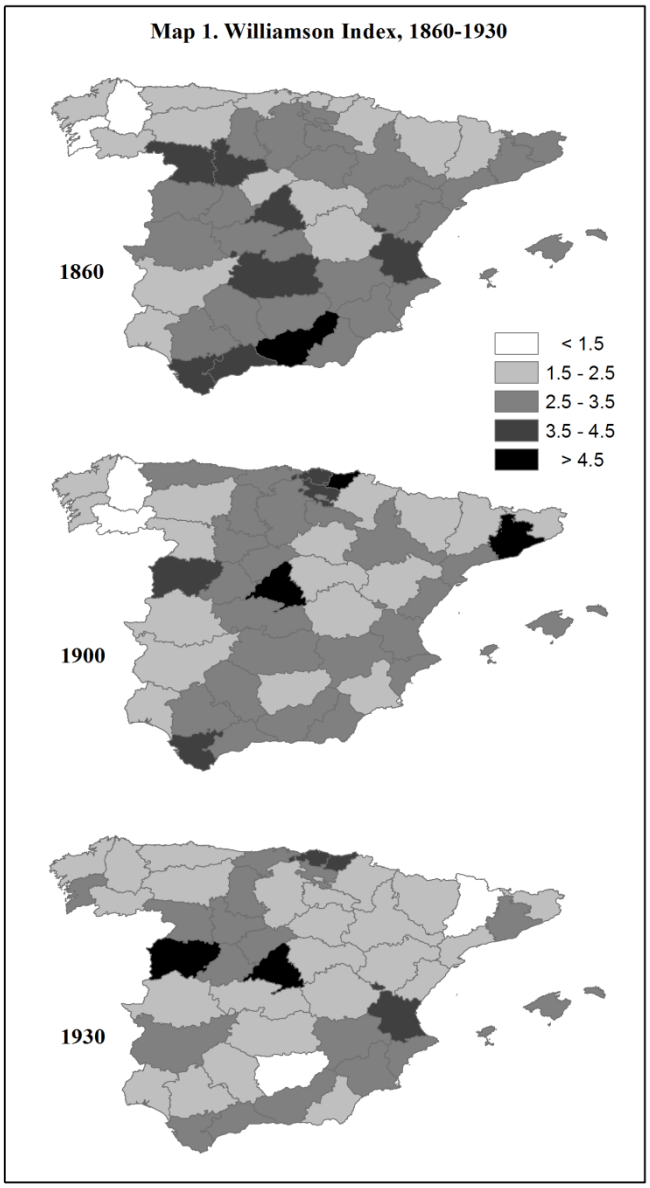
5. Conclusion

In a period where other potential indicators are lacking, the Williamson Index and the Poverty Ratio developed here enhance our knowledge about the evolution of Spanish inequality and poverty at the provincial level during the early stages of modern economic growth. Importantly, this study shows that country-level inequality hides significant differences at more disaggregated regional levels. The analysis also contributes to the debate on the causes behind inequality and poverty. On the one hand, while growing incomes appear to have fostered inequality (although at a decreasing rate), other processes associated with economic development, such as the rural exodus to urban and industrial centers, the demographic transition, the spread of literacy or the effect of extending political participation helped improving the relative standards of living of the lower classes. On the other hand, our results show that economic growth, at least during the early stages of economic development, was pro-poor. However, the analysis also shows that reducing inequality also contributed cutting poverty levels, so according to our results a combination of growth and distribution policies would be doubly beneficial for reducing poverty. Interestingly, other processes associated with

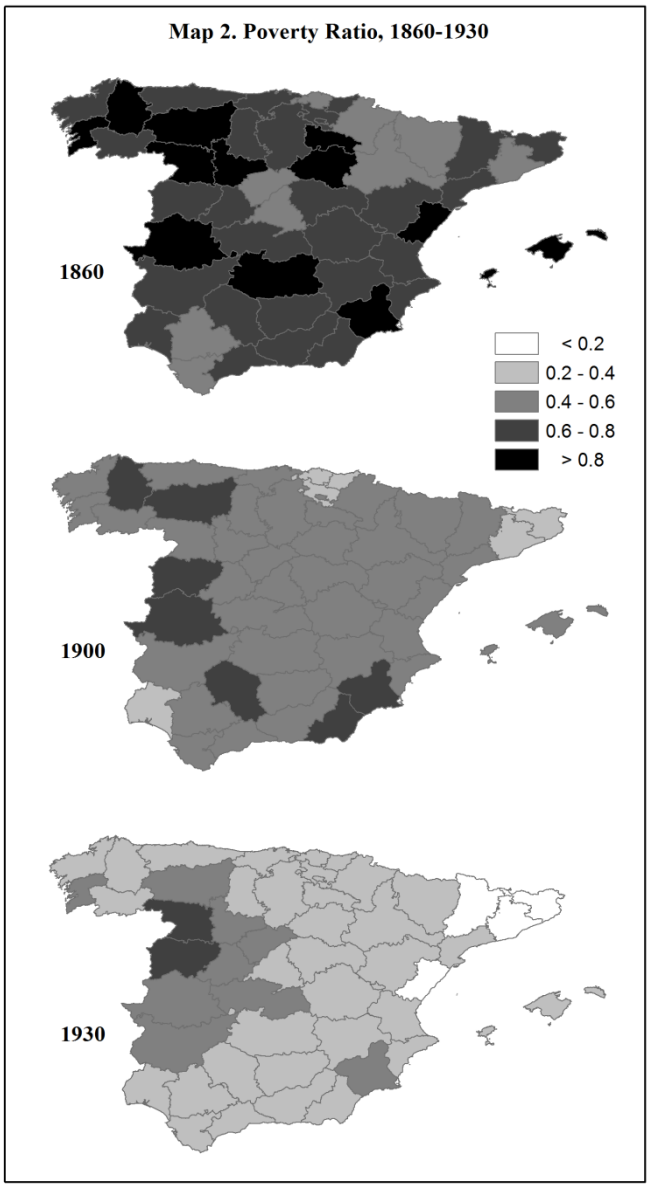
[38] This effect is also economically significant. According to table 3, between 1860 and 1900, the poverty ratio was reduced from 0.72 to 0.52, so the time dummy accounts for almost half of this change.
[39] Note that, due to the loss of one period when employing the IV approach, the reference year in column (6) is 1900 instead of 1860.

economic growth mentioned above, also contributed to reducing poverty via their effect on inequality. Therefore, the potential of economic growth to improve the lot of the bottom part of the population becomes conditional on its ability to expand the opportunities available to increasingly wider segments of the population.

Appendix I



Source: See text and Statistical Appendix.



Source: See text and Statistical Appendix.

Statistical Appendix

GDP and wages

Nominal GDP at factor costs for Spanish provinces (NUTS3) comes from the database used in Rosés *et al* (2010). In order to express it in per capita terms, *total population by province* has been compiled from the respective Censuses of Population (1860, 1900, 1910, 1920 and 1930).

Nominal unskilled wages correspond to agricultural wages by province. By construction, the Williamson Index heavily relies on wages and thus we attempt to capture the unskilled provincial wages in each benchmark year by considering as much information as possible. For that reason we often compute averages of agricultural wages for different years when available. This way of proceeding allows correcting volatile values in some provinces in a particular year. Agricultural nominal wages are drawn from two sources. For 1860, data come from Sánchez-Alonso (1995, 302-303). Wages are referred to the years 1849-1856, and are collected from the information provided by Moral Ruiz (1979) and García Sanz (1980). For 1900-1930, the source used is Bringas (2000, 178-183) who offers data of average agrarian daily male wages (*Jornales medios diarios masculinos en pesetas*). For 1900, we take the simple average of the three closest years with information available (1890, 1897 and 1910). The lacking data in 1890 is filled using the wages of the neighbouring provinces (Vizcaya); for the Canary Islands we take the wages of 1897. For 1910, we consider the wages available for that year. The closest information to that year is that of 1914 being the wages virtually the same. For 1920 and 1930, we use the simple average of the years 1919-1921 and 1929-1931, respectively. The missing values for wages in some provinces are obtained computing them as the simple average of the neighbouring provinces.

Employment and hours worked

Total male active population by province has been compiled from the respective Censuses of Population (1860, 1900, 1910, 1920 and 1930). Due to the lack of consistency regarding the registration of female agrarian population in the period analysed (Erdozáin and Mikelarena, 1999; Nicolau, 2005), we have only considered the male agrarian population in the calculation of the total active population, a usual procedure both in the Spanish as well as the international historical literature (Van Zanden 1991; O'Brien and Prados de la Escosura 1992; Prados de la Escosura 2008). However, the first Census of Population in this study does not disaggregate agrarian population between male and female actives. The male agrarian workers in 1860 are thus obtained by applying the percentage of the total male agrarian population over total active male population in each province in the closest Census, that of 1877, offered by Erdozáin and Mikelarena (1999). As a robustness test four our results, we have also computed total agrarian population including both males and females, and, considering only agrarian males, adding a fixed proportion of one third for female agrarian

workforce (Prados de la Escosura 2008, 322; Prados de la Escosura and Rosés 2009, 1074)[40].

For the *number of days* worked throughout the year, we consider, following Prados de la Escosura (2008, 322), that each full-time worker was employed 270 days per annum. To obtain the daily *hours worked*, we take a value of ten hours per day for the manufacturing sector. In the case of the agrarian sector, the same amount of hours is considered. As Prados de la Escosura (2008, 322) states, "[f]or mid-nineteenth-century agriculture, Caballero (1864) pointed to 10 hours per day while a similar average figure, 9.7 hours, was found in the mid-1950s".

Subsistence level

The *subsistence level* employed in the construction of the poverty ratio is based, following Milanovic *et al* (2007, 15-16), on the assumption of a subsistence minimum of $PPP 300 per capita a year at 1990 prices. This level has been converted into nominal pesetas comparing, for the different years, the figures on Spanish GDP per capita in Maddison (2003) and Rosés *et al* (2010). Then, this subsistence level per capita is transformed into subsistence wages by multiplying it by population and dividing it by the labour force and expressed in hourly terms assuming, as above, 270 working days and 10 hours a day.

Regression variables

Real GDP has been obtained from the five-sector disaggregation of provincial GDP in Rosés *et al* (2010) and the deflators at the national level for those sectors provided in Prados de la Escosura (2003). Urbanisation rates (*urbanisation*), measured as the percentage of population living in municipalities bigger than 5.000 inhabitants, are taken from Reher (1994) and Tafunell (2005). The variable *industrialisation* is computed as the ratio between the industry GVA and the nominal GDP (Rosés *et al* 2010). *Agrarian population*, which corresponds to the percentage of the population enrolled in agricultural activities over the total active population in each province, is compiled from the Censuses of Population. In addition, the underlying geographical data for the calculation of the *population density* (population by square km) in each province are compiled from the Censuses of Population and INE. *Fertility rates* come from Livi-Bacci (1988). Given the lack of data for 1860, the figures of 1887 are considered instead, thus assuming that fertility rates hardly changed between these two years. The information about *literacy*, calculated as the percentage of the total population over 10 years who was able to read and write, is offered by Núñez (1992). Lastly, the stock of common lands is measured as a fraction over the total provincial area using data from GEHR (1994), Artiaga and Balboa (1992) and Gallego (2007).

[40] In this sense, 'since female EAP figures for agriculture are inconsistent across censuses, women in agriculture were assumed to allocate their time in a way that made female labor a fixed fraction of male labor in the agricultural sector' (Prados de la Escosura and Rosés 2009, 1074).

Unfortunately, there is no information for the three provinces in the Basque Country. Given that no data exist for 1910 and 1920, linear interpolation has been employed instead.

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