The Rise and Fall of Spain (1270-1850)

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Abstract

Two distinctive regimes can be observed in preindustrial Spain. A first one (1270-1590) corresponds to a high land-labour ratio frontier economy, largely pastoral, trade-oriented, and led by towns. Wage and food consumption levels were high as were living standards. Sustained per capita growth took place after Reconquista ended (1264) and until the Black Death and the Spanish phase of the Hundred Years War. Then, it resumed over 1390s-1590s only interrupted by mid-15th century political turmoil. A second regime (1590s-1810s) corresponds to a more agricultural and densely populated, low wage economy with growth occurring along a lower path since the late 17th century. Spain’s affluence by 1492 can be tracked down to the pre-Black Death era. Spain’s decline sinks its roots in the early 17th century. Per capita GDP growth in the early 19th century occurred, paradoxically, while Spain fell behind Western Europe.

Keywords: Preindustrial Spain, Frontier economy, Black Death

JEL Classification: O47, N13, N93

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The Rise and Fall of Spain (1270-1850)

When and why did Spain fall behind continues being debated and attempts have been made at quantifying Spain’s relative position over time (Yun-Casalilla 1994, Carreras 2003, van Zanden 2005a, 2005b, Maddison 2006). In a recent contribution Álvarez-Nogal and Prados de la Escosura (2007) have suggested that prior to her American expansion Spain had already attained a significant affluence which continued increasing during the 16th century so, by 1590, Spain was among the top European countries in per capita income terms. This finding raises the question of when, and why, did Spain achieve such an early affluence.

This paper attempts to provide an answer by examining pre industrial Spain’s comparative performance over half a millennium. Specifically, we estimate yearly movements in agricultural output using an indirect demand approach (Section II), while those in industry and services are proxied through changes in urban population not living on agriculture (section III), so trends in per capita output over half a millennium (1280-1850) can be established (section IV). A discussion of Spain’s relative position within Western Europe closes the paper.

From our quantitative exercise we conclude that two distinctive regimes appear to exist in preindustrial Spain. A first one (1270-1590) corresponds to a high land-labour ratio frontier economy, largely pastoral, trade-oriented, and led by towns. Wage and food consumption levels were high as were living standards. Sustained per capita growth took place after Reconquista ended (1264) and until the Black Death and the Spanish phase of the Hundred Years War. Then, it resumed over 1390s-1590s and was only interrupted by mid-15th century political turmoil. A second regime (1590s-1810s) corresponds to a more agricultural and densely populated, low wage economy with growth occurring along a lower path since the late 17th century.

Thus, Spanish affluence by 1492 can be tracked down to the pre-Black Death. Spain exhibits an opposite behaviour to that of most of Western Europe where the highest standards of living of the early modern era were achieved at the recovery from the Black Death. In the pre Black Death era, Malthusian forces were absent in Spain but for few areas along the Mediterranean coast. On the contrary, sustained progress took place after the Reconquista in the context of a frontier economy, urban expansion, and

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2 This a major difference with Álvarez-Nogal and Prados de la Escosura (2007) in which a regional approach is used to derive output at benchmark years and a national figure is obtained through aggregation. Lack of data precludes so far a regional approach for the wider time span covered here.
openness to trade. The plague destroyed the equilibrium between scarce population and abundant resources and the pre-Black Death per capita income levels were only recovered in the late 16th century after two centuries of growth.

The fall in output per head in the early 17th century initiated Spanish absolute decline. In the early 19th century demographic expansion was paralleled by an improvement in GDP while, paradoxically, Spain fell behind Western Europe.

Output in agriculture: an indirect approach

Agricultural output for Spain as a whole has been estimated indirectly. Given the lack of hard empirical evidence for medieval and early modern Europe, alternative ways of deriving output trends have been put forward.³ On the one hand, Wrigley’s (1985) proposal assumes that, in the long run, food consumption per head is roughly constant. This way output in agriculture evolves as total population adjusted for the agricultural trade balance.⁴

The rationale for Wrigley’s approach is that in a traditional economy workers try to keep their food consumption per head stable (Lewis 1955). Recent research on developing countries reveals that consumption per head of food staples remains constant in aggregate terms even as per capita income rises (Bouis 1994). Although serious critiques can be raised against this approach, in the absence of hard empirical evidence it provides explicit quantitative conjectures for further exploration.

Wrigley’s hasty procedure has, nonetheless, some shortcomings. For example, Kaneda (1968) and Crafts (1976) criticised the assumption of a constant per capita food consumption arguing that the values of price and income elasticities of demand for food in developing countries are significantly different from zero.

This critique led us to a second alternative to estimating agricultural output indirectly: the demand function approach.⁵ A recent user of this procedure, Allen (2000), has derived agricultural output for a sample of pre-industrial European countries. He firstly estimated agricultural consumption per head that, adjusted for net food imports, allowed him to derive output per head and, then, with population, absolute

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³ We are currently constructing an alternative estimate on the basis of tithes.
⁴ Such method has been used for late nineteenth and early twentieth century Japan (Nakamura 1965), eighteenth century Britain (Deane and Cole 1967, Overton 1996), nineteenth century Spain (Simpson 1989, 1995) and, more recently, medieval Italy (Federico and Malanima 2004).
⁵ Crafts (1976, 1980, 1985) was the pioneer in the use of the demand approach to derive agricultural consumption and output. The method was later used by Jackson (1985) and Allen (1999) for eighteenth century Britain and by Prados de la Escosura (1988, 1989) for nineteenth century Spain.
output. In the demand approach real consumption per head of agricultural goods \((C)\) can be expressed as,

\[
C = a P^ε Y^µ M^γ
\]  \[1\]

in which \(P\) and \(M\) denote agricultural, and non-agricultural prices relative to the consumer price index (CPI), \(Y\) stands for real income per head; \(ε, \mu,\) and \(γ\) are the values of own price, income and cross price elasticities, respectively; and \(a\) represents a constant.\(^6\) Taking rates of variation (denoted as low case), we get:

\[
ε = ε p + µ y + γ m
\]  \[2\]

Since information on disposable income per head for preindustrial Europe is usually lacking, Allen’s suggestion of using real wage earnings \((W)\) per worker as a second best alternative provides a most convenient solution, so \(Y\) can be replaced by \(W\).

The rationale for Allen’s (1999: 214) claim is that as proprietors comprise a small share of population and consume, therefore, only a small fraction of total food, workers’ returns provide a relevant measure of disposable income. Hence, changes in real wage earnings \((w)\) are suggested to proxy changes in real income per head \((y)\) in equation \([2]\).\(^7\)

However, such a supposition hides ‘the contribution of property-income growth to the overall rise of national income’ (Hoffman et al. 2002) and implies the improbable assumption that the share of labour in national income remains stable over time.

Moreover, if real wages are used as a proxy for real per capita GDP, deflators matter too. In the case of nominal wages, a consumer price index is usually employed to obtain real wages, while to derive real aggregate output the GDP implicit deflator, which reflects the prices of both consumption and investment goods, is used. As these two price indices do not necessarily evolve alike, this introduces another potential bias in agricultural output estimated with real wages proxying real income per head.\(^8\)

To complicate the situation further the available evidence on wages in early modern Europe usually refers to wage rates \((w)\) while what is actually needed is real

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\(^6\) Allen (2000) arbitrarily assigned the value of one to \(a\). It should be noticed that Wrigley’s proposal represents a particular case of a demand function for agricultural goods in which price and income elasticities are zero.

\(^7\) Another related issue is the extent to which changes in real wages are representative of changes in workers’ real incomes. It is commonly accepted that wages were only a part of household incomes, especially in rural areas (see evidence for as late as 1850 in García Sanz (1981)) but the extent to which variations in household income are captured by those in real wage earnings is an unknown. Nonetheless, the fact that, in times of hardship, authorities usually tried to regulate and control nominal wages suggests that the representativeness of wage labour is higher than commonly accepted (Bois 2000, Sanz Fuentes 1987, Vaca 2001).

\(^8\) Hoffman et al. (2002) have shown that the different evolution of consumer price indices for lower and upper social classes constitutes an additional source of inequality in income distribution in early modern England, France, and the Netherlands.
wage earnings \((W)\), that is, wage rates \((w)\) times the number of days or hours \((h)\) worked per person-year. Changes in work intensity affect yearly wage earnings per economically active person. In the early modern age, workers (and their families) were prepared to increase their work load (usually more days of work rather than more hours per day) either to offset the decline in wages rates (van Zanden 1999, Malanima 2007) or because of the higher opportunity cost of leisure resulting from wider consumption choices (de Vries 1994, Voth 1998, Allen 2004b). In fact, a more intense use of land appears to go along declining wage rates, implying a more intense use of labour (Boserup 1987, Malanima 2007, De Vries 2008). The corollary is that long-run changes in real wage rates do not necessarily capture those in real returns to wage labour.

Given the dearth of direct estimates with contemporary data, the choice of values for price and income elasticities to be used in the calibration of the demand for agricultural goods presents another challenge. Studies on developing countries, not too dissimilar in income per head from most western European countries in the early modern era (Maddison 2006), cast values of 0.7/0.8 for the expenditure elasticity for food (with -0.5/-0.6 as own price elasticity) (Lluch et al. 1977). However, it has been claimed that cross-section estimates of income elasticity tend to be upwards biased as food transfers from high to low income groups are inaccurately recorded in food expenditure surveys (Bouis 1994). A similar conclusion is reached for Britain during the Industrial Revolution by Clark, Huberman and Lindert (1995) who argue that budget studies fail to include high income consumers who, by Engel’ law, have lower income elasticities of food demand.

A relevant caveat is that, as an economy grows, the value added of food relative to its inputs (agricultural staple goods) increases by including services –whose income elasticity of demand is higher than that for staple food products—raising the income elasticity of the aggregated demand for food. Thus, the use of income elasticities of

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9 This fact implies that using expression (2) with the variation in wage rates as a proxy for those in real disposable income per head provides a measure of changes in daily per capita consumption, so the challenge is to ascertain the extent to which working time varies in the long run.

10 The improvement of housing, the acquisition of durable goods and the increasing consumption of exotic goods has been pointed as evidence of material progress just at the time real wage rates were declining (Reis 2005: 199).

11 However, it is unclear that in the late middle ages, at times of high wages, in a frontier economy such as Spain, an increase in real wage rates would lead to a reduction in working time.

12 Moreover, direct cross-section estimates for late 1950s Spain still show high absolute values for income (and own price) elasticity of food demand (0.9 and -0.7, respectively) (Lluch 1969).

13 Clark et al (1995: 234-235) point out, “the value of food and beverage consumption rises relatively to the foodstuff supplies over the course of development”, while Kaneda (1968) uses a similar argument to
food demand for present-day developing countries to calibrate the demand of agricultural goods in the past may lead to an over-exaggeration of the true value of income elasticities.\(^{14}\) Interestingly, for the income elasticity of agricultural products in Japan over 1878-1940, Kaneda (1968) found values of 0.3/0.4, certainly low but not implausible for the demand of food in developing countries.\(^{15}\) Rough and ready time series estimates (along Kaneda’s) of income elasticity of demand for Spain over 1850-1913 cast significantly different values for food (0.9) and for agricultural goods (0.4) and tend to confirm our suspicions. If, instead of per capita GDP, real wage rates are used, the income elasticity for agricultural goods falls to 0.3.\(^{16}\)

For pre-1800 Europe Allen (2000) cautiously assumed values of 0.5 and -0.6 for income and own price elasticities and used the Slutsky-Schultz relation to derive the cross price elasticity of demand,\(^{17}\) while Federico and Malanima (2004) adopted values of 0.4 and -0.5, respectively, for early modern Italy. Our preference, in the Spanish case, for low absolute values of income ($\mu = 0.3$) and own price ($\epsilon = -0.4$) elasticities is motivated by the fact that we are addressing the demand for agricultural staple goods, not for food itself that incorporates higher income-elastic services. Moreover, as we discuss later, a low value of income elasticity somehow captures the impact on the demand for food staples resulting from variations in working time as a response to changes in real wage rates. In other words, we are implicitly assuming that the daily wage elasticity of demand for foodstuffs is lower than that of yearly disposable income per head.

Let’s look now at the evidence available for our case. Real wage rates experienced a rise between the late 13\(^{th}\) and mid-14\(^{th}\) century, followed by a sharp decline until the end of this century and a subsequent recovery in the early 15\(^{th}\) century when the highest wage rates of half a millennium were reached. Then, a long-term decline took place until 1800, although real wages remained at high levels, similar to

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\(^{14}\) This does not necessarily mean that the services content of food in early modern Europe was lower than in today’s developing countries. Probably the difference, then and now, lies between countryside and town, with lower services content of food in the former.

\(^{15}\) Cross-section estimates of income elasticities for aggregate food staples from household surveys are often in the 0.3/0.6 range (Bouis 1994).

\(^{16}\) Computed from data in Prados de la Escosura (2003).

\(^{17}\) The Slutsky-Schultz relation states that for the individual demand of any commodity, the income elasticity, with a negative sign, is the sum of own price and cross price elasticities, so it allows one to derive the value of the cross price elasticity of demand from the assumed values for own price and income elasticities.
those of the pre-Black Death era, up to mid-16th century with reversals in the last quarter of the 15th century and the second half of the 17th century (Figure 1). However, it is unclear that wage rates capture trends in wage earnings, as incentives to work harder increased over time, particularly in the eighteenth century. As population grew and trade increased, relative prices changed, and a more intense use of land took place with a shift from extensive livestock rearing (sheep) to crops (cereals, vineyards, olives) and also to cash crops (fruit trees, etc) along the Mediterranean coast (Anes 1970). Rising demand from an expanding population contributed to the increase in food prices that led, in turn, to a sustained fall in real wage rates as nominal wages were much more stable. Given the low number of days worked per economically active population, particularly in agriculture, the supply of labour was presumably rather elastic, and workers could make for the fall in daily real wages by increasing the amount of days allocated to work over the year.

For example, in the Kingdom of Castile c. 1750 the Cadastre de Ensenada assigned 120 days of work per year to day-labourers (rural and non-rural), 180 to artisans, and 250 to servants (Ringrose 1983) which weighted by each sector’s share in economically active population (EAP) cast an average of 168 days per EAP/year, lower than the one suggested for nineteenth century Europe (196 days) by Bairoch (1965, 1989) and the figure of 250 working days per year accepted for early modern Europe by Allen (2001).

The early nineteenth century provides a new scenario in which real wage rates went up simultaneously to an intensification of work as a result of the wider access to property, following the disentailment of church and communal lands (desamortización), and the increase in the variety of goods and services the market provided. We know that, by 1850, EAP in agriculture worked an average of 240 days.

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18 In Catalonia, the increase in trade stimulated the use of marginal, unexploited lands for vineyards and olive trees as a growing demand covered the cost of opening up new lands (Vilar 1962).
19 See also Vilar (1970: 129) and Santaolaya Heredero (1991). The figure for days worked in agriculture is confirmed by Simpson (1992) for late nineteenth century Andalusia, where labour input requirements implied that agricultural workers were employed for fewer than 120 days per year.
20 Evidence for the construction industry in seventeenth century Valladolid indicates that most workers were occupied less than 150 days although, exceptionally, the working year could reach up to 270 days, (Gutiérrez Alonso 1989). In late eighteenth Madrid masons only worked, on average, 3.5 days per week during winter while in summer they went up to 4.4 days/week. Thus, assuming a weekly average of 4 days per week would represent 208 days per year (computed from Nieto Sánchez 2006: 428).
21 Such figure is a weighted average computed from data of labour force and days worked at provincial level in Spain c. 1850 (del Moral Ruiz 1979)
over the first half of the nineteenth century, while cultivated land multiplied by 2.4 over
the first half of the nineteenth century (Bringas 2000: 86) and employment in
agriculture only did it 1.5 times (Álvarez-Nogal and Prados de la Escosura 2007), we
can presume that, by 1800, the number of working days in agriculture was around 150
(=240*1.5/2.4), a figure consistent with that of 120 days at the time of the Cadastre of
Ensenada (c. 1750), prior to the agricultural expansion of the late eighteenth century.

However, before accepting changes in real wages as a proxy for those in real
disposable income per head, the stability of the share of labour in national income needs
to be established. Inequality was deep. For example, in Old Castile c. 1750, the
wealthiest 10 percent outweighed the poorest 40 percent by 15 to 17 times. These
ratios are similar to those found for contemporary England (14 times), and France (17
times) (Hoffman et al. 2002).

Nonetheless, high inequality can be compatible with the stability of the share of
labour in national income. Was this the case of pre-industrial Spain? Trends in relative
factor returns provide a good test for the stability of income distribution. Land
rent/wage ratio rose throughout the sixteenth and eighteenth centuries, while declined in
the seventeenth and early nineteenth centuries (Figure 2). Thus, unless returns to
property are included in our proxy for disposable income, in phases of rising (declining)
inequality our output estimates may suffer a downward (upward) bias and, hence,
provide a lower (upper) bound of the actual performance of Spanish agriculture.

We have carried out, then, an estimate of the demand of agricultural goods
using, as detailed below, real wage rates and relative prices for agricultural and non-
aricultural goods. The main challenge to calibrate equation [2] is posed by the choice

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23 Gini coefficients for income distribution at different Old Castile towns c. 1750 cast values ranging from
0.39 to 0.56, while similar estimates were obtained for Jerez (around 0.5) (Álvarez-Nogal and Prados de
la Escosura 2007). These figures are close to the 0.52 Lindert computed for England and Wales in 1759
24 As Hoffman, Jacks, Levin, and Lindert (2002: 325) point, real inequality was ‘caused by the interaction
of population growth with concentrated land ownership and the Engel’s law’.
25 Scattered evidence indicates that the incomes of the middle and upper classes were growing in early
modern Spain, while those of the lower classes were stagnant or declining (Nader 1977).
26 As a test, we have estimated per capita consumption of food for Spain over 1850–1913 with a demand
function (and a common data set from Prados de la Escosura (2003)) using real wage rates (Bringas 2000)
and GDP per head alternatively as indicators of real per capita disposable income. The results confirm the
downward bias introduced when wage rates are employed as a proxy for income per head. Interestingly,
when agricultural consumption per head for eighteenth century England is derived with a demand
function, the use of per capita income (Crafts 1985) also casts a faster pace of growth than when real
wages rates are employed (Jackson (1985) and Allen (1999)).
27 The sources and procedures for agricultural (P) and non-agricultural prices (M), consumer price indices
(CPI), and real unskilled wage rates (w) are detailed in the Appendix.
of a proxy for changes in real disposable income per head. One option, following Allen (2000), Federico and Malanima (2004), and Álvarez-Nogal and Prados de la Escosura (2007), is to use the variations in real wage rates (Estimate I). Another option is to assume that real returns to labour remained stable over time, as workers reacted to declining real wage rates by working extra days. This assumption, that seems particularly plausible for the 18th century, would imply that changes in the consumption of agricultural goods per head would depend on the relative price of agricultural and non-agricultural goods weighted by their own- and cross-price elasticities (Estimate II).

A more comprehensive proxy for disposable income per head would result if, in addition to a crude measure of labour earnings, the returns accruing to proprietors were also taken into account. We have been able to construct a crude proxy of disposable income as a weighted average of real wage rates and real land rents per hectare, in which the shares of labour (0.75) and property (0.25) in Spain’s national income during the 1850s are used as weights (Prados de la Escosura and Rosés 2009) (Estimate III).

As regards the values of demand elasticities, we have explored alternative sets, ranging from -0.7/-0.4 (own-price, $\varepsilon$) and 0.6/0.3 (income, $\mu$) with cross-price elasticity ($\gamma$) always equal to 0.1, but finally opted deliberately for low absolute values: $\varepsilon = -0.4$; $\mu = 0.3$; $\gamma =0.1$. The adoption of lower values for income and own price elasticities for early modern Spain than those computed for countries at similar levels of development allows for the fact that we are addressing the demand for agricultural staple goods, not for food itself which, by incorporating services, reaches a higher value for the aggregate income elasticity. Furthermore, choosing a low value for income (wage) elasticity allows for the fact that the demand for agricultural food staples was affected by changes in the amount of time EAP allocated to work.

In Figure 3 and Table 1 the three alternative estimates of agricultural consumption per head and their yearly rates of variation are offered and implicitly

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28 It is worth noting that the use of unskilled wages does not alter our results as the skill premium remained relatively stable in early modern Spain. The skill premium, that is, the skilled/unskilled wage ratio, was computed for masons and carpenters in Catalonia, Valencia, and New Castile from data in Feliu (1991).

29 Lack of long run series for interest rates precluded its inclusion in our proxy for disposable income. This alternative measure suffers also from our lack of knowledge about the evolution of the quantity of agricultural land over time.

30 Allen (2000) and Federico and Malanima (2004) used similar values for own price ($\varepsilon = -0.6$ and - 0.5), income ($\mu = 0.5$ and 0.4) and cross price ($\gamma =0.1$) elasticities of demand. It is worth mentioning that, alternatively, elasticities should be adjusted over time as income per head changes. However, since per capita income in early modern Spain remained at low levels and its change over time was not dramatic, the range within which expenditure and own price elasticities would fluctuate is rather narrow, and so is the range for the output estimates obtained using alternative elasticities.
compared with Wrigley’s assumption of a constant consumption per head of agricultural goods (a constant 100 value). It seems clear that Wrigley’s approach proves inadequate since, even when real disposable income is assumed to remain unaltered (Estimate II), the demand for agricultural staple goods reacts to changes in relative prices and consumption per head is far from stable. In fact, the decline in real per capita consumption observed for the demand estimate which includes real wage rate as a proxy for disposable income (Estimate I) is confirmed, but for a milder slope, in Estimate II. Another interesting finding is that the inclusion of land rent as a proxy for returns to property in our measure of disposable income (Estimate III) confirms the (declining) trend in the per capita consumption of food staples. This suggests, on the one hand, that Allen’s (1999) point about the primacy of workers in the demand for food is well taken; and, on the other hand, it raises the issue of how the number of days worked and hectares cultivated evolved over time.

Our results show two distinctive phases. A first one, up to the 1550s, of high levels of per capita consumption, and a second one, post-1550s, of significantly lower ones, which largely coincides with the picture provided by real wages. Interestingly, Estimates I and II match each other closely after 1550, but not beforehand, in particular, during the 15th century, when consumption is much lower in Estimate II. This raises the issue of the extent to which, at a time of high wages, people would forgo food consumption in order to reduce their working time. In a high land-labour ratio economy, with an extensive use of natural resources –mostly, livestock rearing- it seems doubtful that peasants would cut down their already low working days per year. In the urban-led repopulation of the 14th and 15th centuries it seems also improbable that those employed in industry and services would reduce their working effort as their wages increased, particularly since trading networks linking towns within Spain and to the European markets catered for their demand. Therefore, we concluded that the most plausible representation of trends in per capita consumption of agricultural staples is provided, in our view, by Estimate I.

The highest food staples consumption per head corresponds to the pre-Black Death era. The recovery of consumption in the early 15th century fell short of the peak levels of the 1330s-1340s but consumption levels remained high until mid-16th century. The reason is that the advance of the reconquest in the thirteenth-century made available
large tracts of land which were not matched by population growth.\textsuperscript{31} In fact, the colonization of new land was far from complete in the eve of the Black Death and migration flows southwards from northern Spain took place (MacKay 1977: 67-71). A declining trend is observed in foodstuffs consumption per head throughout the 16\textsuperscript{th} and early 17\textsuperscript{th} century to stabilize, then, until mid-19\textsuperscript{th} century.

Due to lack of trade data for most of the considered period, we had to assume, as Allen (2000) did for most European countries, that agricultural trade was balanced.\textsuperscript{32} Fortunately, the available evidence for the late eighteenth and early nineteenth century indicates that trade represented a small share of agricultural output.\textsuperscript{33} Thus, output per head (\(q\)) equals, by construction, per capita consumption (\(C\)), and total agricultural output can be, then, derived with population figures (\(N\)) as:

\[
(Q)_{agr} = q \cdot N
\]  \textsuperscript{[3]}

**Output outside agriculture: conjectural estimates**

Lack of data from which to infer trends in industrial and services production in preindustrial Spain is even more dramatic than for agriculture and renders the use of indicators necessary. Using urbanization, for which more reliable evidence is available, to draw long-run trends in economic performance is not new. Parallels have been established between changes in urbanization rates and those in per capita GDP.\textsuperscript{34} Increases in real per capita income have been linked, \textit{ceteris paribus}, to the proportion of the total population living in urban centres in preindustrial economies (Wrigley

\textsuperscript{31} This occurred even though large numbers of Muslims did not migrate and stayed especially in the east, the Valencia region, in particular. Nonetheless, in areas along the Mediterranean coast the situation was often not too dissimilar from that in Western Europe (MacKay 1977).

\textsuperscript{32} The first official computation of trade flows corresponds to 1792 (Prados de la Escosura 1982a), and reconstructions of Spain’s trade with her major partners in the eighteenth century (Romano 1957, Prados de la Escosura 1984) do not provide the trade balance for agricultural goods. Nonetheless, it is not the size of exports or imports of agricultural goods what really matters but its balance (that is, net exports) which can be easily assumed to be a small share of total consumption.

\textsuperscript{33} It can be reckoned that Spain was a net food importer in the late eighteenth century up to, at most, 5 percent of GDP and no more than 10 percent of agricultural output (Prados de la Escosura 1993: 271-73, 276). By mid-nineteenth century, however, Spain was a net exporter of foodstuffs, though but no more than 5 percent of agricultural output (Prados de la Escosura 1988, 2003). This suggests that the improvement in consumption per head between 1787 and 1857 should be raised by around 15 percent to represent the increase in agricultural output per head. As a consequence our estimates tend to be downward biased over 1787-1857.

\textsuperscript{34} Urbanization represents, according to Kuznets (1966), ‘an increasing division of labor within the country, growing specialization, and the shift of many activities from nonmarket-oriented pursuit within the family or the village to specialized market-oriented business firms’. Cf. also Acemoglu, Johnson, and Robinson (2005), Reis (2005), and Temin (2006).
We have accepted urban population (excluding those living on agriculture) as a proxy for non-agricultural output and, hence, assumed that trends in the rate of adjusted urbanization -that is, the share of non-agricultural urban population over total population- capture those in per capita output in industry and services.\footnote{This approach is supported by van Zanden (2001) who claims that “regional differences in levels of development ... are perhaps best approached via variations in the urbanization ratio”. Craig and Fisher (2000: 114) suggest using changes in the urbanization rate as a proxy for per capita income growth.}

In early modern Spain, urbanization rates have usually been considered upwards biased as a result of the existence of ‘agro-towns’. Towns provided security and lower transactions costs in a frontier economy during the re-population process that followed the reconquest and after the Black Death. After the third wave of the Reconquista in the 13\textsuperscript{th} century, Christian settlers from Aragon, Catalonia and Southern France acquired farms but preferred to live in towns (MacKay 1977: 69). Moreover, the Black Death favoured urban growth in Spain as (southern) towns were more secure and provided better services and attracted immigrants from the (northern) countryside (Ladero Quesada 1981, Rubio Vela 1987, Pladevall 1962, Cuvillier 1969, Rodríguez Molina 1978, Santamaría 1969). At the same time, the acceleration of the reconquest and the Black Death favoured the formation of large landholdings (Vaca 1983, Valdeón 1966).\footnote{It seems clear that the higher the threshold to be deemed as an urban centre, the lower the probability of including people employed in the agricultural sector. In order to mitigate the inclusion of ‘agro-towns’, in which most of the population is employed in agriculture, Malanima (1998) proposed a lower limit for being considered urban, 5,000 inhabitants, for the north and centre of Italy, and a higher one, 10,000, for the south of the country.}

“Agro-towns” in southern Spain seem to be a legacy of a highly concentrated landownership which resulted in a large proportion of landless agricultural workers (Casado 2001, Reher 1990).\footnote{Different attempts to discriminate between agricultural and non-agricultural employment in towns have been carried out for early modern Spain. Reher (1990) reckoned that, in 1787, half the economically active population living in towns in Spain worked in agriculture, a clearly over-exaggerated figure, since all day labourers were to agriculture while servants were excluded from the labour force. Llopis Agelán and González Mariscal (2006) introduced a more astringent definition: in order to qualify as ‘urban’, a population centre needs to have a) more than 5,000 (alternatively, they also used 10,000) inhabitants and b) at least 5% of its economically active population employed in non-agricultural activities.}

Notwithstanding the existence of ‘agro-towns’, a large proportion of urban economic activity was associated to industry and services.\footnote{Different attempts to discriminate between agricultural and non-agricultural employment in towns have been carried out for early modern Spain. Reher (1990) reckoned that, in 1787, half the economically active population living in towns in Spain worked in agriculture, a clearly over-exaggerated figure, since all day labourers were to agriculture while servants were excluded from the labour force. Llopis Agelán and González Mariscal (2006) introduced a more astringent definition: in order to qualify as ‘urban’, a population centre needs to have a) more than 5,000 (alternatively, they also used 10,000) inhabitants and b) at least 5% of its economically active population employed in non-agricultural activities.} In sixteenth century Old
Castile, Yun-Casalilla (2004) reckons that agricultural employment represented, on average, 8 percent of the urban labour force. In late eighteenth century Spain most urban day labourers were employed outside agriculture and, according to Pérez Moreda and Reher (2003: 129), farmers (labradores) only represented 7.6 percent of the urban population in the 1787 population census.

Although keeping a constant threshold over time, while population grows, is rather questionable (Wrigley 1985), we have adopted the definition of ‘urban’ population as dwellers of towns of 5,000 inhabitants or more to maintain consistency with Bairoch, Batou and Chèvre (1988) estimates so international comparisons can be carried out. 40 We have, then, adjusted the urban population downwards by excluding those living on agriculture (See Appendix). 41 Spanish ‘adjusted’ urbanization rates, at benchmark years over 1100-1857, are presented in Table 2 and their rates of variation have been accepted to proxy those in non-agricultural output per head.

However, efficiency changes resulting from variations in the composition of labour by economic sectors and in the dependency rate could affect our proposed index. We have, then, carried out a sensitivity test by estimating the intersectoral shift effect that results from changes in the shares of industry and services in non-agricultural employment and in the productivity gap between industry and services. Furthermore, we allowed for changes in the potentially active to total population ratio (PAP/N) that could also affect our index. Fortunately trends in the proposed index of output outside agriculture do not appear to be significantly altered by either demographic or output composition changes. 42

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b) less than half of its economically active population (EAP) occupied in agriculture. This way they estimated, also for 1787, that the conventional rate of urbanization (23.7 percent, according to their own computations) should be cut down to almost half of it (12.7 percent), or 14.5 percent if we accept a less astringent definition of urban population.

40 Such a definition is arbitrary and alternative thresholds of 10,000 (de Vries 1984) or 20,000 (Flora 1981) inhabitants have been used. Bairoch, Batou, and Chèvre (1988) employed alternatively 2,000, 5,000, 10,000, and 20,000 inhabitants as measures of urbanization.

41 Details of the estimation of adjusted urban population over 1500-1850 are provided in Álvarez-Nogal and Prados de la Escosura (2007).

42 Services increased relative to manufacturing in terms of output and employment during the early modern era in Spain (García Sanz 1991a, López-Salazar 1986, Reher 1990) probably as a consequence of the Dutch disease provoked by the inflow of American silver (Forsyth and Nicholas 1983, Drelichman 2005). Given the lack of national data, we arbitrarily assumed that the evolution of the internal composition of non-agricultural employment in Spain was captured by the shares in non-agricultural economically active population (L_i+s) of industry (L_i/L_i+s) and services (L_s/L_i+s) in Cuenca (Reher 1990). As regards the productivity ratio between industry and services, lack of data forced us to accept a fixed ratio (1.4) derived from the Cadastre de Ensenada for the Kingdom of Castile c. 1750. The resulting intersectoral shift effect [IS = (L_s/L_i+s) + (1.4* (L_i/L_i+s))] shows a mild decline over time. If alternatively the productivity gap for the 1850s were used (Prados de la Escosura 2003) the productivity index would rise slightly over 1750-1850. Changes in the potentially active to total population ratio (PAP/N) can also
A glance at Tables 2 and 3 shows an apparent contradiction between a declining consumption of agricultural staples per head and a rising (adjusted) urbanization rate in the 16th and 18th centuries. How can it be explained? Was the opportunity cost of food consumption rising as a result of wider consumer choices? An over-exaggeration of the decline in the consumption of food staples per head might result from the use of real unskilled wage rates as a proxy for real income per head (Estimate I) since it may introduce a downward bias in the estimates (at least when income inequality increases and work intensifies). However, the alternative results obtained by assuming stable real wage earnings per worker (Estimate II) do cast similar declining trends. An alternative explanation would be that the prices of industrial goods and services fell relative to those of agricultural goods allowing the population to consume an increasing amount of non-agricultural goods. Figure 4 exhibits the steady decline in the relative prices of industrial goods up to the early 17th century that, after a reversal, resumed during the 18th century. Lastly, it could be argued that such a contradiction evidences that rising urbanization in preindustrial societies fails to capture increases in economic activity outside agriculture as it just results from rural immigrants expecting to live on charity. However, even if this were the case, feeding an increasing idle urban population implies that a surplus existed to be distributed among the poor, and such a surplus could only result from either an improbable redistribution in income, with the consequence of a decline in inequality, or from an increase in industrial and services output.

**Aggregate output**

To reach an estimate of aggregate output we need to combine our indicators of agricultural output and economic activity outside agriculture. We have computed a Divisia index for real GDP per head in which yearly variations in agricultural and non-agricultural output per head (the latter proxied by the ‘adjusted urbanization rate) are weighted by the average, at adjacent years, of the shares of agriculture and non-agricultural activities in current price GDP.\(^4^3\)

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\(^4^3\) Álvarez-Nogal and Prados de la Escosura (2007) derived aggregate output \((O)\) by combining agricultural output \((q\ N)\) and the indicator of economic activity outside agriculture (namely, adjusted urbanization, \(N\ sub\)-nonagr), expressed in index form with 1857 as 100, with their shares in GDP in 1850-1859—the earliest dates for which national accounts are available (Prados de la Escosura and Rosés 2009)—as weights,

\[
O_t = \frac{S_a.1850/59 (q_t.1857 \ N_{1857})}{(q_{1857} \ N_{1857})} + (1 - S_a.1850/59)*N_{urb\-nonagr.1857}/N_{urb\-nonagr.1857} \tag{4}
\]

Where \(S_a.1850/59\) represents the average share of agriculture in GDP in the 1850s (0.404).
\[
\ln Q_i - \ln Q_{i-1} = \sum_i \left( \frac{\bar{\theta}_i}{\ln Q_i - \ln Q_{i-1}} \right)
\]  

Where share values are computed as:

\[
\bar{\theta}_i = 1/2\left( \theta_i + \theta_{i-1} \right), \quad (i = agriculture, non-agriculture)
\]

In order to do so, current price estimates of GDP have been obtained by reflating real sectoral output with their corresponding price indices. In the case of agriculture, a price index was already available; while, in the case of non-agricultural activities, rates of variation for manufacturing prices, the CPI, and nominal wages were arithmetically averaged and its exponential computed to obtain the non-agricultural price index.\(^{44}\) This way current GDP estimates were obtained and the share of each sector derived. The share of agriculture in national income at current price is presented in Figure 5. These conjectural results confirm our intuition of the relatively small size of agriculture in the pre-Black Death era and in the 16th century, as the economy was grounded on towns, and commerce, and livestock rearing.

But do our estimates proxy GDP or just ‘market income’, leaving aside home, non-marketed production? Our conjecture is that we fall short from covering non-market production and that its inclusion in our output estimates would have a counter-cyclical effect, moderating the intensity of both the decline and rise of output over time that we present here.\(^{45}\)

Trends in product per head are offered in Table 3 and Figure 6. In our GDP estimates agricultural output has been derived with a demand equation using real wage rates as a proxy for labour returns which, in turn, are a surrogate for real disposable income.\(^{46}\) Over the long run, real income per head grew at a yearly average rate around

\(^{44}\) This amounts to allocating one-third of the weight to industry (the industrial price index) and two-thirds to services (nominal wage and consumer price indices), which is a good approximation to the sectoral shares within non-agricultural output in the 1850s (Prados de la Escosura 2003).

\(^{45}\) For agricultural output, it is unclear that this is case in our demand approach estimates. As for non-agricultural output, a non-negligible share was contributed by the active population employed in agricultural activities and we fail to capture it, although an early use of the market even in remote regions of Spain has been documented (Domínguez 1994). Furthermore, the so called ‘agro-towns’ tended to facilitate the production for the market.

\(^{46}\) An alternative estimate, assuming that real wage earnings remained stable in the long run –that is, that variations in real wage rates are offset by the number of hours allocated to work per occupied, cast no significantly different growth rates.
0.05 percent. In cumulative terms, real output per head increased mildly, over one-fourth between the late 13th and the mid-19th century.

Two clearly differentiated epochs can be distinguished in the economic performance of preindustrial Spain: 1270s-1590s and 1590s-1810s. In the first one, sustained progress -that can be tracked down to the 11th century- was broken by the Black Death. The loss of population reduced the ability to maintain per capita production levels in a frontier economy by destroying commercial networks and isolating population. By the early 14th century, Castile and, to a large extent, the whole of Spain, was a high land-ratio economy whose primary sector had a relatively small size, repopulation was driven by urban centres, and trade networks linked towns in the Douro valley and Camino de Santiago with Andalusia’s cities helped by the relatively abundance of specie. A commercial society, initiated with the Camino de Santiago in the 11th and 12th centuries, developed with Castilian trade expansion and the creation of a network similar to Hansa in northern Spain, the spread of Catalan economic interests in the Mediterranean, and the clearing of Gibraltar straits for southern trade (MacKay 1977: 74-75 127). All this resulted in a high income society with an expanding population, which was able to defeat Islam and extract large tributes. The exogenous shock of the Black Death by reducing population contributed to end this world.

A phase of long-term growth (1390s-1590s) opened after the Black Death in which economic expansion happened on the basis of a staple, wool, whose production adapted well to the relative abundance of land, and a dynamic trade sector which supplied not only international markets but also domestic ones as increasing living standards stimulated the creation of urban industry. Declining relative industrial prices since 1380 reinforced the allocation of resources to livestock rearing and opening up to European markets. Castilian transhumance expanded once Extremadura and La Mancha grass lands were won and the demand for wool grew both internationally, in the Low Countries and Italy and, then, in England (Childs 1978), and domestically, as local textile industry rise (Iradiel Murugarren 1974). Then, over 1490s-1590s, American colonization and international trade expansion contributed to stimulate economic activity. Thus, by the end of the 16th century, real output per head recovered pre-Black

47 A third one, of modern economic growth from the early 19th century to the present is outside the focus of this paper (See Prados de la Escosura 2007).
48 The plague hit Spain in 1348 and its effects were less devastating in the Kingdom of Castile, despite recurring plague outbreaks, than in the Kingdom of Aragon, Catalonia in particular (Pérez Moreda 1988).
49 Spanish took advantage of the closing of European markets to English wool during the Hundred Years War.
Death levels, while Spain had built an empire and become an economic centre which connected Europe and the New World.

The second epoch, ranging from the 1590s to the 1800s, had significantly different features. A sustained fall in per capita income until the mid 17th century opened it. The foundations of growth over 1390-1590, wool, trade, and urban activity, were no longer in place. The decline in wool exports after 1570 and the contraction in the purchasing power of American silver since the early 17th century (Flynn 1982) forced an inward-looking re-orientation of the Spanish economy. Low productivity and competitiveness in tradable production was reinforced by the Dutch disease brought by American silver (Forsyth and Nicholas 1983, Drelichman 2005). The rising cost of the empire fell on Castile, its richest and more populated kingdom. Growing taxation since 1575 led towns to increasing indebtedness which affected negatively urban activity, at the time of wool exports decline and Medina del Campo fair disappearance. As a result, population fled towns. The fiscal system collapsed as cities did.\textsuperscript{50} Increasing ruralisation, however, did not imply a significant improvement of agriculture’s efficiency.

An economic recovery only took place in the late 18th century. Population pressure led to extensive cultivation of land. Crops (cereals, in particular) took the lead over livestock. Population, who lived mostly in interior Castile and the Guadalquivir valley in the 15th century, shifted its balance towards the periphery where a more commercial agriculture developed. When in the early 19th century Spain per capita income went back to the level of the 1590s, she was no longer an empire and a link between Europe and the New World.

**Spain’s economic performance in European perspective**

If we now place Spain in comparative perspective we observe that, in the 14th and 15th centuries, she exhibited an opposite behaviour to that of most countries in Western Europe and the Eastern Mediterranean, in which the recovery from the Black Death is associated to the highest output per head of the early modern era (Pamuk 2007, Clark 2009, Broadberry et al. 2010). Conversely, in Spain, the Malthusian forces underlying economic performance in Western Europe, namely, population pressure on

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\textsuperscript{50} Monetary alteration (fiat currency, vellón) and debt default (1635-58), together with war with France and revolts in Catalonia (1640-53) and Portugal (1640-68) help to describe the new situation. It is worth noting that, contrary to the experience of the late 14th and 15th centuries, fiscal revenues fell and the primary sector gained weight while urban centres decline.
increasingly scarce resources after more than two centuries of demographic expansion, were not in action (MacKay 1977). On the contrary, most of Spain was a frontier economy with manpower shortage and land abundance, which implied high land-labour ratios and, most probably, increasing returns to labour. This explains why sustained progress took place when by 1264 the reconquest was over and only the Grenada kingdom remained under Islamic control. Empty lands, as the Moorish largely escaped from Christian rule, had to be populated and exploited in southern Spain. These results contradict the neo-Malthusian interpretation of 14th century Spain which would replicate Western Europe’s experience (overpopulation, land scarcity, diminishing returns to land, hunger) (Valdeón Baruque 1969).\footnote{The Malthusian interpretation of 14th century Spain has been rejected by García Sanz and Sanz Fernández (1988) and Casado Alonso (2009).} However, in achieving relatively high living standards prior to the Black Death, a high land/labour ratio was an important constituent, but also openness to goods and ideas from abroad mattered as it allowed Spain to take advantage of her privileged position at the crossroads of the European and African economies.

Spain’s position in comparative perspective in offered in Table 4 which provides output per head estimates for a sample of Western European countries (namely, Belgium, France, Germany, Italy, the Netherlands, and the U.K.) over 1300-1850, expressed relative to the U.K. level in 1850.\footnote{Relative levels to the U.K. in 1850 are from Prados de la Escosura (2000). Alternative comparisons can be carried out with directly estimates of output for England (Broadberry et al. 2010, Clark 2009) and van Leuwen and van Zanden (2009) but a common approach and wider country coverage has been preferred here. More accurate estimates for Germany and Northern Italy through a similar approach have been carried out by Pfister (2009) and Malanima (2009).} Aggregate output per head has been computed using constructed using a homogenous approach with a demand approach for agricultural output and employing urbanization to proxy economic activity outside agriculture.\footnote{We opted to choose the U.K. rather than England, as scholars usually do (Allen 2000), (van Zanden 2001) since we are looking at whole countries, not regions, and a major point in our paper is to establish trends in Spain, not just in Castile, and to compare Spain to other nations.} Thus, for each country, agricultural and non-agricultural output were expressed in index form with 1850 as 100 and weighted by their relative shares of GDP.\footnote{Sector shares in GDP were derived from Horlings (1997) for Belgium, Toutain (1997) for France, Hoffmann (1965) for Germany, Fenoaltea (2005) for Italy (1861), Horlings, Smits, and van Zanden (2000) for the Netherlands, and Feinstein (1998), for the U.K. This is a provisional estimate since, as it has been shown for the case of Spain, the use of fixed weights over such long time span creates an index number problem. A Divisia index is used for Spain although its discrepancies with the fixed weight index are not substantial (Table 3).} Allen (2000) data set provides population, agricultural output derived through the demand approach (using real wage rates as a proxy for real disposable income per
head), and urbanization (to proxy output in industry and services) for 1300-1800, that were completed with (Bairoch 1988) urbanization estimates for 1850 and national estimates of agricultural output during the first half of the nineteenth century.\textsuperscript{55}

In the long run, however, Spain experienced a sustained decline. For example, compared to Britain, she fell from having a 40 percent higher income in 1300 to two-thirds by 1850, although it is during the 17\textsuperscript{th} and early 18\textsuperscript{th} century when she fell behind and not only to the new leading nations (Britain and the Netherlands) but to Western Europe altogether. Spanish recovery in the first half of the nineteenth century—a significant achievement given that occurred at the time of the loss of empire and the complex institutional transition to a liberal society—fell short of the economic progress that took place in north-western Europe during the first Industrial Revolution. Thus, Spain suffered the paradox of breaking the Malthusian trap and experiencing modern economic growth for the first time while falling behind.

\textsuperscript{55} Thus, figures for agricultural output in 1850 were obtained from Allen (2004) for England, Horlings and Smits (1997) for Belgium (assuming that the growth rate over 1800-1850 was identical to that of 1810-50), Horlings, Smits, and van Zanden (2000) for the Netherlands, Tilly (1978) for Germany (proxied by estimates for Prussia over 1816-49), Toutain (1997) for France (1780/90-1845/54), and Federico and Malanima (2004) for Italy 1300-1850 (assuming that per capita consumption in North-Central Italy was representative of the whole country). In the Italian case, population and urbanization for has been drawn from Malanima (1998, 2003, 2005). Total population figures for 1850 were otherwise taken from De Vries (1984).
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Appendix: Data sources and procedures

All prices and wages were quoted in silver. Original regional series have been converted into grams of silver with the silver content of coins from Casado Alonso (1991), Hamilton (1934, 1936, 1947) and Feliu (1991).

All price indices (for agricultural and industrial goods and the CPI) for the Kingdoms of Castile and Aragon were derived as unweighted Divisia indices. Then, to obtain an aggregate index for Spain weights of two-thirds and one-third were assigned to the Kingdoms of Castile and Aragon, respectively, as a crude way to capture their relative size in terms of population over time.

The index for agricultural prices was constructed on the basis of those we previously built for Lérida, 1361-1500, from data in Argilés (1998); Aragon, from data in Zulaica (1994), 1276-1429, and Hamilton (1936),1429-1497; Valencia, 1413-1501, for which the index built by Allen (2001) has been accepted; Toledo, 1401-1475, from data in Izquierdo (1983); and Burgos, 1352-1501, from data in Casado Alonso (1985, 1991, 2009) and MacKay (1981), 1352-1501. For 1501-1800 price indices were constructed with the following sources: for Catalonia, Feliu (1991); New Castile, Andalusia, and Valencia, Hamilton (1934, 1947); Old Castile, Llopis et al. (2001) and Moreno (2002). For 1800-1850, a price index for all Spain was taken from Bringas (2000).

An index of manufacturing prices fro 1276-1500 was constructed on the basis of those we previously built for Toledo, from data in Izquierdo (1983), 1401-1475; Burgos, from data in MacKay (1981) and Casado Alonso (1985, 1991), 1390-1500; and Aragon /Zaragoza), from Zulaica (1994), 1276-1429, and Hamilton (1936), 1429-1500. For the period 1501-1860, we used the aggregate index constructed by Joan Rosés for Rosés, O’Rourke and Williamson (2007) who kindly supplied it to us.

A CPI for 1276-1501 was constructed as weighted average of agricultural (0.75) and industrial (0.25) price indices on the basis of local Divisia indices, except for Valencia, taken from Allen (2001). For 1501-1860, a Divisia index was derived from regional CPIs taken from the following sources: for Catalonia, Feliu (1991), 1501-1807, and Maluquer de Motes (2005) 1830-1860; Valencia, Allen (2001), 1501-1785; New Castile, Reher and Ballesteros (1993); Old Castile, Llopis et al. (2001), 1518-1650, and Moreno (2002), 1751-1860.

Nominal wage rate Divisia indices were computed for 1277-1500 from wage rates in Zulaica (1994), 1277-1423, and Hamilton (1936), 1423-1497, for Aragon;

Land rents, Aragon, 1276-1429, Zulaica (1994); Burgos, 1320-1520, Casado Alonso (1987, 2009); Andalusia, Ponsot (1986), western, 1504-1845, and Corona (1994), Jaen, 1520-1672; Old Castile, Sebastián Amarilla (1990), Leon, 1569-1835; García Sanz (1986), Segovia, 1651-1690, 1780-1817; Llopis (personal communication), Avila, 1790-1841; Álvarez Vázquez (1987), Zamora, 1683-1840; Catalonia, Duran (1985), Gerona, 1520-1800. The procedure used to get an aggregate series has been the following. First, the original regional series, commonly expressed in wheat, have been converted into grams of silver with price data from Hamilton (1934, 1947) and Feliú (1991) and silver content of coins from Feliú (1991). Then, we have taken log-growth rates of silver rents that have been combined into an unweighted Divisia index for land rent.

Urbanization rates: Spanish urban population, adjusted to exclude population living on agriculture, at benchmark years over 1530-1857 has been taken from Álvarez-Nogal and Prados de la Escosura (2007), was projected backwards to 1420, 1300, and 1000 with an estimate of urban population on the basis of Bairoch et al. (1988: 15-21) data base amended in 800 and 1000 with estimates by Glick (1979) and in 1300 with those by Bosker et al (2008). Adjusted urbanization rates, namely, the ratio of adjusted urban population to total population were, then, computed.
Table 1
Growth of Agricultural Goods Consumption per Head (%)
(Average logarithmic rates of variation)

<table>
<thead>
<tr>
<th></th>
<th>(I) (wage rates)</th>
<th>(II) (wage rates and land rent)</th>
<th>(III) (stable wage earnings)</th>
</tr>
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<tbody>
<tr>
<td>1280/9-1340/9</td>
<td>0.22</td>
<td></td>
<td>-0.09</td>
</tr>
<tr>
<td>1340/9-1370/9</td>
<td>-1.33</td>
<td>-1.29</td>
<td>-0.71</td>
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<tr>
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<td>-0.11</td>
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<tr>
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<td>-0.21</td>
<td>-0.12</td>
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<tr>
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<td>-0.06</td>
<td>0.00</td>
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<tr>
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<tr>
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<td>-0.09</td>
<td></td>
<td>-0.08</td>
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*Sources: See the text*

Table 2
Adjusted Rate of Urbanization* (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1591</td>
<td>14.5</td>
</tr>
<tr>
<td>1700</td>
<td>11.1</td>
</tr>
<tr>
<td>1750</td>
<td>13.5</td>
</tr>
<tr>
<td>1787</td>
<td>17.4</td>
</tr>
<tr>
<td>1857</td>
<td>23.2</td>
</tr>
</tbody>
</table>

* Share of population in towns of 5,000 and over, excluding those living on agriculture
*Sources: post-1530, Álvarez-Nogal and Prados de la Escosura (2007); pre-1530, see the text*
Table 3
Real Output per Head Growth (%)
(Average logarithmic rates of variation)

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Logarithmic Rate</th>
</tr>
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<tr>
<td>1280/9-1340/9</td>
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</tr>
<tr>
<td>1340/9-1370/9</td>
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<tr>
<td>1370/9-1590/9</td>
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<td>-0.18</td>
</tr>
<tr>
<td>1670/9-1790/9</td>
<td>0.11</td>
</tr>
<tr>
<td>1790/9-1850/9</td>
<td>0.33</td>
</tr>
<tr>
<td>1280/9-1850/9</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*Sources: See the text.*
## Table 4
### Output per Head in Western Europe (U.K. in 1850 = 100)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Belgium</th>
<th>U.K.</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Spain</th>
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Note: * Relative levels to the U.K. in 1850, Prados de la Escosura (2000). For Italy the level in 1850 was assumed to be that of 1861. Agricultural consumption per head computed using real wage rates as a proxy for real per capita income.

Sources: For Spain, Table 3, Estimate I; For other countries, Population, agricultural output, and urbanization for 1300-1800, from Allen (2000); urbanization for 1850, Bairoch (1988)
Sector shares in GDP, derived from Horlings (1997), Belgium; Toutain (1997), France; Hoffmann (1965), Germany; Fenoaltea (2005), Italy (1861); Horlings, Smits, and van Zanden (2000), Netherlands; Feinstein (1998), U.K.
See also the text.
Figure 1. Real Wage Rates, 1277-1850 (1790/99 = 100) (logs)

Sources: See Appendix

Figure 2. Land Rent-Nominal Wage Rate Ratio, 1506-1845 (1790/99 = 100)

Sources: See Appendix
Figure 3. Real Consumption per Head of Agricultural Goods, 1277-1850: Alternative Estimates (1790/99 = 100) (logs)

Sources: See the text.

Figure 4. Ratio Industrial to Agricultural Prices, 1277-1850 (semilog)

Sources: See the text
Figure 5. Share of Agriculture in GDP, 1277-1850 (current prices) (%)  
Sources: See Appendix

Figure 6. Real Output per Head, 1277-1850 (1850/59 = 100) (logs)  
Sources: See the text