Labour market response to Globalisation: Spain, 1880-1913

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Abstract

This paper analyses the impact of globalisation (trade and migration) on the Spanish labour market between 1880 and 1913 by examining the influence that globalisation factors had on agricultural and industrial wages. Our results show that the nineteenth century grain invasion had a negative impact on agricultural wages, whereas the fall in wheat prices did not benefit industry workers. We also found that migration pushed up real agricultural and industrial wages although only in the case of industrial wages did migration outweigh the effect of trade. As agriculture was the main sector in the economy the final impact was a wage decrease. The negative impact of trade on agricultural and industrial labour markets partly explains the trade policy response of “integral protection”. However, migration policy was not used to promote migration, which would have been an effective policy to improve living standards.

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1. Introduction

In this paper we aim to analyse how the two globalisation factors, trade and migration, affected the Spanish labour market in 1880-1913. There are only a few studies that have jointly considered the impact of trade and migration on the labour market. O’Rourke and Williamson (1999) analysed the impact of globalisation on real wages and per capita income convergence for a sample of Old World and New World countries, but they concentrated mainly on the migration effect. In another related study, O’Rourke (1997) quantified the impact of trade, the grain invasion, in Europe (mainly in Britain, France and Sweden) and obtained a different impact on the labour market depending on the importance of the agriculture sector in the economy and, therefore, the economic policy response to globalisation also differed. Moreover, trade and migration could be related. One of the consequences of the Heckscher-Ohlin (H-O) model is that trade and migration are substitutes: with trade restrictions the incentives for labour to move increase but without labour mobility, labour endowments are incentives for trade. According to O’Rourke and Williamson (1999) the experience of the Atlantic economy 1870-1940 shows that trade and migration were often complements, contrary to H-O model implications.

Finally, other variables also affect the labour market, such as internal migration. Precisely, there is nowadays a debate about the labour market impact of immigration. For example, for the USA Borjas (2004) obtains that the differences in the labour market outcome of many studies are due to the adjustments on the labour market from the native labour workers, because the native internal migration response is sufficiently strong to attenuate the measured impact of immigration on wages in a local labour market. However, Card (2005) considers that native mobility (internal migration) and H-O
mechanisms of industrial adjustment as a response to external migration are relatively unimportant in the USA.

What studies are there about Spain? As Spain did not participate in the globalisation process to the same extent as other European countries, there is a great deal of Spanish literature about the consequences of protection as a reaction to the grain invasion. O’Rourke and Williamson (1999), despite including Spain, concentrated mainly on migration and in the Atlantic core economies. Sánchez Alonso (2000 a, b), who has studied the causes of Spanish emigration, obtained a relationship between emigration and protection policy considering trade and migration as substitutes: protection policy produced a reduction in trade (wheat good flows) and an increase in labour factor mobility, a different result to that obtained by O’Rourke and Williamson.

However, the impact of trade and migration on the Spanish labour market has not been measured and we are going to analyse their influence jointly because we are interested in measuring the impact of globalization and moreover there could be an adjustment between these two factors that affected the labour market outcome. Furthermore, we are also going to take into account other variables that influence the labour market, such as internal migration and other changes in the labour force.

To analyse the impact of trade on the Spanish labour market, we concentrate on the impact of the grain invasion that took place at the end of the nineteenth century on wages. It was mainly a wheat invasion, which was sparked by massive imports from New World countries to Europe. The grain entry had income distributional consequences. In the agricultural sector, the grain invasion had a negative effect on land, capital and labour by decreasing rents, profits and wages. In the industrial sector, as we will explain later on, the effect of the grain invasion is less clear, because it may have increased profits and wages due to the cost of living effect derived from the fall in wheat prices, but could also
have decreased industrial demand as a consequence of the reduction in agricultural income reducing profits and wages. In this paper we are interested in quantifying these effects on agricultural and industrial wages.

As a less integrated country the impact of the grain invasion was felt later in Spain than in other countries, in the 1880s. The negative consequences of the slump in cereal prices led to several reactions. Firstly, farmers tried to reduce production costs by changing cultivation methods. Secondly, they diversified to specialise in products less affected by the crisis, such as vineyards, olives, beet, fruits, vegetables or other products derived from cattle such as milk, cheese or meat. Finally, the main reaction to the crisis was an increase in protection. From 1869 Spain had a liberalising policy in relation to 1849. As a result there was an increase in imports; in fact, around 1890 the openness rate in Spain had risen to 30 per cent in comparison to previous levels of 10 per cent in the mid nineteenth century and 7 per cent in the 1820s (Gallego 2001, p.156). However, protection increased in the 1880s and 1890s, especially with the 1891 tariff. This protective policy reduced the impact of the entry of cheap grain and pushed up agricultural prices. The fall in wheat prices was around 20.25%, whereas in other European countries it was between 22% and 35%, the difference being protection.

What were the main consequences of this increase in tariffs? As said before, there is debate about the impact of protection on Spanish agriculture. Some historians consider tariff policy to be an important explanatory factor of the underdevelopment of Spanish agriculture, particularly the high level of tariffs and other interventionist measures that impeded competition and discouraged the introduction of new techniques thus producing low agricultural productivity (Tortella 1994, Palafox 1991, Carreras and Tafunell 2004). However, other historians (Jimenez Blanco 1986, Gallego 2001 and Garrabou 2001) do not believe tariff policy was the cause of agricultural problems. They affirm that tariff
policy was adapting to the changing conditions, it was highly flexible and not very
different to the agricultural policy followed by other European countries. Moreover, it
avoided an important trade balance deficit (Gallego and Pinilla 1996 and Garrabou 2001).
From these interpretations of the impact of protection on Spanish agriculture they obtain
some implications about the impact of protection on wages and living standards. The first
mentioned historians consider high wheat prices a result of protection that reduced
purchasing power and thus the demand for industrial goods. However, Gallego and Pinilla
(1996) and Garrabou (2001) said that tariff protection softened the effects of the
agricultural crisis in terms of employment and wages, reducing the decrease in the
demand for industrial goods. Although these works mentioned the impact of protection on
wages and living standards, they do not measure it.

With respect to the other globalisation factor, external migration, Spain was a
latecomer in terms of migration and emigration rates were not relevant until the beginning
of the twentieth century. Despite Spain having significant emigration rates in the 1900s
(around 7 per thousand inhabitants), they were still clearly below the Italian rates (around
10.8 per thousand inhabitants in this period). According to Sánchez Alonso (1995) the
main reasons for emigration rates increasing later and less included the low level of
income in the Spanish economy (which meant people could not afford to emigrate) and
the exchange rate (that made it more expensive to emigrate).

We therefore seek to answer several questions. Firstly, we aim to calculate how
negative the impact of the wheat invasion was on agricultural wages. Secondly, we
analyse the effect of wheat prices (through an increase in purchasing power) on industrial
wages. Did industrial workers benefit from the wheat price decrease that took place at the
end of the nineteenth century? Lower agrarian prices imply a higher purchasing power of
industrial goods (“cost of living effect”), but lower agrarian prices have a negative effect
on agrarian income (wages, rents and profits) and could have a negative effect on the demand for industrial goods (“demand effect”). Which of these two effects (“cost of living” or “demand effect”) had a predominant impact on real industrial wages? Finally we will study how external migration affected agricultural and industrial wages by considering how internal migration could adjust the labour market. What most contributed to increasing living standards: trade or migration?

To analyse the impact of trade and migration on the Spanish labour market, the agricultural and industrial sectors are considered separately. Firstly, because of the different influence that trade and migration had on agricultural and industrial wages. Obviously the impact of trade was more important in agriculture. Migration could have different effects in the two sectors. Internal migration consisted of people mainly moving from agriculture to industry, while external migration came mainly from the agricultural sector. Secondly, there is a lack of labour market integration between 1880 and 1913. The labour market was integrating during the period, but in the 1930s there were important regional differences. Although Rosés and Sánchez-Alonso (2004) show that from the middle of the nineteenth century until 1930 there was a process of regional market integration, at the beginning of the 1930s regional differences in terms of wages among regions were significant.

We follow a regional approach in order to capture how different regions responded to globalisation factors. On the one hand, we adopt a regional approach to analyse the impact of wheat prices on agricultural wages. Although Spain was a wheat producing country, not all regions were equally specialised in this product. While Castille, for example, was mainly a wheat producing location, other regions were more diversified, such as Catalonia in vineyards, Valencia in fruit or Asturias and the Basque country in cattle. Moreover, the impact of migration was not the same across the country. Regional
analysis shows that Galicia, Cantabria and Asturias were in the group of regions with the highest emigration rates in contrast to Extremadura and Andalusia with the lowest. Moreover, internal and external migration had different regional patterns. External migration was more relevant in Northern Spain, while internal migration was mainly bound for Barcelona and Madrid. On the other hand, industrial wage data were not available at national level, which led us to take a regional approach considering only three regions which represented important economic centres and for which reliable wage data were available: Madrid, Barcelona and Biscay. These three regions had an industrial labour force above the Spanish average (23%, 35% and 42% respectively and the average 16% in 1900), Barcelona and Biscay being the most industrial centers and Madrid the largest service center (35% and the average 11%) in Spain.

The structure of the paper is as follows. In Section 2 we carry out a critical analysis of the main data on the Spanish labour market, particularly agricultural and industrial wages, and we document the pattern of the main globalization factors: trade and migration. How we are going to study the impact of globalisation on the Spanish labour market is explained in Section 3 and in Section 4 we show the main results obtained. The main conclusions are summarised in the final section.

2. Data

2.1. Wage data

The main problem we have is to find a reliable and representative wage data base. Official statistics begin in 1914 and before that sources were heterogeneous. Hence, we comment on how valid they are for the period studied. We are going to explain the different sources and their possibility of being used in this research.
2.1.1. Agricultural wages

We do not have a time series for the period. Bringas (2000) constructed a series on a national and regional (provinces) level for some of the years of the period: 1870, 1881, 1883, 1887, 1890, 1893, 1894, 1895, 1897, 1904, 1905, 1908, 1910 and 1914; but they come from different sources\(^2\). Moreover, the national series is constructed as a weighted-by-labour-force average of wages from different regions and there are years for which we lack data for important regions or provinces. For example the Galician and Castilian provinces, which are relevant in our analysis because Galicia was labour sending and Castilla was a grain producer.

We have selected the following years: 1887, 1890, 1897 and 1910 for several reasons. First, we have data for almost all the regions (except for three provinces in 1887, two provinces in 1890 and one province in 1910). Second, after checking the regional pattern for all the data available, these years are also the most reliable. Finally, the years selected coincide with those from official sources such as Comisión encargada de estudiar la crisis agraria y pecuaria (1887), Avances estadísticos from the Dirección General de Agricultura (1890), the data from Estadística de Emigración (1897) and the year 1910 has a similar pattern to the year 1914 belonging to Estadísticas de Salarios (1914-1930). For all these reasons, we have used these four years of the period and the regional analysis to study the impact of globalisation on agriculture. These data are wages paid for the tasks related to cereal crops.

Figure 1 shows Bringas’ agrarian wage series commented for the entire period. Due to their being many kinds of agriculture in Spain (Simpson, 1995) specialized in

\(^2\) Using regional data, Garrabou and Tello (2002) constructed two wage series for Inland Catalonia and Coastal Catalonia. They involved wages for labourers who worked in non-specialized tasks in cereals, viticulture (vine growing) and olive growing and are from the private accounts of properties and other sources where there are no payments in kind.
different products, Figure 1 also displays agrarian wages for different locations that were more specialized in wheat (Valladolid), vineyards (Barcelona), olives (Seville) and fruit (Valencia). We were able to see how different the regional wage pattern was in relation to the national average. The agricultural crisis had different regional impacts depending on agrarian specialization and, for example in Barcelona, which was more specialized in vineyards than the average, the impact of the wheat crisis was lower. However, this region was later affected by a phylloxera plague that hit Spanish agriculture in 1891. Moreover, as said previously, emigration also followed different regional patterns; the sending regions were the Northern regions (Asturias, Galicia, Basque Country, and North Castille). As a result, the regional viewpoint matters when analyzing the impact of globalization.

2.1.2. Industrial wages

There are no time series at national and regional level for the period under analysis (1880-1913). There are only data at firm level or for public or private institutions. We have wages for a Catalan textile firm from Barcelona, *La España Industrial*\(^3\) (Camps 1995), for a building labourer at the Madrid city council (Reher and Ballesteros 1993) and for the Mines of Biscay (Carreras and Tafunell 2005)\(^4\). Thus, we are going to consider them as representative of the different regions: Barcelona, Madrid and Biscay. We can see the pattern of nominal and real wages for these series in Figure 2 and Figure 3. Real wages are deflated by local consumer price indexes (CPI). We used Maluquers’ CPI based on Barcelona prices (Maluquer 2007) to deflate Barcelona and Biscay wages\(^5\) and Reher and Ballesteros’ CPI based on Madrid prices (Reher and Ballesteros, 1993) to

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\(^3\) *La España Industrial* was one of the biggest textile firms in Spain and supplied all Spanish regions.

\(^4\) There are also wage series for building labourers from a hospital in Palencia (Moreno Lázaro, 2006), but we are not going to include them in this research because Palencia is a small city and the pattern of the series is different to the others. This pattern must have been affected by specific local shocks.

\(^5\) In the case of Biscay, we did not use a local CPI because the available index (Pérez Castroviejo 1992) only considers food prices, which meant it was not possible to compare wheat and industrial prices. However the Maluquer index is considered a proxy of the national CPI.
deflate Madrid wages. Nominal wages remain stable in Madrid until 1904 and varied little in Barcelona and Biscay. We can observe in Figure 3 that real wages fall in Catalonia and Biscay during the grain invasion, while in Madrid real industrial wages decreased from 1877 to 1883 to later rise from 1883 to 1891. However, in the twentieth century real wages increased in all regions, especially in Madrid. Therefore, we will study the impact of globalization (trade and migration) in these three regions as representatives of three important economic centres in Spain.

2.2. Globalisation factors: trade and migration

We use wheat prices to capture the influence of trade (see data appendix). National wheat prices (Figure 4) generally displayed a downward trend from 1882 to 1889 as a consequence of the wheat entry. After 1889 wheat prices recovered, but in 1892 prices decreased again for the next two years. Prices rose in 1896 and 1897, but from 1898 to 1904 there was a fall in wheat prices with a recovery from 1906 to 1913. With respect to regional prices, we observe different regional patterns in Figure 5. If we consider the evolution of regional prices in Valladolid (a wheat producing region), Madrid (in the Meseta region near the wheat producing centres), Barcelona (a region less specialised in wheat production) and Biscay (a mining region) we observe that in the wheat producing regions such as Valladolid, prices were (as expected) below average, but in Barcelona and Biscay, two regions less specialised in wheat, prices were above average for the regions as a whole. The wheat market seems quite integrated most of the period. The trend in prices is very similar in the provinces under consideration, although we can observe differences between Barcelona and the other regions in some periods, especially

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6 In 1906 another protection tariff was applied.
the fact that the wheat price fall had a lesser impact in Barcelona than in other regions in the eighties and from 1900 to 1907.

As regards migration, different sources have been used. Mikelarena (1993) provides data on total regional migration. Mikalerena estimates total migration by means of the intercensal method. He estimates the difference between real census population growth and a projection estimated using the natural increase (births and deaths), the difference being due to migration (see data appendix). According to these migration data, the two main receiving regions were Madrid and Barcelona. The regions with the highest migration rates were Castille and Leon (Avila, Burgos, Leon, Palencia, Salamanca, etc) and Galicia (Coruña, Lugo and Orense). However, this method of estimating total migration has two main problems: firstly, it includes both internal and external migration and secondly, it cannot be used to assess the direction of flows. To separate internal and external migration we are also going to make use of the data on internal migration from Silvestre (2003). Silvestre (2003) offers an estimation of internal migration by considering the changes in the population that is born abroad to approximate the flow of migrants in a region. Although the main problem with this estimate is that it does not take into account the departure of the native population to other regions, this is the method that migration studies typically use. Internal migration had two features. First, the low rates recorded over the period under study (1880-1913) and second, the concentration of immigration in very few destinations (mainly Madrid and Barcelona) (Silvestre 2005).

With respect to external migration, national data are from Sánchez Alonso (1995) and we have obtained regional external migration data for the three economic centres (Madrid, Barcelona and Biscay) from the Estadística de la Emigracion e Inmigración de España. As explained in the data appendix, we do not have data for all the years. As a result, we carried out some interpolations using the national emigration rate for the years
for which we lacked data.

3. The impact of globalisation on labour market

As explained previously, the aim of this paper is to analyse how the Spanish labour market responded to globalisation over the period 1880-1913. We are interested in studying how complex the transmission of globalisation shocks was to the agricultural and emerging industrial sector. To do so, we are going to estimate agriculture and industrial wage functions based on a version of the Todaro model by Hatton and Williamson (1992)\textsuperscript{7}. The research by Hatton and Williamson focuses on rural-urban wage differentials to explain labour market integration, whereas we are interested in capturing the influence of each globalisation factor (trade and emigration) on wages.

This model considers a dual economy: the agricultural sector, which is the most important sector in the economy, and an incipient industrial sector, where there is surplus labour in agriculture and there is rural emigration to industrial regions. As a result, this model can capture the impact of internal migration on wages. We also consider external migration which was more important than internal migration during this period.

Following Hatton and Williamson (1992) agricultural wage change ($\Delta w_a$) depends on:

$$\Delta \log w_a = \Delta \log P_a + \frac{1}{\alpha} M + \frac{(r - n_a)}{\alpha}$$

\textsuperscript{7} The Todaro model analyses the process of rural-urban migration and has been used especially to analyse it in contemporary less developed countries (Todaro 1980, Fields 1979 or De Brauw, Taylor and Rozelle 2000). However, simplified versions of this model have also been used to study internal migration processes and the rural-urban wage gap (Hatton and Williamson 1991, Boyer and Hatton 1997, or Borodkin and Scott Leonard 2000).
wheat prices, $\Delta \log P_a$ (change in agricultural prices), migration, “$M_T$” is total migration\(^8\), which is the sum of internal ($M_I$) and external ($M_E$) migration and the combined effects of capital accumulation and technological change, “$r$” and the natural increase ($n_a$).

This equation shows that the changes in agricultural wages ($\Delta \log w_a$) will depend on shifts in agriculture prices (wheat prices) and migration respectively. Through “$P_a$” we will capture the influence of trade and through “$M_T$” the impact of migration. Demographic growth and technological change are considered in the residual. We can see the impact of wheat prices and migration on agriculture wages in Figure 6. As a consequence of the wheat invasion there was an increase in wheat supply and subsequently wheat prices dropped significantly. When there is a decrease in prices, agriculture production is less profitable and, therefore, the demand for agricultural workers decreases (from $L_d^{a0}$ to $L_d^{a1}$) and their wages too (from $w_a^0$ to $w_a^1$). The impact of trade will also depend on the level of protection in the economy: a higher level of protection will imply a lower decrease in wheat prices than in an open economy and therefore the decrease in agricultural labour demand would be smaller.

With respect to migration, an increase (to other regions or to other countries) implies a decrease in total labour supply (from $L_s^{a0}$ to $L_s^{a1}$) and wages would rise (from $w_o^a$ to $w_2^a$). The final effect on wages will depend on the magnitude of the changes: agricultural wages only increase if migration offsets the negative effect of prices.

After estimating an agricultural wage function, we are going to consider the main determinants of industrial wages\(^9\). We estimate the following equation for real industrial wages:

\(^8\) We have substituted $M_T$ for $M_I$ in the Hatton and Williamson (1992) model because as explained we are interested in including external migration.
\(^9\) Although Hatton and Williamson (1992) do not estimate an industrial wages function we can capture from their model the main determinants of industrial wages.
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\log\left(\frac{w_i}{p_i}\right) = b + \gamma_0 \log\left(\frac{p_a}{p_i}\right) + \gamma_1 \log\left(\frac{w_a}{p_a}\right) + \gamma_2 M_L + \gamma_3 M_E + \gamma_4 \log L + \mu
\]

Real industrial wages \(\frac{w_i}{p_i}\) will depend on real agricultural prices \(\frac{p_a}{p_i}\), real agrarian wages \(\frac{w_a}{p_a}\), internal migration \(M_L\), external migration \(M_E\) and labour supply \(L\).

In Figure 7 we can observe three effects related to the impact of the grain invasion. Firstly, a reduction in agricultural prices produces an increase in purchasing power ("cost of living effect") and in turn the demand for industrial goods rises, the demand for industrial workers goes up and industrial wages increase. Secondly, when agricultural prices decrease, agrarian income (wages, rents and profits) would also fall and the demand for industrial goods would be reduced ("demand effect"), hence decreasing industrial labour demand. The final effect on industrial wages would depend on the magnitude of the "cost of living" and "demand" effects. In Figure 7 we assume that the "cost of living effect" offsets the "demand effect" and the demand for industrial workers rises (from \(L_{d0i}\) to \(L_{di1}\)) and wages too (from \(w_{oi}\) to \(w_{i1}\)). This is one of the questions we are going to test in the next section. Thirdly, the fall in agricultural labour demand as a consequence of the grain invasion reduced real agrarian wages, thus the demand for industrial goods goes down and industrial wages decrease.

As regards migration, an increase in internal migration from rural to industrial centres would increase the supply of industrial workers (from \(L_{s0i}\) to \(L_{si1}\)) in urban areas and wages would decrease (from \(w_{0i}\) to \(w_{2i}\)). When external emigration goes up, the supply of industrial workers falls and then industrial wages climb. Finally, we are going to consider some variables linked to the labour supply, in particular a 15-year lagged natural increase rate, which measures when the increase in population has an effect on the labour market, and the share of the labour force in total population, as a proxy of the
proportion of native labour force. An increase (decrease) in the labour force (L) will increase (decrease) labour supply and decrease (increase) real industrial wages.

4. The impact of globalisation on the Spanish labour market: main results

The agriculture labour market:

In order to estimate the agricultural wage equation we have used a balanced panel data set of agricultural wages for all 48 Spanish provinces (regions) for the three periods obtained with the four years of the sample: 1887-1890, 1890-1897, and 1897-1910. The dependent variable is the change in agricultural wages and the independent variables are change in wheat prices with different lags and the total immigration rate, which includes both internal and external migration. We have considered total migration because there is no data on regional external migration for all of the years. Moreover, in the agricultural sector internal and external migrants affected the labour market in the same direction; people mainly went from the agriculture sector to industrial centres or abroad, thus reducing labour supply. The results of the estimation are in Table 1. We estimated the equation with and without fixed effects. In regression 1 we found the expected signs and significance for both variables when including the change in wheat prices lagged two years. The change in wheat prices has a positive effect on the change in agricultural wages, that is, when wheat prices fall (raise) agricultural production is less (more) profitable, agricultural labour demand falls (raises) and agricultural wages fall (raise) too. Total immigration had a negative impact on agricultural wage change, thus an increase in emigration decreases labour supply and increases agricultural wages. We can observe in Table 1 that these results hold with fixed effects but both variables have a greater impact. We also show in regression 4 of Table 1 that the wheat price variable without lags is only significant when the region dummies and the dummy period of 1890-1897 are included.
In this last case, the change with regard to regression 3 is the reduction in the coefficient of wheat prices, because the immigration coefficient is held. Therefore, the impact of wheat prices would be lower but it would still be superior to the impact of immigration.

In Table 2 we present the contribution of each variable to the change in agricultural wages for the three periods. We observe that with the exception of the first period, the most significant impact was the change in wheat prices. Emigration always increased agricultural wages, having a larger effect in the last period due to the highest emigration rate being recorded in 1897-1910. Wheat prices lagged two years decreased in the two first periods, 1887-1890 and 1890-1897, that is, they reduced agricultural wages while, as immigration was negative, emigration always increased agricultural wages. But emigration was unable to offset the agriculture terms of the trade effect, thus agricultural wages remained lower. However, in the third period, 1897-1910, as wheat prices rose, trade and migration increased agricultural wages.

In short, we found that wheat prices had a higher impact on agricultural wages than emigration. Therefore, we are going to see what the impact of these two variables was on the industrial labour market so as to analyse what the final impact on the labour market was.

The industrial labour market:

In order to estimate the industrial wage equation we used the time series data of wages for a building labourer in Madrid (from the City council), for the textile sector in Barcelona (from a textile firm) and for the iron mines in Biscay. We estimated the real industrial wage equation with a balanced panel for these three regions and for the period dating from 1880 to 1913 and we have estimated this equation separately for each region. The dependent variable is real industrial wages and the independent variables are real
wheat prices, real national agricultural wages, the internal immigration rate, the external emigration rate and the variables linked to the labour supply (see data appendix for variable definitions and construction). In the case of real industrial wage estimates we have considered internal and external migration separately for two reasons. Firstly, although we do not have data on external migration for all the years, as we have only three regions, for those years we do not have data for, they have been interpolated by assuming that regional data followed the same trend as the national rate. The distortions derived from interpolations are less significant than in the agricultural panel where we included all 48 regions. Secondly, internal and external migration had a different effect on the industrial sector. Internal migration increased labour supply and external migration reduced it.

With the first variable, real wheat prices, we measure the impact of agricultural terms of trade on real industrial wages. As explained before, we would expect industrial workers to experience an increase (decrease) in their purchasing power if wheat prices are reduced (increased) and as a result, we would expect an increase (decrease) in the demand for industrial goods and thus a rise (fall) in industrial labour demand and in real industrial wages (“cost of living effect”). However, if the agriculture sector is sizable, the purchasing power effect could be offset by a reduction in agriculture demand for industrial goods and consequently the sign of the coefficient could be the opposite, positive instead of negative (“demand effect”).

We use real agricultural wages to measure the demand for industrial goods from workers in the agricultural sector. We considered real national agricultural wages because the demand for industrial goods came from the entire country, for example, industrial demand from the agricultural sector would affect the demand for textile goods in Catalonia, which is the region specialized in textile production. As we have no national
agricultural wages for the entire period we were forced to interpolate them using the agricultural wages from inland Catalonia (from Garrabou and Tello, 2002) which are more similar to wheat producing regions.

Regarding internal migration, we used two variables in our estimates. The first is constructed from Mikelarena’s data: as we have external net emigration data, we obtained internal immigration as the difference between total and external immigration ($M_I = M_T + M_E$). The second is the migration data from Silvestre (2003). With respect to external migration, we used an estimation of net emigration (see data appendix). Regarding the labour force, we considered two variables: a 15-year lagged natural increase rate and the labour force share of total population. The expected signs of the variables are as follows. An increase in internal immigration reduces real industrial wages due to the increase in labour supply. An increase in external emigration increases real industrial wages due to the reduction in labour supply. Likewise, an increase (decrease) in the labour force decreases (increases) real industrial wages.

The results for the pool are presented in Table 4. We estimated the balanced panel for the three regions with and without fixed effects. We obtained the same results using the two variables considered for internal migration, as we can see with the data calculated from Mikelarena (1993) in regression 1 and with Silvestre’s data in regression 2, the only change is the coefficient of the internal immigration rate. The problem we have is that Mikelarena’s data show a larger jump from 1901 in the evolution of internal immigration than in Silvestre’s data and this jump alters the results obtained in the regional regressions. For this reason, we preferred to use the immigration data from Silvestre.

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10 We have estimated the equation in levels and in differences but we present the results in levels because although the signs of the variables are the same, the levels of significance of internal and external migration are lower in differences than in levels.
In regression 2 in Table 4 we have the panel without fixed effects and we found that all the variables were significant. However, the sign of the real wheat price variable is positive, which means that the effect of wheat prices on agriculture income (wages, profits and rents) or the “demand effect” was more important than the purchasing power effect for industrial workers or “cost of living effect”. A fall (rise) in wheat prices produces a decrease (increase) in agriculture income reducing (increasing) the demand for industrial goods and industrial labour demand. Therefore, as the agricultural labour force was the largest (66%), the effect of the reduction in industrial labour demand due to the reduction of agriculture demand for industrial goods outweighed the effect of the increase in purchasing power for industrial workers which positively affected real industrial wages.

Agriculture demand for industrial goods from agricultural workers has a positive effect. The increase (decrease) in agricultural wages increased (decreased) the demand for industrial goods and thus industrial labour demand and real industrial wages. Regarding migration, we obtained the expected negative and positive signs respectively for internal and external migration. While the labour force displayed a negative sign and is significant, the 15-year lagged natural increase rate has the expected sign (with fixed effects) but is not significant. In tables 4 and 5 we present the results for the labour force (L).

All these signs are maintained with the inclusion of the region and period dummies (see regressions 3 and 4 in Table 4). But with fixed effects, the coefficients are lower for all the variables. For example the coefficient of wheat prices is 0.52 in the first, but only 0.22 in the second.

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11 We also tested agrarian demand for industrial goods with agrarian productivity and agrarian wages from inland Catalonia. However, while the coefficients of these variables have the correct sign, they are not significant.
If we compare these results to those obtained for agricultural wages, we can see by comparing Tables 2 and 4 that wheat prices had a greater impact on agricultural wages than on industrial wages. However, the impact of internal and external migration was greater on industrial wages.

Table 5 presents the results of the time-series regressions for Madrid, Barcelona and Biscay. We present them with Silvestre's data for internal immigration as we have explained before. All the variables have the same signs, the only difference being that the coefficients are higher in Madrid than in the rest of regions and some of the variables are not significant in some regions. We can see that the sign of wheat prices is the same in all three regions, but the coefficient is higher in Madrid than in Barcelona and Biscay. In the case of agricultural wages, the impact was also greater in Madrid than in the rest, but in Biscay it was negative and not significant. One of the possible reasons for the grain invasion having a greater impact on Madrid is that wheat prices fell more than in the other industrial centers due to the location of Madrid in the Meseta, a cereal producing zone, and thus the demand effect was stronger than in the other two centers located on the coast and with more diversified agriculture. Furthermore, the impact of internal and external immigration was higher in Madrid than in Barcelona and Biscay, with internal immigration not being significant in Barcelona.

The contribution of change in each variable to change in real industrial wages is presented in Table 6 (calculated using the coefficients of fixed effects estimation). We can see that in the case of real industrial wages with respect to agricultural wages the impact of external emigration was greater than the impact of the agricultural sector, through both real wheat prices and agricultural wages. This happens in both of the periods considered. In 1880-1890, before the establishment of the trade tariff in 1891, wheat prices and agricultural wages decreased and reduced real industrial wages. However, the
positive effect of emigration offset these two effects producing an increase in real industrial wages. In the case of external emigration, there is great change over this period because the average emigration rate for the three regions recorded a large increase, which is attributed to Biscay. However, even when only considering Madrid and Barcelona, the same result is obtained: emigration offsets the agricultural effect.

In the period after the trade tariff, 1891-1913, wheat prices and agricultural wages increased and pushed up real industrial wages. However, while their contributions were higher than in the previous period, the emigration rate change was higher than both and thus both effects (agriculture and emigration) increased real industrial wages. The model predicts this last period much better than the first.

In short, in the case of real industrial wages, the emigration effect was more important than the agricultural effect (wheat prices and agricultural wages): in the first period by offsetting the reduction in real industrial wages due to the agricultural effect and in the second period by increasing, together with the agricultural effect, real industrial wages.

5. Conclusions

In this paper we examine the impact of globalisation factors (trade and migration) on the Spanish labour market and in particular their influence on agricultural and industrial wages. We aimed to answer to the following questions.

What was the impact of trade on wages? The fall in wheat prices as a consequence of the nineteenth century grain invasion had a negative impact on agricultural wages, as expected. However, this wheat price reduction did not benefit industrial workers. Our estimates show that the possible increase in purchasing power as a result of lower wheat prices was offset by the losses in terms of income that the agricultural sector suffered due
to the fall in wheat prices. In this sense, the “demand” effect was more important than the “cost of living” effect and the wheat price fall reduced industrial wages. This makes sense in countries where agriculture accounted for the largest share of the labour force (O’Rourke 1997) and supports the thesis that considers the importance of the impact of wheat prices on employment and wages. How did emigration affect wages? Migration increased wages in both agriculture and industry, although the impact was greater in the latter.

What was the contribution of each globalisation factor to wage change? In the agriculture sector, the impact of wheat prices on wage change was more important than the impact of migration. During the grain invasion, the fall in wheat prices reduced agricultural wages and migration was unable to offset this effect. As a result, agricultural wages decreased. After protection was imposed, wheat prices increased and agricultural wages followed suit. Therefore, both trade and migration increased agricultural wages.

In the industrial sector, migration made the largest contribution to industrial wages. During the grain invasion, although the impact of agricultural demand reduced industrial wages, migration outweighed the trade effect, which resulted in an increase in industrial wages. After protection, both the impact of trade and migration increased industrial wages. As agriculture was the most important sector (representing 66% of the labour force), the final effect during the grain invasion was that wages worsened. Our results are in line with those obtained by O’Rourke and Williamson (1999) for the European periphery: trade by low cheap grain contributed to wage divergence with respect to developed countries whereas migration acted as an important convergence factor.

Was policy effective in protecting labourers and improving living standards? What would have been the impact on living standards if policy had been different? Trade policy
raised agricultural wages by increasing protection and industrial wages also rose through the “demand effect”. Therefore, in an agrarian economy protection guarantees profits and maintains living standards. Our results allow us to understand Spain’s political response to the grain invasion: the main sectors of the economy, especially agriculture, textile, iron and steel industries reached an agreement to increase tariffs in 1891, which was called “integral protection”. However, protection also had a negative effect on resource allocation and reduced the incentive to increase productivity and this had a negative effect in economic growth and living standards in the long run.

The alternative to maintain living standards would have been higher emigration rates. However, Spain was a late emigration country because income restriction meant people could not afford the trip. Moreover, in terms of policy response, migration policy did not promote emigration and even tried to prohibit it in the 1880s. It was not until 1907 when the right to emigrate was declared, but without any kind of financial support. In any case, one of the possible reasons for the difference between trade (with a general agreement about protection) and migration policy was that protection benefited profits and also wages, whereas emigration benefited only wages because profits could be damaged by the effect of emigration increasing wages.
References


- (2005): “¿Fue/Es la globalización la causa de la desigualdad salarial?”, *Cuadernos Económicos del ICE*, 70, pp. 97-126.


*Estadística de la Emigracion e Inmigración de España, 1880-1914.*


Data Appendix

Agricultural Prices

Wheat prices: (unit: pesetas/100 kilograms)

National Prices:

1880- 1906 and 1913.

Regional Prices:

We used two sources to obtain regional wheat prices:

In the agrarian data set (regional panel): We estimated a panel for three periods: 1887-1890, 1890-1897 and 1897-1910 but for the last period we only have the changes in wheat prices between 1897 and 1907.

In the industrial data set (regional panel and time series for each region): as we only have data up to 1907, we have interpolated regional prices from 1907 to 1913 using Garrabou and Tello’s data on wheat prices for inland Catalonia. Garrabou R. and Tello E. (2002): “Salario como coste, salario como ingreso: el precio de los jornaleros agrícolas en la Cataluña contemporánea (1727-1930)”, in Martínez Carrión J.M. ed: El nivel de vida en la España rural, siglo XVIII y XIX. Alicante: Universidad de Alicante.

Relative prices

In the industrial data set we used the relative prices between wheat and industrial prices (or real wheat prices) using the Consumer Price Index (CPI) from Reher and Ballesteros (1993) for Madrid and from Maluquer, J.(2007) for Barcelona and Biscay (100 Base = 1913).

Migration:

Total Migration

Total migration rate: The total migration rate is total net immigration (internal and external) divided by total population (in thousands). We made use of an indirect estimation of total migration: intercensal migration.

Net intercensal migration: migration rates obtained by using the population of the first census and projecting this to the second census using birth and mortality rates. The

As Milelarena only offers the total immigration rates for intercensal periods (1878/1887, 1888/1900, 1901/1910, 1911/1920, 1921/1930), we estimated the annual migration rates by dividing the total annual migrants by the population in each year.

**External Migration:**

**Emigration rate:** The emigration rate is total net emigration divided by total population (in thousands).

For national emigration rates:


For regional emigration rates:

1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1897: *Estadística de la Emigración e Inmigración de España*. Dirección general del Instituto geográfico y estadístico.


For regional data (Madrid Barcelona and Biscay), we have total emigration rates from 1885 to 1895, 1897 and 1913 and net emigration rates for 1887-1893 and 1895. We have interpolated the rest of the years by assuming that regional data followed the same trend as national rates.

**Internal Migration:**

We used two alternative estimates:
- An indirect estimate from Mikelarena’s data: as Mikelarena provides total migration we calculated total annual migration rates and obtained internal migration by subtracting external migration.
- Silvestre J. (2003): *Migraciones interiores y mercado de trabajo en España, 1877-1936*. Zaragoza: Universidad de Zaragoza. Unpublished PhD Thesis. We would like to thank Javier Silvestre for offering us these unpublished data. Silvestre estimates internal migration and considers changes in the population that is foreign born to approximate the flow of migrants in a region.

**Wages**

**Agricultural wages** (National and Regional): (unit: pesetas a day)

**Industrial wages**: (regional data): (unit: 100 Base 1913)

**Catalonia**


**Madrid**


**Biscay**


We obtained real industrial wages for Barcelona and Biscay by deflating with the CPI in Maluquer, J. (2007) and for Madrid by deflating with the CPI in Reher and Ballesteros (1993).

**Labour force**

We obtained the labour force as percentage of the total population from the *Censos de Población* considering the population between 11 and 70 years old.

**15 years’ lagged natural increase rate**: the annual growth rate of the fifteen years lagged population from *Censos*. 

29
Figure 1. Nominal agricultural wages

Source: See Appendix
Figure 2. Nominal industrial wages

Note: 100 Base= 1913
Source: See Appendix
Figure 3. Real industrial wages

Note: 100 Base = 1913
Source: See Appendix
Figure 4. National wheat prices

Source: See Appendix
Figure 5. Regional wheat prices

Source: See Appendix
Figure 6. Determination of agricultural wages
Figure 7. Determination of industrial wages
Table 1. The impact on the agricultural labour market

Dependent variable: Change in nominal agricultural wages in logs (Δlog W_a)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.006</td>
<td>-0.018</td>
<td>-0.255</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(-1.62)</td>
<td>(-0.64)</td>
<td>(-0.92)</td>
<td>(-0.18)</td>
</tr>
<tr>
<td>Δ log P_a</td>
<td>0.419*</td>
<td>0.443*</td>
<td>0.624*</td>
<td>0.237**</td>
</tr>
<tr>
<td></td>
<td>(3.44)</td>
<td>(4.06)</td>
<td>(2.14)</td>
<td>(1.85)</td>
</tr>
<tr>
<td>M_T</td>
<td>-0.0016</td>
<td>-0.0035</td>
<td>-0.0038</td>
<td>-0.0034</td>
</tr>
<tr>
<td></td>
<td>(-2.54)</td>
<td>(-2.08)</td>
<td>(-1.87)</td>
<td>(-1.91)</td>
</tr>
<tr>
<td>Region dummies</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Period dummies</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes***</td>
</tr>
<tr>
<td>R^2 (centered)</td>
<td>0.084</td>
<td>0.263</td>
<td>0.273</td>
<td>0.224</td>
</tr>
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<td># Observations</td>
<td>144</td>
<td>144</td>
<td>144</td>
<td>144</td>
</tr>
</tbody>
</table>

Note: Pool OLS regressions of 48 regions (provinces) and three periods, 1887-1890, 1890-1897 and 1897-1910. Variables: Δlog W_a, annual growth rate of agricultural wages for each period, Δ log P_a, annual growth rate of wheat prices for each period, M_T, the average of the annual total immigration rate for each period. * lagged two years except in regression 4 ** without lags and *** with only one of the two period dummies, 1890-1897, t-statistics are in parenthesis.

Source: see the text.
Table 2. The contribution of each variable in the agricultural wage change

<table>
<thead>
<tr>
<th></th>
<th>1887-1890</th>
<th>1890-1897</th>
<th>1897-1910</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in actual agricultural wages (Δlog Wₐ)</td>
<td>-0.0106</td>
<td>-0.0097</td>
<td>0.0155</td>
</tr>
<tr>
<td>Contribution of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in wheat prices (Δ log Pₐ)* (percentage)</td>
<td>-0.0006</td>
<td>-0.0144</td>
<td>0.0216</td>
</tr>
<tr>
<td>Total Immigration (Mₜ) (percentage)</td>
<td>0.0063</td>
<td>0.0065</td>
<td>0.0111</td>
</tr>
<tr>
<td>Residual</td>
<td>-0.0163</td>
<td>-0.0018</td>
<td>-0.0173</td>
</tr>
</tbody>
</table>

**Note:** Contributions are calculated using the coefficients of regression 3 in Table 2 and the average of each variable for each period. The percentage in the total predicted value is in parenthesis. * lagged two years.
Table 3. The impact on the industrial labour market

Dependent variable: Real industrial wages in logs (Log $W_i/P_m$)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.147</td>
<td>2.414</td>
<td>1.651</td>
<td>1.398</td>
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<tr>
<td></td>
<td>(8.89)</td>
<td>(9.43)</td>
<td>(4.34)</td>
<td>(3.45)</td>
</tr>
<tr>
<td>Log $P_a/P_m$</td>
<td>0.590</td>
<td>0.518</td>
<td>0.221</td>
<td>0.270</td>
</tr>
<tr>
<td></td>
<td>(7.42)</td>
<td>(6.651)</td>
<td>(2.83)</td>
<td>(3.27)</td>
</tr>
<tr>
<td>Log $W_{an}/P_{an}$</td>
<td>0.244</td>
<td>0.221</td>
<td>0.111</td>
<td>0.144</td>
</tr>
<tr>
<td></td>
<td>(3.27)</td>
<td>(3.043)</td>
<td>(1.93)</td>
<td>(2.52)</td>
</tr>
<tr>
<td>$M_i$</td>
<td>-0.004*</td>
<td>-0.017**</td>
<td>-0.012**</td>
<td>-0.009**</td>
</tr>
<tr>
<td></td>
<td>(-2.51)</td>
<td>(-4.097)</td>
<td>(-4.74)</td>
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<tr>
<td>$M_e$</td>
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<td>0.031</td>
<td>0.017</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>(7.08)</td>
<td>(5.985)</td>
<td>(4.96)</td>
<td>(4.79)</td>
</tr>
<tr>
<td>$L$</td>
<td>-1.02</td>
<td>-1.420</td>
<td>-1.409</td>
<td>-0.911</td>
</tr>
<tr>
<td></td>
<td>(-5.11)</td>
<td>(-7.22)</td>
<td>(-4.75)</td>
<td>(-2.38)</td>
</tr>
<tr>
<td>DMA</td>
<td>No</td>
<td>No</td>
<td>-0.100</td>
<td>-0.137</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-2.09)</td>
<td>(-2.63)</td>
</tr>
<tr>
<td>DBA</td>
<td>No</td>
<td>No</td>
<td>0.083</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.49)</td>
<td>(1.48)</td>
</tr>
<tr>
<td>D1891-1913</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.726)</td>
</tr>
<tr>
<td>$R^2$ (centered)</td>
<td>0.670</td>
<td>0.670</td>
<td>0.829</td>
<td>0.835</td>
</tr>
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<td>102</td>
<td>102</td>
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<tr>
<td># Usable Observations</td>
<td>96</td>
<td>96</td>
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</table>

**Note**: Pool OLS regression, Balanced Panel with the three regions. Variables: $P_a/P_m$, real wheat prices are at regional level, $W_{an}/P_{an}$, real agricultural wages are at national level, $M_i$, * Internal immigration calculated by the difference between total migration from Mikelarena (1993) and external emigration from *Estadísticas de la Emigración española* (data runs from 1882). $M_i$, ** Internal immigration from Silvestre (2003), Me, external net emigration, and $L$ is the share of labour force over total population. DMA, Madrid dummy, DBA, Barcelona dummy, D1891-1913, dummy for the period from 1891 to 1913, t-statistics are in parenthesis.

**Sources**: see text and data appendix
Table 4. The impact on the industrial labour market in each region

<table>
<thead>
<tr>
<th></th>
<th>(1) Madrid</th>
<th>(2) Madrid</th>
<th>(3) Barcelona</th>
<th>(4) Barcelona</th>
<th>(5) Biscay</th>
<th>(6) Biscay</th>
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<tr>
<td>Constant</td>
<td>0.817</td>
<td>1.568</td>
<td>0.817</td>
<td>0.788</td>
<td>5.364</td>
<td>1.665</td>
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<td></td>
<td>(3.70)</td>
<td>(1.72)</td>
<td>(4.54)</td>
<td>(4.98)</td>
<td>(6.74)</td>
<td>(2.39)</td>
</tr>
<tr>
<td>Log P_a/P_m</td>
<td>0.451</td>
<td>0.534</td>
<td>0.159</td>
<td>0.168</td>
<td>0.162</td>
<td>0.147</td>
</tr>
<tr>
<td></td>
<td>(3.09)</td>
<td>(3.52)</td>
<td>(3.16)</td>
<td>(2.52)</td>
<td>(2.79)</td>
<td>(2.39)</td>
</tr>
<tr>
<td>Log W_an/P_an</td>
<td>0.335</td>
<td>0.434</td>
<td>0.096</td>
<td>0.10</td>
<td>-0.011</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>(2.60)</td>
<td>(3.52)</td>
<td>(3.28)</td>
<td>(3.17)</td>
<td>(-0.28)</td>
<td>(1.29)</td>
</tr>
<tr>
<td>M_i</td>
<td>-0.025</td>
<td>-0.010</td>
<td>-0.0008</td>
<td>-0.0007</td>
<td>-0.012</td>
<td>-0.006</td>
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<td></td>
<td>(-2.23)</td>
<td>(-0.56)</td>
<td>(-0.35)</td>
<td>(-0.31)</td>
<td>(-4.26)</td>
<td>(-1.78)</td>
</tr>
<tr>
<td>M_E</td>
<td>0.071</td>
<td>0.089</td>
<td>0.010</td>
<td>0.010</td>
<td>0.015</td>
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<td>(3.99)</td>
<td>(4.18)</td>
<td>(4.16)</td>
<td>(4.10)</td>
<td>(4.57)</td>
</tr>
<tr>
<td>L</td>
<td>-1.25</td>
<td>0.028</td>
<td>-0.515</td>
<td>-0.458</td>
<td>-7.187</td>
<td>-1.97</td>
</tr>
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<td></td>
<td>(-3.26)</td>
<td>(0.03)</td>
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<td>(-2.00)</td>
<td>(7.25)</td>
<td>(-0.84)</td>
</tr>
<tr>
<td>D1891-1913</td>
<td>No</td>
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<td>No</td>
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<td>0.064</td>
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<tr>
<td></td>
<td></td>
<td>(1.47)</td>
<td></td>
<td>(0.31)</td>
<td></td>
<td>(2.67)</td>
</tr>
<tr>
<td>R² (centered)</td>
<td>0.600</td>
<td>0.622</td>
<td>0.526</td>
<td>0.527</td>
<td>0.732</td>
<td>0.805</td>
</tr>
<tr>
<td>D-W</td>
<td>0.651</td>
<td>0.799</td>
<td>1.657</td>
<td>1.692</td>
<td>1.19</td>
<td>1.650</td>
</tr>
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<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
</tbody>
</table>

Note: Regression for each region: Madrid, Barcelona and Biscay for the period 1880-1913, see Table 4 note for the variables. T-statistics are in parenthesis.
Table 5. The contribution of each variable in the real industrial wage

<table>
<thead>
<tr>
<th></th>
<th>1880-1890</th>
<th>1891-1913</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual change in real industrial wages (log ( W_m/P_m ))</td>
<td>0.0005</td>
<td>0.0061</td>
</tr>
<tr>
<td><strong>Contribution of change in:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real wheat prices (log ( P_a/P_m )) (percentage)</td>
<td>-0.00243</td>
<td>0.00141</td>
</tr>
<tr>
<td>Real agrarian wages (( W_{an}/P_{an} )) (percentage)</td>
<td>-0.00011</td>
<td>0.00024</td>
</tr>
<tr>
<td>Internal Migration (( M_i )) (percentage)</td>
<td>0.00002</td>
<td>0.00002</td>
</tr>
<tr>
<td>External Migration (( M_e )) (percentage)</td>
<td>0.15857*</td>
<td>0.00212</td>
</tr>
<tr>
<td>Labour force (( L )) (percentage)</td>
<td>-0.00105</td>
<td>0.00168</td>
</tr>
<tr>
<td>Residual</td>
<td>-0.1545</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

**Note:** Contributions are calculated using the coefficients of regression 4 in Table 4 and the average of the change of each variable for each region in each period. In the case of external emigration the change is calculated from a centered three-year average. The percentage of the total predicted value is in parenthesis.

* This contribution is very high due to the huge increase in external migration in Biscay during this period. This contribution would be 84.31% if we did not include Biscay in average growth.
Table 6: Wage Inequality in Spain, 1870-1930

<table>
<thead>
<tr>
<th>Years</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1870</td>
<td></td>
</tr>
<tr>
<td>1884</td>
<td>1,424</td>
</tr>
<tr>
<td>1890</td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td></td>
</tr>
<tr>
<td>1914</td>
<td>1,483</td>
</tr>
<tr>
<td>1920</td>
<td>1,455</td>
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<tr>
<td>1925</td>
<td>1,476</td>
</tr>
<tr>
<td>1930</td>
<td>1,559</td>
</tr>
</tbody>
</table>

Source: Betrán and Pons (2005).