The Decline of Spain (1500-1850): Conjectural Estimates

Carlos Álvarez-Nogal and Leandro Prados de la Escosura
(Universidad Carlos III de Madrid)

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Abstract

This paper attempts to quantify the decline of Spain over 1500-1850. In contrast to earlier estimates that focus almost exclusively on Castilian agriculture, we look at trends in urbanization and construct new measures of agricultural and aggregate output at both regional and national levels. A distinctive long-run behaviour is found across Spanish regions that rejects the identification between Castile and Spain. Per capita income grew in the sixteenth and the early nineteenth century, while contraction and stagnation occurred in the seventeenth and eighteenth centuries. In the long run, output per head did not improve until the early nineteenth century. At the time of her imperial expansion Spain was a relatively affluent nation and, by 1590, was only behind the Low Countries and Italy in terms of per capita income. Spain's decline sinks its roots in the seventeenth century while her backwardness deepened in the first half of the nineteenth century.

Keywords: Preindustrial Spain, Decline, Backwardness, Urbanization, Agriculture

JEL Classification: O47, N13, N93

Carlos Álvarez-Nogal
Departamento de Historia Económica e Instituciones
Edificio Foronda, Despacho 7.0.07
Calle Madrid, 126
28903 Getafe (Madrid), Spain
Tel. +34 916249621
canogal@clio.uc3m.es

Leandro Prados de la Escosura
Departamento de Historia Económica e Instituciones
Edificio Foronda, Despacho 7.0.14
Calle Madrid, 126
28903 Getafe (Madrid), Spain
Tel. +34 916249623
leandro.prados.delaescosura@uc3m.es

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The Decline of Spain (1500-1850): Conjectural Estimates[2]

Spain's macroeconomic performance from the conquest of Granada (1492) to the beginning of modern economic growth in the 1850s remains unclear. Although decline and backwardness are stressed by historians, no consensus exists about when Spain fell behind. While early modern historians place it between the late sixteenth and mid-seventeenth century (Hamilton 1938, Elliot 1961, Thompson and Yun 1994) modern economic historians locate it in the early nineteenth century when a painful definition and enforcement of new liberal property rights took place (Prados de la Escosura 1988).

In spite a hot and long-lasting debate on the historical decline of Spain (Hamilton 1938, Elliott 1961, Kamen 1978, 1981, Israel 1981) she was considered in isolation and no attempts were made at quantifying her economic performance.[3] Recently hypothetical exercises have been carried out with different outcomes: from a sustained decline to a moderate increase in GDP per head. Attempts to compare Spain with other European countries also cast contradictory results. Significant puzzles emerge from the debate. How was it plausible, for example, that if Spain were one of the poorest and dwindling countries in Europe, as suggested by van Zanden (2005a), could she succeeded in maintaining a permanent state of war with much wealthier rivals over almost three centuries?.[4] Actually, van Zanden's (2005a) guesstimates match Kamen's (1978: 41) earlier appraisal of imperial Spain: "a backward country with poor resources, dependent on external markets and external suppliers".[5]

Moreover, assessments of Spain's long-term economic performance rely on incomplete attempts to derive product per head in the Kingdom of Castile (Figure 1) largely on the basis of agricultural indicators. Regions outside Castile, especially those coastal areas that became very active overtime, are left aside.

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[2] We follow Paul David (1967:157) definition of 'conjectural estimates' as 'figures which are in the nature of predictions' in contrast with direct historical estimates that can afford internal consistency checks.

[3] Elliott (1961: 55-56) proposed in vain "to compare Spanish conditions with those of other contemporary societies, and then, if it is possible to isolate any features which appear unique to Spain, to search for their origins not only in the realm of national character, but also in the conditions of the soil and the nature of land-holding, and in the country's social and geographical structure."

[4] Elliott (1961: 63) pointed the similarities between Spain and East Europe, Poland in particular, exporters of primary produce and importers of manufactures, and with high income inequality.

[5] According to Kamen (1978: 49) Spain was "an underdeveloped country which never reaped the benefits of its imperial position". Cipolla (1980: 250) shares this perception: "The decline of Spain in the seventeenth century is not difficult to understand. The fundamental fact is that Spain never developed to begin with".

This paper investigates when did Spanish decline begin and investigates the evidence on economic performance during more than three hundred years. We start by examining the available estimates and conjectures on Spain's real product and the consistency of their underlying assumptions. We find that widening the focus to include regions other than Castile as well as economic activity outside agriculture is necessary and, as a first step, we look at urbanization levels and trends. Then, we carry out a new estimate of GDP on a regional basis. Specifically, we estimate movements in agricultural consumption and output using a demand function approach, while we proxy output trends in industry and services through changes in urban population (adjusted to exclude those living on agriculture), so tendencies in total output and output per head can be established at regional and national level. Finally, Spain' position within Western Europe is re-examined.

Our favoured results show a long-term productivity decline in agriculture, only partially reversed in the seventeenth century and, again, in the early nineteenth century. Urbanization rates, adjusted to exclude population living off agriculture, rose significantly in the sixteenth century and, again, in the eighteenth century (especially after 1750) while fell sharply in the seventeenth century. Overall, the adjusted rate of urbanization almost doubled between the early sixteenth and the late eighteenth century and, by 1850, was nearly two and a half times higher than in 1500. In aggregate terms, we can conjecture that per capita income hardly changed between 1500 and 1800, while increased slightly if the time span is extended up to 1850. Our results highlight the disparity in regional performance, especially between inland and coastal regions. When we look at specific periods we find that real GDP per head grew moderately in the sixteenth century (0.1 percent), declined between the late sixteenth century and 1700 (at -0.1 percent), practically stagnated during the eighteenth century, and rose in the early nineteenth century (at 0.3 percent annually).

In a comparative perspective, our findings support the view that when Spain colonised America and built a worldwide empire was not a poor country of warriors but a relatively affluent nation and, by the end of the sixteenth century, when she had achieved "the political hegemony of Europe" (Hamilton 1938: 168), Spanish per capita income was among the highest in Europe, only second to Italy and the Low Countries. Since the 1590s Spain experienced an absolute decline that only became relative in the early nineteenth century. Spain's decline sinks its roots in the seventeenth century while her backwardness deepened in the first half of the nineteenth century.

Available conjectures on Spain's economic performance

The available *conjectural estimates* about long-run economic performance in early modern Spain are summarized in Table 1. Their variance is large as they range from a decline to a rise in per capita income over 1500-1800, with Maddison (2003) and van Zanden (2005b) providing the extreme optimist and pessimist (+42 and -17.5 percent change) views, respectively.[6] A closer look reveals contradictory assessments of the sixteen century, from a substantial rise (Maddison) to a sharp fall (Carreras), while no consensus appears on the seventeenth century, usually considered the locus of Spanish decadence, and discrepancies emerge, once again, on the eighteenth century performance. Only Maddison's estimates cover up to 1850 and suggest a mild increase in per capita GDP.[7]

The contrast between Spain and the two leading early modern economies, Britain and the Netherlands, exposes a long-run decline (Table 2). From nearly parity in 1500, Spanish per capita income fell to represent half the British in the early nineteenth century.[8] With respect to the 'average' European income, guesstimates range from relative stability to a significant backwardness over 1500-1800. Maddison (2003), in particular, points to catching up in the sixteenth century, decline during the seventeenth century and, after the eighteenth century stability, falling behind in the early nineteenth century.

It is worth noting that Maddison and van Zanden based their estimates on previous attempts at quantifying early modern Spanish economic performance. In his most recent study van Zanden (2005a) follows Albert Carreras (2003), who, in turn, relied on contributions by García Sanz (1991b) and Yun-Casalilla (1994), while Maddison (2003) drew also on Yun's estimates. Moreover, van Zanden (2005b) regressed his own (and largely conjectural) per capita GDP estimates (van Zanden

[6] Computed as the natural logarithm of the ratio between the corresponding values for the final (1800 or 1820) and the initial (1500) dates.
[7] Maddison (2003) uses for 1820-1850 a figure derived from a previous study (Maddison 1995) in which he assumed that real per capita GDP growth between 1820-1850 matched that computed for 1832-1860 by Prados de la Escosura (1982: 110). However, Maddison (2003: 66) implicit yearly growth rate is 0.23 percent while Prados de la Escosura (1982: 69) is 0.34 percent. Later, Prados de la Escosura (1988) reckoned that real GDP per head increased at an annual rate of 0.14 percent between 1800 and 1860.
[8] Alternative estimates of Spanish per capita GDP relative to the United Kingdom in 1850 suggest a higher figure, that goes up to 64 and 68 percent, in purchasing power parity terms, in Prados de la Escosura (2000) and Bairoch (1976) computations, respectively, while it is only 43 percent in nominal terms (that is, when the conversion is made with the trading exchange rate) (Cf. Prados de la Escosura 2000).

2001) on the labour share in agriculture and real wage rates for a sample of countries. Then, he multiplied the parameters obtained in the regression for each independent variable by their corresponding values in every country, and their results were added up in order to derive per capita income for European countries at benchmark years for which figures were not available.

Hence, in order to assess the available guesses about early modern growth in Spain we must begin by examining how these computations were made by Yun-Casalilla (1994) and Carreras (2003) and testing their consistency against the available evidence.

Carreras followed an eclectic approach in which he derived GDP guesstimates on the basis of García Sanz (1991b) bold conjectures about Castilian fiscal pressure (that is, tax revenue expressed as a proportion of GDP) and combined them with Yun's GDP estimates from the expenditure side for the Kingdom of Castile.[9] Thus, Carreras, by (implicitly) identifying Spain with Castile, obtained Spain's nominal GDP as the result of dividing tax revenues –excluding revenue from America– by García Sanz's guesstimates of fiscal pressure, and used the available population data to derive GDP per head.[10] GDP estimates based upon hypotheses on the level of fiscal pressure are, therefore, far from accurate and should be treated with extreme caution.[11]

Yun-Casalilla (1994) based his computation of private consumption for late sixteenth and early seventeenth century Castile (c. 1590 and c. 1630) on different estimates of rural families' expenditure to which he added public spending in order to reach total consumption, as an approximation to GDP.[12] For 1750, he revised upwards

[9] García Sanz (1991b) reckoned that, by mid-eighteenth century, the *Rentas Provinciales* (that is, taxes paid in the Kingdom of Castile that mainly fell on consumption goods: alcabalas, cientos, millones, etc) represented between 4.0 and 6.5 percent of the Kingdom of Castile's national income. He went on to suggest that if, around mid-eighteenth century, these main taxes provided the Treasury with 25 percent less revenue than in 1600, while the population had increased by 15 percent, "it would be reasonable to estimate that tax revenues in 1600 represented around 10 percent of Castile's 'national' income". He added that fiscal pressure could have reached 5 percent of GDP around 1500, and up to 15 percent in the first half of the seventeenth century.

[10] However, as different fiscal authorities existed in Spain, any estimate of aggregate taxation would require information regarding the Kingdom of Aragon (that is, Aragon, Valencia, Catalonia, Balearic Islands) and the Kingdom of Navarre, in addition to that on the Kingdom of Castile (the dominant but declining part, that includes the rest of Spain) (See Figure 1). The *Decretos* (decrees) *de Nueva Planta* represented the institutional and fiscal unification of the Kingdoms of Castile and Aragon in the early eighteenth century that led to the introduction of new taxes in Aragon.

[11] Moreover, the data on taxation capture better, perhaps, the economic situation of the Monarchy than that of the Spanish economy.

[12] He appears to have neglected investment (at least, private capital formation, as public investment could be included under the public spending estimates) in his GDP estimates.

the Cadastre de Ensenada (1752) figures, while his estimates for the last decade of the eighteenth century are derived from the various contemporary sources.

How reliable are these figures? One way to putting available GDP per head estimates and guesses to the test is to compute a lower bound for per capita income, biasing downwards the estimates in order to show that even in such a case, our control estimates tend to be higher. To do so, we have used the following identity:

$$y = w * L/N * d/L * s^{-1} \quad [1]$$

where ***y*** represents per capita income; ***w***, the daily wage rate; ***L***, the economically active population; ***N***, total population; ***d/L***, the number of working days per occupied person each year; and ***s***, the share of labour in national income (Malanima 2006).[13]

Feliu (1991) provides information on unskilled wages (journeymen or day labourers' (*jornaleros*) and farm workers' (*peones*)), expressed in grams of silver, for Catalonia, along with similar data for Old and New Castile, Andalusia and Valencia originally from Hamilton (1934). We chose unskilled wages on purpose to get a lower bound estimate of income per head and to derive ***w*** we weighted the available evidence on unskilled wages for the Kingdoms of Castile (taken from Old and New Castile and Andalusia) and for Aragon (obtained from Catalonia and Valencia) by their shares in Spain's population (roughly three-fourths and one-fourth, respectively).[14]

Then, the proportion of the total population represented by the economically active population, ***L/N***, was needed. A figure of 30.5 percent was estimated from the Cadastre of Ensenada (1752) for the Kingdom of Castile by Grupo´75 (1977). Such a low figure results from the practice of excluding the female population from the economically active population (EAP) in the eighteenth century censuses.[15] This is an extreme assumption but, since our goal is to obtain a lower bound estimate for per capita income, we decided to accept it.

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[13] It can be easily shown that this expression can be transformed into
$y = w * L/N * d/L * s^{-1} = (w*d) / (N * s)$; from which s can be obtain: $s = (w*d) / (N * y)$

[14] That is, roughly three-fourths and one-fourth for the Kingdoms of Castile and Aragon, respectively. It is worth noting that money wages were often just a part of the returns to unskilled labour (López-Salazar 1986). Available evidence on the working poor for the 1840s suggests that a large gap existed between their expenditure and their income (García Sanz 1981). As individuals tend to conceal their income due to taxation, expenditure seems a better approximation to the concept of permanent income and has become a preferred measure of the standard of living. Such gap between income and expenditure is a recurrent phenomenon in present day studies carried on the basis of microdata obtained from household surveys (Milanovic 2005: 16-17). For present day Spain, cf. Goerlich and Mas (2001: 364).

[15] An even lower figure, 26.4 percent, results from the 1787 Floridablanca's population census. These figures are lower than those for the mid-nineteenth century: 35.8 percent in the 1850s and 36.5 percent as an average over 1850-1913. In nineteenth century estimates female agricultural labour has been excluded due to statistical errors. Cf. Prados de la Escosura (2003).

The next step was to establish the number of days worked, ***d***. Bairoch (1965, 1989) accepted 196-197 days for nineteenth century Europe, and Allen (2001) opted for a higher figure, 250 working days, for early modern Europe. However, in the Cadastre de Ensenada it was assumed that farmers worked 120 days per year, artisans, 180, and servants, 250 (Ringrose 1983).[16] We chose 180 days as a lower bound.

Finally, we need to know the share of labour in national income, ***s***. The labour share in national income is usually assumed to range between 0.5 and 0.6 (Crafts 1995, Crafts and Harley 1992). In our view, this probably represents an underestimate for early modern Spain where the endowment of capital was low.[17] We adopted the closest available estimate for Spain, that one for the 1850s, 0.75 (Prados de la Escosura and Rosés 2007). Since it is our purpose to obtain a lower bound estimate, this value for ***s*** seems adequate.

Our estimates represent, therefore, a lower bound estimate because of the astringent assumptions introduced in the calculation (the use of unskilled wages only, a low rate of activity, and a low number of days per worker and year). If, instead, we accept a higher number of working days, 250, the one allocated to services in the Cadastre de Ensenada, a participation rate of 55 percent, as in late eighteenth-century England (Voth 1998, 2001), and a labour share of 0.6, as it is usually assumed in the literature, we would reach a higher estimate, that could be increased further by using a weighted average of skilled and unskilled wages rather than just unskilled wages.

In order to facilitate the comparison between per capita income estimates resulting from our arithmetical exercise and the available estimates of GDP per head, all of them were converted in grams of silver.[18]

The conjectural estimates on GDP per head and our (lower and upper bound) control estimates are provided in Table 3. It clearly appears that Carreras (2003) and

[16] See also Vilar (1970: 129) and Santaolaya (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.

[17] Antrás and Voth (2003: 66) considered 0.6-0.7 an upper bound for Britain during the Industrial Revolution.

[18] The reason to convert nominal figures into grams of silver derives from the depreciation of the *real de vellón* from the early seventeenth century onwards. The large amount of *vellón* coinage (fiat money made of copper) in the seventeenth century was rejected by the public, instead of contributing to facilitate minor transactions (Motomura 1997, Sargent and Velde 2002). It is not possible to know what proportion of tax revenues were in silver and what proportion in *vellón*. Consequently, as we had to assume that all tax revenues were in *vellón*, GDP estimates based on fiscal pressure may be downward biased from the seventeenth century onwards.

Yun-Casalilla (1994) figures, and those that can be derived on the basis of García Sanz (1991b) conjectures on fiscal pressure, tend to be on the low side.

Why are these GDP guesstimates on the low side? Our proposed explanation is that they suffer from two main biases. The first one is that they only take one part of Spain into account: the Kingdom of Castile and, often, only Old and New Castile. Other regions, especially those on the Mediterranean periphery, amounting to approximately 30 percent of Spain's territory, are left aside.

A way of assessing the extent to which focusing exclusively on Castile introduces a downward bias in Spain's GDP estimates is to look at regional population trends. The scant information available indicates substantial differences in population growth across regions (Table 4).[19] The more vigorous demographic performance in the Kingdom of Castile during the sixteenth century is clear, with New Castile and Galicia, where the rate of growth exceeded 1 percent per year, standing out. The Kingdom of Aragon took over in the seventeenth century, with moderate growth, while the population of the Kingdom of Castile fell, despite the increases recorded in some regions (Basque, Murcia, and Andalusia). In the eighteenth century, only Murcia and Asturias (and, to a lesser extent, Galicia) were able to match Catalonia and Valencia's demographic dynamism. Early nineteenth century demographic acceleration was led by the peripheral regions with the pace of Catalan growth doubling that of Castile. In short, the uneven regional expansion since the sixteenth century changed the geographical distribution of Spain's population and, consequently, pushed economic activity (with the exception of Madrid) towards the coastal areas. Regional discrepancies in population growth could signal very different paths of economic progress as demographic expansion often leads to widening the market and increasing specialization (Reis 2005: 198). Alas, such different regional demographic performance is neither captured by current assessments of early modern Spain's economic performance nor by trends in real wages that offer roughly the same declining pattern across regions (Figure 2).

A non negligible caveat to be made is that the population figures assigned to Spain in international comparisons (de Vries 1984, Bairoch, Batou, and Chèvre 1988, Allen 2000) present large discrepancies with those currently used by Spanish historical

[19] The dispersion of regional population growth rates (as measured by the coefficient of variation) rose from 0.5 between 1530 and 1591 to 2.2 in the seventeenth century, before falling to 0.6 and 0.3 in the eighteenth and early nineteenth century, respectively.

demographers. Population figures by Bairoch and his associates are significantly higher than those generally accepted by Spain's historians (Table 5).[20] The resulting trends in population growth are also discrepant as illustrates, for the sixteenth and early nineteenth century, the contrast between the brisk population expansion offered by the 'consensus' estimates and the sluggish pace by Bairoch's figures.

The second bias derives from the almost exclusive concentration on agriculture.[21] It is true that there is little documentary evidence on trade, industrial production in rural areas, and services but the lack of data does not justify its neglect.[22] In fact, albeit a significant part of the Spanish economically active population worked in services (López-Salazar 1986, Alvar Ezquerra 1989, Reher 1990, Yun-Casalilla 2004), this sector has been neglected in GDP guesstimates. If the arrival of American silver caused a *Dutch disease* in Spain (Forsyth and Nicholas 1983, Drelichman 2005), it should be reflected in an increase in non-tradable goods' production, that is, mainly in construction and services. [23] Neither sector, however, has been taken into consideration in the available estimates.

An active transport sector, for example, had to develop if large quantities of foreign goods were imported into Spain, given the nature of the country's geography and particularly that of Castile which cities were located several hundred kilometres away from the coast.[24] Evidence for Old Castile and Andalusia villages indicates that a non negligible part of the economically active population was employed in transportation (Herr 1989, Bernardos Sanz 2003). Transport activities must have had an impact on urban centres, not only because they received their supplies, as in the case of

[20] It should be noted that de Vries (1984) also tends to overestimate the population: by more than 40 percent for 1500 and around 20 percent for 1600.
[21] For example, computing expenditure on the basis of peasant family consumption, as Yun-Casalilla (1994) does, implies assuming that no difference existed between urban and rural consumption levels.
[22] The fact that, in the late sixteenth century, real wages in Spain were among the highest in Europe (Allen 2001) also suggests that activities outside agriculture must be taken into account.
[23] The arrival of American silver provides a case in point. There is almost complete agreement among historians about the impact of New World precious metal. In Europe, American silver reduced transaction costs and encouraged trade, leading to an increase in output. Both rural and urban industrial growth received a stimulus. It also strengthened the trade link between Europe and Asia, diversifying consumption and opening new markets to an active group of traders (Hamilton 1934). Spain, however, would be the only country negatively affected by American silver, which pushed up nominal wages, made agricultural products more expensive, encouraged the consumption of luxury goods and acted as a disincentive to work.
[24] A high transport activity must have remained until, at least, mid-seventeenth century, as the amount of American specie arriving in Spain, the main source used to pay for the imports, grew until 1620. The scarcity of transport is, nonetheless, one of the elements most frequently put forward to explain Spain's economic backwardness (Ringrose 1970).

the capital city, Madrid, but because of the development of highly active trade networks that required its services.[25]

To sum up, a more comprehensive view of early modern Spain's economic performance requires widening the focus to include regions other than Castile and economic activity outside agriculture. Looking at the pace of urbanization is one way to do it, as it was in towns and cities where most, though not all, the industrial and service sectors' activity took place.

Urbanization: A glance at long-run performance outside agriculture

By comparing figures for urban dwellers with those for the total population we can trace urbanization trends through the Early Modern Age. But how can we define 'urban' population? To keep consistency with Bairoch, Batou, and Chèvre (1988), we define 'urban' population as dwellers of towns of 5,000 inhabitants or more. Such a definition is arbitrary and other authors prefer a threshold of 10,000 (de Vries 1984) or 20,000 (Flora 1981) inhabitants.[26] However, maintaining a constant threshold over time, while population grows, is questionable (Wrigley 1985).

It is 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.[27] In the case of Spain, it has been argued, urbanization rates are over-exaggerated due to the existence of 'agro-towns', especially in central and southern Spain. 'Agro-towns', a legacy of highly concentrated landownership that led to a large proportion of landless agricultural workers, were mainly located in Andalusia, Murcia, and the south of Valencia (Casado 2001, Reher 1990).

Unfortunately, it is far from easy to exclude that part of the population totally or partially employed in agriculture from the urban population for the early modern age.

[25] Such networks distributed and traded the foreign goods consumed in Spain that were paid for, not only with silver, but also with wool, high quality cloth or raw materials. One of the most active trade centres was the area of Bilbao and Navarre which linked the French border and the ports along this part of Spain's north coast with the central plateau (Priotti 2005). While, during the sixteenth century, smuggled goods from France passed through Bilbao or Navarre on their way to Valladolid, Burgos and Medina del Campo, in the following century the destination of such goods was mainly Madrid. Merchants from Soria went to the capital to stock up on these imported goods. Madrid's importance lay not only as a centre of consumption but also in its role as a hub of redistribution for all types of merchandise to the rest of the peninsula. Trading activity, in addition to that linked with America via the *Carrera de Indias* also took place in the south.

[26] Bairoch, Batou, and Chèvre (1988) employ alternatively 2,000, 5,000, 10,000, and 20,000 inhabitants.

[27] In order to mitigate the inclusion of 'agro-towns', in which most of the population is employed in agriculture, Malanima (1998), for example, proposes a lower limit for being considered urban: 5,000 inhabitants for the north and centre of Italy, and 10,000 for the south of the country.

Likewise, it is difficult to leave out the rural population totally or partially occupied in industry or services as the diversification of labour activities was a widespread phenomenon (Federico 1986, Domínguez 1994). In Spain, a non negligible share of the rural population worked in manufacturing and in the provision of services during the slack season in agriculture (Herr 1989, López-Salazar 1986). It is also true that farmers and rural labourers could be found among urban population and, consequently, neither the income of the rural population derived exclusively from agriculture, nor that of the urban population came only from industry and services. Thus, alongside the existence of 'agro-towns', we should keep in mind non-agricultural activities carried out by the rural population (storage, transportation, domestic service, construction, light manufacturing).[28] Perhaps, then, rather than assigning each worker to a single occupation a more rigorous option would be to measure employment composition by sector in terms of days or hours (Wrigley 1985).[29] More important, however, from the point of view of economic growth is to emphasize that the reduction in transaction costs and the specialization associated to a more intense use of the market in urban centres does not conflict with the kind of economic activity performed by those living in towns (in other words, urban dwellers, regardless their occupation, benefited from the use of the market more than those living in the countryside).

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. Reher's computations are on the high side as he increased artificially the share of urban population employed in agriculture by allocating all day labourers to this sector while excluding servants from the labour force. Recently, Llopis Agelán and González Mariscal (2006) introduced a more astringent definition of urban population: 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) less than half of its economically active population (EAP) occupied in agriculture. This way they estimated,

[28] Wool provides a case in point in early modern Spain. A mainly rural activity, it had both industrial and services (trade, transport, financial services) dimensions (García Sanz 1986).
[29] The number of days (and hours) worked per EAP in Spain was lower in agriculture than in industry and services leaving extra time to work in non-agricultural activities. Cf. Santaolaya (1991), Vilar (1970: 19) and Ringrose (1983).

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).[30]

Notwithstanding the existence of 'agro-towns', a large proportion of urban economic activity was associated to industry and services. From data on the six major cities in sixteenth century Old Castile, Yun-Casalilla (2004) reckons that agricultural employment represented, on average, 8 percent of the total labour force. For the late eighteenth century Pérez Moreda and Reher (2003: 129) observe that most urban day labourers were employed outside agriculture and, according to their estimates from the 1787 population census, farmers (*labradores*) only represented 7.6 percent of the urban population in Spain.

In our case, we accepted the 5,000 inhabitant conventional threshold to define an urban centre, but qualified it by previously adjusting the urban population downwards to exclude those living on agriculture. In order to distinguish the shares of those employed in agricultural and in non-agricultural activities for both the total urban and rural population we have carried out an arithmetical exercise along the lines suggested by Wrigley (1985) and more recently Allen (2000) that, nonetheless, introduces some departures from the original approach. Wrigley assumed that all the agricultural population lives in rural areas so the crucial distinction to make is between the agricultural and non-agricultural shares of rural population.[31] However, since the existence of 'agro-towns' is accepted in the case of Spain, our challenge has been to establish the share of population employed in agriculture in both the rural and the urban populations.

In order to do so, we could start by comparing the share of the economically active population ($\boldsymbol{L}$) occupied in agriculture ($\boldsymbol{L_{agr}/L}$), with the share of total population ($\boldsymbol{N}$) living in rural areas ($\boldsymbol{N_{rur}/N}$). If the ratio between the two shares [($\boldsymbol{L_{agr}/L}$):($\boldsymbol{N_{rur}/N}$)] is above one, it can be claimed that part of the population living in towns worked in agriculture. Conversely, a ratio below one suggests that part of those living in the countryside work for industry and services. This way we could distribute rural and urban population into agricultural and non-agricultural. However, a further adjustment is required to allow for urban-rural differences in the proportion of total population ($\boldsymbol{N}$) in working age, or potentially active population ($\boldsymbol{PAP}$), and in the share of the working

[30] 14.5 percent if we accept a less astringent definition of urban population.
[31] Allen (2000) accepts the difficulties involved in estimating the number of urban farmers, but claims that 'their number was small as is the error from assuming it was zero'.

age population (***PAP***), which is economically active (***L***). This way, a more accurate test can be performed by comparing the agricultural and the rural economically active populations (L_{agr}/L_{rur}).

Fortunately, we have information on the ***PAP/N*** ratio in both rural and urban areas by region for 1787 (Marcos Martín 2005). This ratio (computed –due to data restrictions in the early modern population censuses– as population ages 16 to 50 over total population) differs for each region (***i***) between urban $(PAP/N)_{urb\ i1787}$ and rural $(PAP/N)_{rur\ i1787}$ areas, being larger in the former, but with a low dispersion in both cases.[32] The implication is that using rural and urban population without a previous adjustment for age composition would bias our results against agricultural employment as, on average, the rural ***PAP/N*** ratio is 87.5 percent of the urban one. Unfortunately, there are no data on the ***PAP/N*** ratio over time except for New Castile for which it was computed by Reher (1991: 70-74) from the late sixteenth century onwards. Thus, we were forced to approximate long-run changes in Spain by those in New Castile (***NC***) $(PAP/N)_{NCt}$.[33] Therefore, we derived the urban and rural working age population for every region ***i*** at each benchmark year ***t*** (= 1530, 1591, 1700, 1750, 1787, 1857) as follows[34],

$$PAP'_{urb\ it} = N_{urb\ it} * (PAP/N)_{urb\ i1787} * ((PAP/N)_{NCt} / (PAP/N)_{NC1787}) \quad [2]$$

$$PAP'_{rur\ it} = N_{rur\ it} * (PAP/N)_{rur\ i1787} * ((PAP/N)_{NCt} / (PAP/N)_{NC1787}) \quad [3]$$

Then, in order to arrive to regional figures for economically active urban ($L_{urb\ it}$) and rural ($L_{rur\ it}$) populations at each benchmark we needed to derive the relevant ***L/PAP*** ratios. Alas, we were only able to compute the ***L/PAP*** ratio for 1787 without being able to distinguish between urban and rural ratios. Thus, we were forced to estimate regional figures of urban and rural ***EAP*** for every region and benchmark year as

$$L'_{urb\ it} = PAP'_{urb\ it} * (L/PAP)_{i1787} \quad [4]$$

$$L'_{rur\ it} = PAP'_{rur\ it} * (L/PAP)_{i1787} \quad [5]$$

[32] They were, on average, 55.7 and 48.8 percent in urban and rural areas, respectively. The urban and rural coefficients of variation are 0.056 and 0.023, respectively and are computed from Marcos Martín (2005). The regional dispersion in the activity rate (EAP/PAP) is also low, 0.113.

[33] Regional dispersion was low for PAP/N in 1787 but we do not really know if this was the case in previous epochs. In New Castile, the PAP/N ratio, computed for the share of population between 15 and 50 years old, was rather stable over time with less than a 5 percentage variation around the 1787 ratio (Reher 1991: 70-74).

[34] In expressions [2] to [12] ´ means an approximated estimate, as opposed to the actual value, since some simplifying assumptions were needed in order to facilitate the computation.

Next, we compared the economically active population occupied in agriculture (L_{agr}), with that living in rural areas (L'_{rur}). If $L_{agr} > L'_{rur}$ it can be presumed that part of the population living in towns worked in agriculture. Conversely, if $L_{agr} < L'_{rur}$ the implication is that those living in the countryside allocated part of their working time to industry and services. This way, we distributed the rural (L'_{rur}) and urban (L'_{urb}) economically active populations into agricultural ($_{agr}$) and non-agricultural ($_{nonagr}$) occupations and reached a figure for urban non-agricultural labour ($L'_{urb\text{-}nonagr\ it}$).

$$L'_{rur\text{-}nonagr\ it} = L'_{rur\ it} - L_{agr\ it} \quad \text{if } L'_{rur\ it} > L_{agr\ it}\text{, 0 otherwise} \quad [6]$$

$$L'_{rur\text{-}agr\ it} = L'_{rur\ it} - L'_{rur\text{-}nonagr\ it} \quad [7]$$

$$L'_{urb\text{-}agr\ it} = L_{agr\ it} - L'_{rur\ it} \quad \text{if } L_{agr\ it} > L'_{rur\ it}\text{, 0 otherwise} \quad [8]$$

$$L'_{urb\text{-}nonagr\ it} = L'_{urb\ it} - L'_{urb\text{-}agr\ it} \quad [9]$$

Thus, economically active population outside agriculture is obtained as

$$L'_{nonagr\ it} = L'_{rur\text{-}nonagr\ it} + L'_{urb\text{-}nonagr\ it} \quad [10]$$

Moreover, we can estimate the adjusted population in towns of 5,000 or more inhabitants (excluding those living on agriculture), by re-scaling the resulting figures for urban economically active population outside agriculture with the activity rate (L/N),

$$N'_{urb\text{-}nonagr\ it} = L'_{urb\text{-}nonagr\ it} / (L'_{urb\ it} / N_{urb\ it}), \quad [11]$$

Thus, we can obtain an adjusted rate of urbanization (Ua_{it}) that partly offsets, at least, the upward biased effect of the agro-towns:

$$Ua_{it} = 100 * N'_{urb\text{-}nonagr\ it} / N_{it} \quad [12]$$

Regrettably, though, we lack data to compute the share of labour in agriculture (L_{agr}/L) at each benchmark year. For L_{agr} evidence can only be obtained from the Cadastre of Ensenada (Grupo´75 1977) for the Kingdom of Castile in the 1750s, and from Floridablanca's population census for the whole of Spain in 1787.[35] This shortcoming was also faced by Wrigley (1985) and Allen (2000). Wrigley (1985) assumed that, in early sixteenth century England and France, up to 80 percent of the rural labour force was in agriculture and he reduced arbitrarily this figure over the three following centuries. Allen (2000) accepted the same percentage for most European countries *circa* 1500 and interpolated the years up to the first one (1800) for which he had estimates. In our case we followed Wrigley and Allen and assumed a fixed 80 percent share of EAP in agriculture as the starting point in 1530 and interpolated log-

[35] Reproduced in Llopis Agelán (2001).

linearly the shares between 1530 and 1787.[36] A sensitivity test was carried out assuming that the 1787 $\boldsymbol{L_{agr}/L}$ remained unchanged for the entire time span considered. Although slightly different, the results exhibited the same trends for the adjusted urbanization rates.[37]

Spanish urbanization rates over three and a half centuries, both unadjusted and adjusted to exclude population living on agriculture, are presented, alongside those derived by Bairoch, Batou, and Chèvre (1988), in Table 6. The figures by Bairoch and his collaborators suggest a stable rate of urbanization of around 20 percent, with a moderate rise in the sixteenth century and a similar decline between mid-eighteenth and mid-nineteenth century. Our figures, in contrast, indicate a substantial increase in urbanization during the 1500s, a sharp fall in the seventeenth century that was reversed during the eighteenth century.[38] In the early nineteenth century both the unadjusted and adjusted rates of urbanization continued expanding at 0.4 percent yearly. It is worth stressing that the discrepancy between the unadjusted and adjusted urbanization rates affects mainly to Andalusia, Murcia, and Valencia, as a result of the existence of agro-towns (Tables 7 and 8). By 1857, the population living in towns reached around one fourth of total population for the adjusted rate (and almost one third for the unadjusted one), that is, nearly two and a half times the level in the early sixteenth century (although only one and a half times compared to 1591). This represents an annual growth of 0.26 percent for the adjusted urbanization rate (0.29 percent, for the unadjusted one) over three and a half centuries, while, according to Bairoch, the rate of urbanization remained unaltered. Moreover, our adjusted rate of urbanization for 1787, 17.6 percent (including the Canary Islands), is higher than the one proposed by Llopis and Mariscal (2006) which ranges between 12.7 and 14.5 percent.

Highly unequal regional urbanization rates can be observed.[39] The Kingdoms of Castile and Aragon exhibited clearly different trends. In the Kingdom of Castile the

[36] The share of EAP in agriculture in regions of the Kingdom of Castile is systematically higher in the Floridablanca Census (1787) than in the Cadastre de Ensenada (1752). We opted for the former as it provides an upper bound for our $\boldsymbol{L_{agr}}$ estimates and, hence, we bias downwards the adjusted urbanization rates.

[37] The adjusted rates of urbanization for Spain resulting from accepting the 1787 share of labour force in agriculture as fixed over 1530-1787 are only different from those obtained by assuming that, initially (1530), the 80 percent of the labour force was occupied in agriculture, for the sixteenth century. Thus, the alternative results are: 12.0, instead of 9.9 percent, for 1530; and 16.5, instead of 14.5 percent, for 1591.

[38] Cumulative annual rates for the unadjusted and adjusted urbanization rates were, respectively, 0.8 and 0.6 percent in the sixteenth century, -0.55 and -0.24 percent in the seventeenth century, and 0.9 and 0.5 percent in the eighteenth century.

[39] The coefficient of variation was kept around 0.8 for the unadjusted rates and a slightly lower for the adjusted ones.

(unadjusted) rates of 1591 were only comfortably surpassed in 1787, and then just in Murcia, the Basque Country and New Castile (due to Madrid's capital city effect). The slowdown experienced in the seventeenth century and the subsequent, gradual recovery affected both Kingdoms of Castile and Aragon. Population in the cities fell and de-industrialization took place in Castile, where the rate of urbanization slumped to 8.8 percent in 1646.[40] By the mid 1640s, this urban decline had reached an end, except in New Castile and the Basque Country where it persisted until 1700. In contrast, all the regions of the Kingdom of Aragon, except the Balearic Islands, peaked in the late eighteenth century. Rapid urban growth during the eighteenth century, especially in its second half, allowed the Kingdom of Aragon to recover the leading position it had relinquished during the 1500s.[41]

Table 9 provides another facet of regional diversity: the pace at which adjusted rates of urbanization progressed, that exhibits a much higher dispersion.[42] The growth of the urbanization rate was impressive in New Castile and Extremadura during the sixteenth century (more than four times faster than the national average). Northern regions experienced accelerated urbanization in the late eighteenth and early nineteenth century. It is worth pointing that the adjusted rate of urbanization did not fall in seventeenth century Andalusia (although the unadjusted rate shrank) and this partly explains the milder contraction in Spain's adjusted urbanization rate. The big urban push of the late eighteenth century in Valencia, Murcia, and Catalonia, after the recovery of the early 1700s, contributed to overcome the national peak level attained in 1590.

We can conclude, then, by stressing that urbanization did not remain stagnant, as suggested by Bairoch, Batou, and Chèvre (1988), but experienced dramatic changes across regions and over time. When placed in European perspective, the adjusted urbanization in Spain grew at a similar pace to the leading countries (England and the Netherlands) in the sixteenth century; fell more dramatically than any other nation during the seventeenth century; and recovered in the eighteenth century, achieving a comparable increase to that of England (Wrigley 1985, Malanima 1998, 2003). In the

[40] De-industrialization in Castile is well documented. Cf. Reher (1990) and López-Salazar (1986) for New Castile and García Sanz (1986) and Yun-Casalilla (1987) for Old Castile.
[41] Lack of data prevents us from measure the depth of the urbanization decline in the Kingdom of Aragon during the seventeenth century.
[42] The coefficient of variation reached 2.1 and 2.40 in the sixteenth century and in the early eighteenth and was a bit lower in the seventeenth (1.6) and the late eighteenth and early nineteenth century (1.4 and 1.3, respectively).

early nineteenth century, Spain's urbanisation gains fell short of France's and England's (Bairoch 1988). On the whole, the increase in Spain's rate of urbanisation over 1500-1850 was only second to England's.

As changes in the 'adjusted' urbanization cast light on the behaviour outside agriculture our findings challenge the conventional assessments of Spanish economic performance and leads us to investigate what happened to aggregate economic performance.

Where can we go from here? New conjectural output estimates

In a pre-industrial economy, according to Wrigley (1985), increases in real per capita income are, *ceteris paribus*, linked to the proportion of the total population living in urban centres.[43] This approach finds support in van Zanden (2001) who argues that "regional differences in levels of development ... are perhaps best approached via variations in the urbanization ratio".[44] More cautious, Malanima (2003), in the case of early modern Italy, uses urbanization to capture output trends in industrial and services,[45] while computes agricultural output indirectly through a demand approach. Analogously van Zanden (2001: 71-2) employs a 'development index' derived by combining population and urbanization ratios to measure European countries' progress between 1500 and 1800.

Our strategy to arrive to aggregate output estimates for economic activities outside agriculture has been, following Malanima's (2003) approach, to accept adjusted urbanization as a proxy. However, efficiency changes resulting from variations in the sectoral composition of labour 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

[43] In the historical literature parallels have been drawn between movements of urbanization rates and those of per capita GDP. The link between increasing urbanization and economic growth is predicated on the fact that cities spread the use of the market and stimulate innovation (North 1982, Boserup 1987). 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. Acemoglu, Johnson, and Robinson (2005), Craig and Fisher (2000), Reis (2005), Peter Temin (2006), Wrigley (1985).

[44] Cf. Craig and Fisher (2000: 114) for a similar proposal that includes using changes in the urbanization rate as a proxy for per capita income growth.

[45] Malanima (2003: 281) emphasised that he did not identify urban population with the share of the labour force outside agriculture but, rather, suggested a relationship between urbanization and non-agricultural output, regardless whether industrial and services output was produced in town or countryside. Malanima (2003: 281-3) ran a regression between the share of non-agricultural activities in GDP and the urbanization rate over 1861-1938 and used the parameters from the regression to predict the relative size of industry and services for each level of urbanization.

employment and the productivity gap between industry and services. Furthermore, we allowed for changes in the potentially active to total population ratio (PAP/N) that could affect our index.

Services increased relative to manufacturing in terms of output and employment during in early modern 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).[46] Given the lack of national data, we arbitrarily assumed that the evolution of the internal composition of non-agricultural employment in Spain over three hundred years 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 over the entire period (1530-1750). The resulting intersectoral shift effect [$IS = (L_s/L_{i+s}) + (1.4 * (L_i/L_{i+s})$] shows a mild decline over time.[47]

Changes in the potentially active to total population ratio (PAP/N) can also affect our index of output outside agriculture. Alas, we only know the evolution of the PAP/N ratio for the case of New Castile from 1586 onwards, that does not exhibit major changes over time.

Therefore, trends in the proposed index of output outside agriculture do not appear to be significantly altered by either demographic or output composition changes.

As regards agricultural output we have estimated it indirectly. Given the lack of hard empirical evidence, two alternative ways of deriving its trends have been put forward for early modern Europe. 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, when data are available, for the agricultural trade balance) and labour productivity can be easily derived if we have crude estimates for the

[46] For example, in Segovia (Old Castile), an industrial centre, services went from representing 17.6 percent of the economically active population employed outside agriculture in 1561, to 19.4 in 1586, and to 22.3 percent in 1750 (García Sanz 1991a: 161). In New Castile, the relative size of services also increased within non-agricultural employment. According to López-Salazar (1986: 24-42), in Ciudad Real, it rose from 36 percent in 1690 to 50 percent by 1750. More detailed information is provided by Reher (1990: 27) for Cuenca where services moved up from 29 percent in 1561 to 49 in 1752 and, then, to 64 percent in 1856.

[47] If alternatively the productivity gap for the 1850s were used (Prados de la Escosura 2003) the productivity index would rise slightly over 1750-1850.

economically active population in agriculture.[48] Crafts (1976, 1980, 1985) criticised the assumption of 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.[49]

The most recent estimate using the demand function approach has been Allen's (2000) who derived agricultural output per head and worker for a sample of pre-industrial European countries.[50] He firstly estimated agricultural consumption per head that, once adjusted for net food imports, allowed him to derive output per head. Then, total output was obtained with population figures and divided it by the economically active population in agriculture to estimate labour productivity. Real consumption per head of agricultural goods (C) can be expressed as,

$$C = a\, P^{\varepsilon}\, W^{\mu}\, M^{\gamma} \qquad [13]$$

in which a represents a constant to which Allen (2000) arbitrarily assigned the value of one, P and M denote agricultural, and non-agricultural prices relative to the consumer price index (CPI), W stands for real wages, while ε, μ, and γ are the values of own price, income and cross price elasticities, respectively. If we now take rates of variation (denoted as low case), we get:

$$c = \varepsilon\ p + \mu\ w + \gamma\ m \qquad [14]$$

We have replicated Allen's calculations for the main Spanish regions at given benchmarks between 1530 and 1857 and, later, derived a national figure. Since we only could estimate agricultural consumption per head for seven regions through the demand approach, we obtained a national estimate by applying a scalar to these regions' population weighted average. Such scalar was the ratio between the national average and that for those seven regions derived through the Wrigley approach.

We adopted Federico and Malanima's (2004) guesses for own price (ε = - 0.5), income (μ = 0.4) and cross price (γ =0.1) elasticities of demand.[51] Alternatively,

[48] Such method was already used (and sometimes adjusting for the food trade balance) for eighteenth century Britain (Deane and Cole 1967, Overton 1996), nineteenth century Spain (Simpson 1989, 1995) and, more recently, late medieval Italy (Federico and Malanima 2004).

[49] However, recent research on present day's poor countries reveals that consumption per head of food staples remains constant in aggregate terms as per capita income rises (Bouis 1994). It should notice that Wrigley's proposal is a particular case of a demand function of agricultural goods in which price and income elasticities are zero.

[50] 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.

[51] The significant similarities between Spain and Italy suggested us to do it. Allen (2000) assumed slightly different values for own price (ε = - 0.6) and income (μ = 0.5) elasticities of demand. We replicated the

elasticities could have been adjusted over time as income per head changes. The literature shows that income elasticity for food falls as per capita expenditure goes up (Engel's Law), while the opposite tends to occur, in absolute values, for its own price elasticity (Lluch et al. 1977). However, since per capita income in early modern Spain remained at low levels, 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.

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.[52] Fortunately, the available evidence for the late eighteenth and early nineteenth century indicates that trade represented a small share of agricultural output.[53] In any case, the assumption of balanced agricultural trade seems more acceptable at national than at regional level and these regional trade imbalances may affect our regional output estimates. During the eighteenth century some regions, like Old Castile's surpluses in grain and wine production were sent to the northern coast, while cereals from Aragon supplied Catalonia (Ringrose 1970, Llopis 2001). However, the recurrent deficit in cereals in the coastal regions was often covered by imports from abroad as transport costs represented a serious obstacle to trade in low value per unit of volume commodities (Palacio Atard 1960, Zabala 1983). A similar situation can be depicted for the sixteenth and seventeenth centuries (Grafe 2001).

Thus, output per head ($\boldsymbol{q}$) equals, by construction, per capita consumption ($\boldsymbol{C}$), and labour productivity can be, then, derived as:

$$\boldsymbol{(Q/L)_{agr} = q\ N/L_{agr}} \qquad [15]$$

exercise using Allen's values and the results did not change significantly. These alternative computations are available upon request.

[52] 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.

[53] 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 conjectural calculation 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 are tend to be downward biased over 1787-1857.

We departed from Allen's estimates of agricultural output in early modern Spain by using different regional data set for agricultural and non-agricultural prices, consumer price indices (CPI), and real unskilled wages (***W***).[54]

The use of unskilled, instead of average, wage rates does not alter our results as the skill premium remained relatively stable in early modern Spain.[55] Only if the shares of skilled and unskilled workers within the labour force had changed significantly over time would the growth rates of average and unskilled wages differ.[56]

Evidence on wages refers only to wage rates and not to wage earnings, as no adjustment is made for the number of hours worked per person every year. Changes in work intensity affect wage earnings. In the early modern age, an intensification in the time allocated to work occurred, either to offset the decline in wages rates by increasing the amount of working time (van Zanden 1999) or because the wider consumption choices resulting from new industrial developments increased the opportunity cost of leisure (de Vries 1994, Voth 1998, Allen 2004b).[57] If in Spain, for example, the number of yearly hours per worker increased over time, as it was the case in late eighteenth century England (Voth 1998, 2001), then, our real wage rates would only provide a lower bound for the actual improvement in real wage earnings.[58]

In Spain, an intensification of work might have taken place since the mid-eighteenth century as a result of the shift from extensive livestock rearing (sheep) to crops (wheat, vineyards, olives but also cash crops along the Mediterranean coast) as population grew and relative prices changed, or during the first half of the nineteenth

[54] All prices and wages were quoted in silver. Agricultural prices were constructed for Catalonia, New Castile, and Andalusia on the basis of prices quoted in Feliu (1991) and weights for cereals, meat, poultry, wine, and olive oil for 1789 (Feliu 2004). We used wheat prices, otherwise. Thus, for Old Castile, wheat prices come from Hamilton (1934, 1947); for Murcia, from Caro (1985); for Valencia, from Palop (1975) and Hamilton (1934, 1947); and for Majorca, from Vaquer (1987). Textile prices, kindly supplied by Joan Rosés (private communication), were used as non-agricultural prices. Wages were taken from Felíu (2004), for Catalonia; Reher and Ballesteros (1993), for New Castile; Moreno (2002) for Old Castile; and (Allen 2001) for Valencia. The CPIs used come from Reher and Ballesteros (1993), for New Castile, Felíu (2004), for Catalonia, Allen (2001), for Valencia; and Llopis et al. (2000) for Old Castile. As a rule, when the coverage of wages and prices was incomplete for a given region it was assumed that they moved as those available for the closer region (namely, Andalusian prices or wages were assumed to move as those for New Castile, and Valencia prices and wages as those for Catalonia).

[55] 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 Felíu (1991).

[56] Unfortunately, we do not have information regarding the shares of skilled and unskilled workers within the labour force and their evolution over time.

[57] 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 wages were declining (Reis 2005: 199).

[58] In such a case, the increase in the number of hours worked per year would offset the decline in wage rates.

century as a consequence of the wider access to property after the disentailment of church and communal lands (*desamortización*). Alas, we cannot verify and, even less, quantify these hypotheses. Nonetheless, the fact that cultivated land multiplied by 2.4 over the first half of the nineteenth century (Bringas 2000: 86) while, according to our own estimates, employment in agriculture did by 1.5, lends some support to these conjectures.

The only evidence as regards the amount of days worked in different sectors of the economy comes from the Cadastre of Ensenada (Ringrose 1983). We have weighted the number of working days assigned in the Cadastre to farmers (120), artisans (180), and servants (250) by the shares of agriculture, industry, and services within total employment. We used our estimates of the labour shares in agriculture and in the rest of the economy (see the discussion above) and made an attempt to decompose employment outside agriculture into industrial and services' shares. Since we only had data for the Kingdom of Castile since 1750 (and from 1787 onwards for the Crown of Aragon) we arbitrarily assumed that, prior to 1750, the shares of industry and services within non-agricultural labour force moved, in each Spanish region, along those for Cuenca (Reher 1990). The amount of days worked per occupied resulting from the decline in the share of agricultural employment and the rise of that for services increased, on average, at less than 0.1 percent per year over the considered period.[59] Such a mild increase in the amount of working days per occupied/year would have only a minor effect in our estimates so we decided not to take it on board.[60]

Some caveats about the use of real wages as a proxy for per capita income are necessary. Using wage rates as a proxy for per capita income hides 'the contribution of property-income growth to the overall rise of national income' (Hoffman, Jacks, Levin, and Lindert 2002). Even in rural areas in mid-eighteenth century Old Castile, where income distribution was considered to be less unequal, the wealthiest 10 percent outweighed the poorest 40 percent by 15 to 17 times (computed from Yun-Casalilla (1987).[61] Similar ratios have been observed for England (14 times), and France (17

[59] In England, the amount of hours worked per occupied rose at 0.6 percent per year over 1760-1800 (Voth 1998).
[60] We have computed a new set of estimates adjusting the wage rates with the increase in the amount of days worked and the results are available upon request.
[61] Income distribution in Old Castile has usually been considered less unequal than in regions of large estates (Spain's south). Catalonia, in turn, has been traditionally considered a region of less social inequality than the Kingdom of Castile since the 1486 Guadalupe Ruling (*Sentencia arbitral de Guadalupe*) introduced new property rights of land that differed from those prevailing in the Kingdom of

times) around 1750 (Hoffman et al. 2002). 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).[62]

The use of real wages to proxy the evolution of real per capita GDP implies assuming the stability of income distribution. A way of testing such a strong proposition is by looking at the trends in income inequality that provide relative factor returns.[63] Land rent/wage ratios for Andalusia, Castile and Catalonia rose throughout the sixteenth and eighteenth centuries, while declined in the seventeenth and early nineteenth centuries (Figure 3).[64] Moreover, as incomes in the middle and upper part of the distribution are not captured, in periods of rising inequality (as were the sixteenth and eighteenth centuries) our output estimates provide a lower bound of the actual performance of Spanish agriculture.[65]

Furthermore, since we are employing real wages to proxy real per capita GDP, deflators matter too. In the case of nominal wages, a consumer price index is usually used to obtain real wages, while the GDP implicit deflator, that reflects the prices of both consumption and investment goods, is employed to derive real aggregate output. These two price indices do not necessarily evolve alike and the use of real wages as a short-cut for real GDP per head probably adds another bias to our output estimates.[66]

Although from a theoretical point of view estimates of agricultural output derived through the demand approach are superior, and we focus our discussion on them, alternative estimates obtained with Wrigley's approach –albeit the unrealistic implicit assumptions about price and income elasticities– are also provided as a

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Castile. In the case of the capital city, Madrid, the Gini reaches 0.77 (computed from data in Ringrose (1983))

[62] Estimates obtained from data in Yun-Casalilla 1987), Ramos Palencia (2001), and Abbott (1990). These figures are close to those computed for England and Wales in 1759 (0.52) by Peter Lindert (http://www.econ.ucdavis.edu/faculty/fzlinder/Massie1759rev.htm).

[63] 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'.

[64] 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).

[65] 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)) and using alternatively wages (Bringas 2000) and GDP per head as indicators of per capita income. The results confirm the downward bias introduced when wages are employed as a proxy for income per head. Food consumption would grow at 0.06 percent annually when estimated using real wages (ε = - 0.5, μ = 0.4, γ = 1) while it would reach 0.42 percent if real per capita GDP is used instead. Interestingly, when agricultural consumption per head for eighteenth century England is derived with a demand function, Crafts (1985) using per capita income also reaches a faster pace of growth than Jackson (1985) and Allen (1999) employing real wages.

[66] 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.

counterpoint. The Wrigley approach assumes a constant consumption per head of agricultural goods and, as we were forced to assume further that agricultural trade was balanced, agricultural output per head is taken as constant in this set of estimates. We have made an exploratory attempt at reconciling these alternative estimates of agricultural output by attributing their differences to work intensification. We estimated the rate of variation for real wage earnings (w') compatible with a zero growth rate for per capita consumption of agricultural goods (c), as posit by the Wrigley approach, keeping unaltered the values of the rest of the variables and the elasticities. Thus, using expression [14] and assuming $c = 0$, we re-arranged it to derive w' as follows,

$$w' = (\varepsilon p + \gamma m) / \mu \qquad [16]$$

Then, the difference between the counterfactual (w') and the actual (w) rates of variation of real wages would cast the annual change in hours worked per occupied (h),

$$h = w' - w \qquad [17]$$

It comes out from this conjectural exercise that, in the sixteenth and eighteenth centuries, for the agricultural output estimates derived through the demand approach to match those obtained with the Wrigley approach, the amount of hours per worker would have needed to grow at yearly rates of 0.6 and 0.8 percent, respectively. These rates are within the range suggested for late eighteenth century England (Voth 2001).[67] It can be objected that the opportunity cost of leisure was probably higher in England during the first stages of the Industrial Revolution than in early modern Spain. However, the dramatic decline of Spanish real wages might have been a powerful stimulus to work longer hours. Our proposal is, then, to consider the output estimates derived through the Wrigley approach as an upper bound for agricultural performance for the sixteenth and the eighteenth centuries.

Table 10 offers levels of agricultural output at regional and national levels, expressed with Spain in 1857 as 100. Notice that Panel A in this Table (and in Tables 11-13) contains information for just seven regions as only for them agricultural output could be obtained through the demand approach.[68] Total output doubled over the early modern age in Spain (and trebled when obtained through the Wrigley approach) but with a large variance across regions. More interesting, however, is the information on

[67] Voth (2001: 1075-1076) estimates that, in agriculture, the amount of hours worked grew at 0.8 percent annually between 1750 and 1800, while for the whole English economy it ranged between 0.6 and 0.7 percent.

[68] Basque and Navarre regions are also missing in Panel B of Tables 10 and 11 as we have not been able to ascertain their shares in Spain's agricultural output in 1850/59, our benchmark year for linking each region's output to the national level.

agricultural labour productivity contained in Table 11. A major feature is the long-run decline in output per EAP across the board, with the exception of Catalonia. A moderate productivity fall occurred in Spain during the sixteenth century (-0.09 percent), followed by a return to the initial levels in 1700. The eighteenth century witnessed a more intense contraction in output per worker (at -0.4 percent per year), only partially reversed in the first half of the nineteenth century. The proposed upper bound figures for labour productivity, derived from the Wrigley approach (Panel B), would reverse the contraction of the sixteenth century (+0.07 percent per year), and turn the decline of the eighteenth century into a very mild advance (0.05 percent).

Two clear cut phases appear to exist in the regional behaviour. Remarkable disparities took place in the evolution of labour productivity across regions over 1530-1700, and its dispersion, as measured by the coefficient of variation, doubled. Regional variance, then, declined in the early eighteenth century and, after a reversal in the second half of the century, fell again in the early nineteenth century to recover the 1750 levels.

When our results are compared with those of other European countries (Allen 2000, Federico and Malanima 2004) we observe that the Spanish productivity decline over the sixteenth century was milder than in most countries (the Netherlands, in which it remained unaltered, was the exception), while its sharp contraction during the eighteenth century was at odds with the productivity gains achieved in England, France, and the Netherlands, and even with the mild fall suffered in (Central-North) Italy. In the seventeenth century Spain sided with France and Italy in achieving minor productivity improvements while the Low Countries and England forged ahead. Again, in the early nineteenth century, Spain and Italy fell short of the gains in output per worker obtained in Britain, France, and the Netherlands (Allen 2004a, Smits et al. 2000, Toutain 1997).

Once agricultural output ($\boldsymbol{q\ N}$) was obtained, we combined it with the indicator of economic activity outside agriculture (namely, adjusted urbanization, $\boldsymbol{N'_{urb\text{-}nonagr\ it}}$) to reach an estimate of aggregate output ($\boldsymbol{O}$). In order to do so, agricultural and non-agricultural output were expressed in index form with 1857 as 100, and, then, weighted by their shares in GDP in 1850-1859 –the earliest dates for which national accounts are available– (Prados de la Escosura 2003),

$$\boldsymbol{O_{.t} = Sa_{.1850/59}\ (q_{.t}\ N_{.t}) / (q_{.1857}\ N_{.1857}) + (1 - Sa_{.1850/59})*(N'_{urb\text{-}nonagr\ .t} / N'_{urb\text{-}nonagr\ .1857})} \quad [18]$$

where $\boldsymbol{Sa_{.1850/59}}$ represents the average share of agriculture in GDP in the 1850s (0.404). Regional weights by sector were obtained by applying each region's share in

agricultural and non-agricultural output (Rosés 2003) to their national levels (Prados de la Escosura 2003). The use of this expression does not imply that the share of agriculture in GDP remains constant over time. On the contrary, in so far as output in each economic sector evolves at different pace, their shares in GDP will vary over time.[69]

A caveat is needed about home, non-marketed production. Do our estimates proxy GDP or just 'market income'? In the case of agricultural output, home production is captured in our Wrigley approach estimates, as it assumes constant consumption of agricultural goods per head, but it is far less clear that this is also the case for our preferred demand approach estimates. As for non-agricultural output, a non-negligible share was contributed by the (urban and rural) active population in agricultural activities and we fail to capture it. It is worth pointing, nonetheless, that there was an early use of the market even in remote regions of Spain (Domínguez 1994). Moreover, the so called 'agro-towns' tended to facilitate the production for the market. Our conjecture is that the inclusion of non-marketed production might have a counter-cyclical effect, moderating the intensity of both the decline and rise of output over time that we offer here, and deserves to be explored in future research.

Trends in total product and product per head at both regional and national levels are offered in Tables 12 and 13, while annual growth per head is provided in Table 14. GDP multiplied by 3.6 over three hundred years (Table 12, Panel A) but, as population more than trebled, the increase in real product per head was reduced to just 15 percent (Table 13, Panel A). Per capita GDP experienced a mild increase in the sixteenth century, followed by a contraction of similar intensity in the seventeenth century, stagnation over the eighteenth century, and non-negligible growth in the early nineteenth century that led, by the 1850s, to overcome the levels achieved in the late sixteenth century. Interestingly, product per head obtained with agricultural output

[69] The share of agriculture in GDP, at constant prices of 1850/59, is as follows,

Agriculture's Share in GDP (1850/59 prices)

	Demand Approach Agriculture	Wrigley Approach Agriculture
1530	0.70	0.61
1591	0.59	0.52
1700	0.65	0.59
1750	0.57	0.54
1787	0.45	0.48
1857	0.40	0.40

alternatively derived through the demand and Wrigley approaches cast similar growth rates for the long seventeenth century, and not far apart for the early nineteenth century, so their discrepancies are restricted to the sixteenth and, especially, the eighteenth century. As we have proposed the Wrigley approach as an upper bound, there is some room in our conjectural estimates for more intense growth in the sixteenth century (up to 0.27 percent per year) and growth (0.24 percent) rather than stagnation in the eighteenth century (Panels A and B in Table 14). In the most favourable scenario, real product per head could have increased up to 52 (Table 13, Panel B) rather than 15 percent over three and a half centuries (Table 13, Panel A).

A large variance across regions is observed in real product per head. Only Catalonia and New Castile (largely due to the rise of Madrid, the capital city) increased their output per head in the long-run. Nonetheless, while in New Castile the increase took place in the sixteenth century, and this level was recovered by 1750, to stagnate thereafter; in Catalonia a sustained rise in per capita income is observed since mid-eighteenth century. Another feature that deserves to be highlighted is the uneven impact of the seventeenth century crisis, mainly circumscribed to the Kingdom of Castile (the two Castiles, but also Extremadura) and to Valencia, the latter usually associated to the expulsion of the Moorish (Reglá 1953, Elliott 1961, Casey 1971).[70]

How do our new estimates compare with previous assessments of Spanish performance? Table 15 shows that, when agricultural output is derived through the demand approach, our real product per head is on the lower bound of the available conjectural estimates. Its 15 percent increase over 1530-1857, is just one-fourth of Maddison's figure. A differential feature of our estimates is, along Maddison's, its suggestion that real output per head grew in the sixteenth century. Our estimates for the seventeenth century show the sharpest decline, close to van Zanden (2005a).[71] Again for the eighteenth century our figures are on the pessimistic side, next to van Zanden (2005b). In turn, the early nineteenth century recovery is, according to our figures (one fourth increase), more intense than Maddison's. However, our alternative output estimates, in which the Wrigley approach is used to derive agriculture product, match rather well the mild but steady growth view Maddison presents for early modern Spain, except for the seventeenth century decline. Since these alternative figures represent an

[70] As Kamen (1978: 41) put it, "It is clear that 'decline' did not fall like a blanket over the whole country … but that different parts of the peninsula experienced disparate rates of development".
[71] Thus, we provide support for Hamilton's (1938) perception of growth in the sixteenth and decline in the seventeenth century.

upper bound of the actual growth, it can be concluded that Maddison's estimates provide an excessively favourable depiction of pre-1850 Spain's economic performance.

Do our new conjectural estimates modify to some extent the established wisdom about Spain's relative performance within Europe? In order to provide an answer we have introduced them in van Zanden (2005a) and Maddison (2003) data sets, expressed relative to the U.K. per capita GDP level in 1820 and 1850, respectively.[72] Figure 4 offers our new estimates within van Zanden's (2005a) data set. We observe that Spain's level was systematically higher in our estimates than in van Zanden's own computations. In fact, during the sixteenth century Spain's per capita income was above Britain's and Belgium's and, by 1600, also above the 'European' average. The evolution of Spain since the seventeenth century shadows at a lower level that of Italy's, while a north-south widening gap emerges in Western Europe. When the comparison is carried out with Maddison's data set (Figure 5), our new estimates show that in the early sixteenth century Spain was only behind Italy's income and, by 1600, only the Netherlands and Italy were ahead of her. Hence, we can suggest that at the time of Charles V and Phillip II Spain was a comparatively affluent nation, only second in per capita income to the Low Countries and Italy. In the long run, however, Spain experienced a sustained decline and Spain fell behind 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 as it occurred at the time of the loss of empire and a complex institutional transition to a liberal society– fell short of the economic progress experienced in north-western Europe during the first Industrial Revolution. Spain suffered, then, the paradox of growing but falling behind.

Summary of findings

Available assessments of long-run performance in early modern Spain are clearly on the low side as they suffer from two shortcomings: focusing on the Kingdom of Castile and failing to include the contribution of non-agrarian activities to GDP.

[72] As we lacked evidence about Spain's per capita GDP in 1820, we arbitrarily proxied it with its level for 1787. In both data sets we accepted Spain's level relative to the U.K. for the benchmark year (1820 in van Zanden (2005a) and 1850 in Maddison (2003)) and projected it back to 1500 with our index of real product per head.

As an alternative, we analysed regional demographic trends and urbanization rates to capture trends in non-agrarian activities and in other Spanish regions. Clear differences between inland and coastal regions, indicating uneven rates of economic progress, come out. Rates of urbanization rose significantly in the 1500s, fell sharply in the seventeenth century, and experienced a recovery since the early eighteenth century. By mid-nineteenth century, a quarter of Spanish population lived in urban settings compared with one tenth in the early sixteenth century, according to our adjusted urbanization rates.

As urbanization is associated to economic activity outside agriculture, we combined its trends (adjusted to exclude those living off agriculture) with those of agricultural output to reach aggregate output figures for more than three centuries. Real product per head grew during the sixteenth and early nineteenth century and suffered an absolute decline during the seventeenth century and stagnated in the eighteenth century. On the whole, Spain hardly experienced any growth in per capita income terms through the pre-industrial era.

The contrast between per capita income trends in Spain and the main Western European countries suggests that sixteenth century Spain was a relatively affluent nation. When Spain's long-run performance is examined from a European perspective a sustained decline takes place. The mild improvement of the sixteenth century was more than offset by the sharp deterioration of the seventeenth century. Spanish relative backwardness deepened during the first half of the nineteenth century.

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Table 1

Real Per Capita GDP in Spain (1600=100): Alternative Guesstimates

	Yun Casalilla *		Carreras	Maddison	van Zanden	van Zanden (2005a) **	
	(a)	(b)			(2005b)	lower bound	upper bound
1500			134.6	77.5	106.4		
1600	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1630 ***	78.4	71.8				90.7	100.0
1700			108.8	100.0	97.0	90.7	91.7
1750	84.8	108.8				85.4	93.0
1800	97.4	118.2	150.4		89.3		
1820				118.2		100.0	111.6
1850				126.5			

Sources : Yun Casalilla (1994), Carreras (2003), Maddison (2003), van Zanden (2005a, 2005b)
Notes:
***** Yun Casalilla, 1590 = 100. (a) converted into grams of silver and deflated with Reher and Ballesteros (1993) consumer price index (in grams of silver); b) deflated with a composite consumer price index for 8 goods from Hamilton (1934) with weights from Vela and Marcos (1978)
****** van Zanden (2005a), 1570 = 100
******* The figure for 1630 corresponds to 1650 in van Zanden (2005a)

Table 2

Relative Real Per Capita GDP in Spain

	van Zanden (2005a)	van Zanden (2005b)	Maddison
		% U.K.	
1500	105.8	98.0	92.6
1570	103.4		
1600		92.3	87.6
1650	80.6		
1700	60.1	68.8	68.2
1750	48.2		
1800		41.7	
1820	48.0		59.1
1850			46.3
		% Netherlands	
1500	78.4	64.5	86.9
1570	78.4		
1600		55.5	61.8
1650	45.8		
1700	44.1	46.4	40.0
1750	43.1		
1800		42.9	
1820	52.2		54.8
1850			45.5
		% Europe *	
1500	84.3	95.4	85.7
1570	84.3		
1600		89.8	95.9
1650	79.1		
1700	74.1	81.6	85.5
1750	72.3		
1800		75.3	
1820	82.8		83.7
1850			55.1

Sources: van Zanden (2005a, 2005b), Maddison (2003)
Notes: van Zanden (2005a), average of the upper and lower bound estimates
van Zanden (2005b), refers to England in the upper panel.
***** weighted average of European countries in each author's sample. In the case of Maddison (2003), Western Europe.

Table 3

Conjectural Estimates of Per Capita GDP at current prices (grams of silver)

	García Sanz	Yun	Carreras	Control Estimates	
				Lower bound	Upper bound
1500	148		160	226	708
c. 1560	339			289	904
c. 1590	499	645	521	665	2082
c. 1630	644	677		748	2343
c. 1650	521			606	1897
1700			510	605	1894
1750	370	462		366	1147
c. 1800		919	959	630	1974

Sources: García Sanz (1991), Yun Casalilla (1994), Carreras (2003), Felíu (1991) and text.
Control estimates: lower bound, assuming 180 days of work, 0.305 activity rate and 0.75 labour share; upper bound, assuming 250 days of work, 0.55 activity rate and 0.6 labour share

Table 4

Regional Population Growth (annual rates %)

	1530-1591	1591-1700	1700-1787	1787-1857	1530-1787	1530-1857
Andalusia	0.55	0.28	0.28	0.66	0.34	0.41
Aragon	0.32	0.50	0.18	0.49	0.35	0.38
Asturias	0.81	0.08	1.01	0.59	0.57	0.57
Balearic Islands	0.53	0.20	0.20	0.57	0.28	0.34
Basque	0.25	0.52	0.03	0.42	0.29	0.32
Canary Islands				0.48		
Catalonia	0.61	0.32	0.64	0.87	0.50	0.58
Extremadura	0.64	-0.17	0.13	0.75	0.12	0.26
Galicia	1.07	0.44	0.58	0.40	0.64	0.58
Murcia	0.71	0.46	0.68	0.41	0.60	0.56
Navarre	0.06	0.52	0.03	0.39	0.24	0.27
New Castile	1.02	-0.21	0.26	0.39	0.24	0.27
Old Castile & Leon	0.32	-0.27	0.32	0.41	0.07	0.14
Valencia	0.45	0.19	0.66	0.66	0.41	0.46
Spain	**0.58**	**0.09**	**0.39**	**0.54**	**0.31**	**0.36**

Note : Regional data adjusted to match the revised consensus national figures. See Table 5.
Sources : 1530 and 1591, Nadal (1984), completed with Fortea (1995) and Ruiz Martín (1967) (with 4 people per household instead of 5); 1700, Grupo '75 (1977) and Bustelo (1972a); 1787, Nadal (1984) and Nicolau (2005); 1857, Nicolau (2005) and Artola (1973).

Table 5

Spain's Population: Alternative Estimates (million)

	[I] Consensus Estimates	[II] Bairoch	[III] [I/II]
1530	4.8	7.5	0.64
1591	6.8	8.7	0.78
1700	7.5	8.6	0.87
1750	9.3	9.6	0.97
1787	11.0	13.0	0.85
1857	15.5	15.5	1.00

Sources : Bairoch et al. (1988); Consensus estimates, 1500-1700, Carreras (2003); 1750-1800, Bustelo (1972a,1972b); 1850, Nicolau (2005)

Table 6

Urbanization Rate: Alternative Estimates (%)
(5,000 or more inhabitants)

	Bairoch	Unadjusted New Estimate	Adjusted New Estimate
1530	18.4	12.5	9.9
1591	21.3	20.6	14.5
1700	20.3	11.3	11.1
1750	21.4	14.2	13.5
1787	19.5	24.5	17.4
1857	18.0	31.9	23.2

Note : Excluding the Canary Islands
Sources : Bairoch et al. (1988), Bairoch (1988),

Table 7

Urbanization Rate (% Total Population)
(towns of 5,000 or more inhabitants)

	1530	1591	1700	1750	1787	1857
Andalusia	33.3	55.0	26.4	31.8	59.6	58.3
Aragon	6.0	6.4	2.9	6.6	13.2	16.0
Asturias	6.8	10.1	4.8	2.1	11.4	13.5
Balearic Islands	22.9	21.7	19.2	21.3	18.1	58.2
Basque	1.3	2.7	2.2	2.8	9.3	21.7
Canary Islands					32.8	26.6
Catalonia	13.8	13.5	13.8	10.7	23.4	31.5
Extremadura	4.8	20.4	1.7	15.1	13.3	32.4
Galicia	4.0	1.2	2.5	2.4	2.2	13.8
Murcia	25.6	35.3	24.7	25.9	53.5	73.6
Navarre	5.1	11.9	6.5	8.3	8.1	19.3
New Castile	6.7	24.3	14.0	26.7	27.7	27.5
Old Castile & Leon	7.9	8.7	4.0	4.5	6.2	9.9
Valencia	19.6	24.7	12.0	18.3	38.7	45.2
Spain						
excluding Canary Is.	12.5	20.6	11.3	14.2	24.5	31.9
including Canary Is.					24.6	31.9

Sources : Urban population, Fortea (1995), Correas (1988), completed with Bairoch et al. (1988).
Total population, as in Table 4.

Table 8

***Adjusted* Urbanization Rate (% Total Population)**
(towns of 5,000 or more inhabitants excluding population living on agriculture)

	1530	1591	1700	1750	1787	1857
Andalusia	18.5	20.1	25.7	27.4	27.7	33.8
Aragon	6.0	6.4	2.9	6.6	13.2	16.0
Asturias	6.8	10.1	4.8	2.1	11.4	13.5
Balearic Islands	19.2	21.7	19.2	21.3	18.1	29.7
Basque	1.3	2.7	2.2	2.8	9.3	21.7
Canary Islands					32.8	26.6
Catalonia	13.8	13.5	13.8	10.7	23.4	31.5
Extremadura	4.8	20.4	1.7	15.1	13.3	21.8
Galicia	4.0	1.2	2.5	2.4	2.2	13.8
Murcia	16.3	19.8	24.7	25.9	31.5	23.2
Navarre	5.1	11.9	6.5	8.3	8.1	19.3
New Castile	6.7	24.2	14.0	26.7	27.7	27.5
Old Castile & Leon	7.9	8.7	4.0	4.5	6.2	9.9
Valencia	19.3	22.0	12.0	18.3	30.2	32.4
Spain						
excluding Canary Is.	9.9	14.5	11.1	13.5	17.4	23.2
including Canary Is.					17.6	23.3

Sources : As in Table 7. See text

Table 9

Annual Variation of the Adjusted Urbanization Rate (%)

	1530-1591	1591-1700	1700-1787	1787-1857	1530-1787	1530-1857
Andalusia	0.14	0.22	0.09	0.29	0.16	0.18
Aragon	0.11	-0.72	1.74	0.28	0.31	0.30
Asturias	0.66	-0.69	0.99	0.24	0.20	0.21
Balearic Islands	0.20	-0.11	-0.07	0.71	-0.02	0.13
Basque	1.21	-0.20	1.66	1.22	0.76	0.86
Canary Islands				-0.30		
Catalonia	-0.03	0.02	0.61	0.42	0.21	0.25
Extremadura	2.36	-2.26	2.35	0.70	0.40	0.46
Galicia	-1.96	0.67	-0.16	2.64	-0.24	0.38
Murcia	0.32	0.20	0.28	-0.44	0.26	0.11
Navarre	1.40	-0.55	0.24	1.25	0.18	0.41
New Castile	2.10	-0.50	0.78	-0.01	0.55	0.43
Old Castile & Leon	0.17	-0.71	0.49	0.67	-0.09	0.07
Valencia	0.22	-0.56	1.06	0.10	0.17	0.16
Spain						
excluding Canary Is.	0.62	-0.24	0.51	0.42	0.22	0.26
including Canary Is.				0.40		

Sources : Table 8

Table 10

Agricultural Ouput (Spain in 1857=100)

Panel A. Demand Approach *

	1530	1591	1700	1750	1787	1857
Spain	48.2	61.9	66.0	68.9	61.6	100.0
New Castile	7.6	11.2	8.7	8.7	7.3	10.1
Andalusia	9.6	9.0	13.2	11.6	13.0	22.4
Murcia	1.0	1.5	2.4	2.8	2.5	3.4
Old Castile/ Leon	14.1	17.0	12.4	13.6	10.3	15.6
Valencia	3.1	3.6	4.0	5.9	4.8	8.9
Balearic Is.	1.3	1.7	2.6	1.6	1.7	2.9
Catalonia	2.2	2.6	4.5	5.7	5.4	11.6

Panel B. Wrigley Approach

	1530	1591	1700	1750	1787	1857
Spain	31.5	44.8	49.3	61.1	68.3	100.0
Asturias	0.6	1.0	1.1	2.5	2.7	4.1
New Castile	4.2	7.8	6.2	6.6	7.7	10.1
Andalusia	5.8	8.2	11.0	12.1	14.1	22.4
Murcia	0.6	0.9	1.4	2.0	2.5	3.4
Old Castile/ Leon	9.8	11.9	8.9	12.2	11.7	15.6
Extremadura	2.0	3.0	2.5	2.4	2.8	4.7
Galicia	1.3	2.4	3.9	6.0	6.4	8.5
Aragon	2.3	2.7	4.7	4.6	5.5	7.8
Valencia	2.0	2.6	3.2	5.0	5.6	8.9
Balearic Is.	1.0	1.3	1.7	1.7	2.0	2.9
Catalonia	1.8	2.6	3.6	5.3	6.3	11.6

***Note* : *** Demand Approach (e = -0.5; g = 0.4; b = 0.1)
Sources : Relative regional levels for 1857, Rosés (2003, background computations); benchmark for Spain in 1857, Prados de la Escosura (2003). Indices of agricultural output, see the text and the sources are provided in footnote 52.

Table 11

Agricultural Ouput per Economically Active Population (Spain in 1857=100)

Panel A. Demand Approach *

	1530	1591	1700	1750	1787	1857
Spain	130.5	123.4	131.0	113.5	92.3	100.0
New Castile	153.6	130.1	146.0	145.1	108.9	115.0
Andalusia	155.8	106.4	124.2	101.5	97.6	116.3
Murcia	125.6	129.3	146.6	127.7	86.7	78.9
Old Castile/ Leon	112.9	120.4	133.3	113.2	93.2	88.2
Valencia	140.6	127.8	125.2	119.8	87.9	106.6
Balearic Is.	181.5	200.8	294.2	192.8	185.5	160.2
Catalonia	105.5	91.4	120.7	109.5	88.2	124.1
c.v.	0.19	0.27	0.40	0.24	0.33	0.23

Panel B. Wrigley Approach

	1530	1591	1700	1750	1787	1857
Spain	85.5	89.3	97.7	100.7	102.3	100.0
Asturias	96.3	95.8	96.5	96.8	95.7	99.4
New Castile	84.7	90.1	104.5	110.1	115.3	115.0
Andalusia	94.4	96.3	103.5	105.9	106.4	116.3
Murcia	72.5	75.6	85.5	89.5	88.6	78.9
Old Castile/ Leon	78.4	84.0	95.8	101.4	105.6	88.2
Extremadura	82.5	84.0	92.3	93.5	95.9	85.0
Galicia	59.6	60.7	62.2	63.0	63.6	60.3
Aragon	109.8	117.1	132.9	138.9	142.2	115.2
Valencia	89.3	92.4	99.2	101.9	103.3	106.6
Balearic Is.	139.4	154.6	186.2	202.5	215.9	160.2
Catalonia	86.3	90.3	97.8	102.0	102.5	124.1
c.v.	0.23	0.26	0.30	0.32	0.35	0.26

***Note* : *** Demand Approach (e = -0.5; g = 0.4; b = 0.1)
Sources : Regional output levels, Table 10. Economically active population in agriculture, see the text

Table 12

Total Output (Spain in 1857 = 100)

Panel A (Computed with agricultural output derived through the demand approach*)

	1530	1591	1700	1750	1787	1857
Spain	27.5	41.7	40.8	48.9	55.4	100.0
New Castile	3.9	11.1	6.5	9.7	10.6	14.0
Andalusia	5.7	6.5	10.3	10.5	12.1	22.5
Murcia	0.6	0.9	1.7	2.2	2.7	3.0
Old Castile/ Leon	9.0	11.4	6.4	7.8	7.4	13.2
Valencia	1.8	2.2	2.1	3.6	4.4	7.8
Balearic Is.	0.7	1.1	1.4	1.1	1.1	2.3
Catalonia	1.5	1.9	3.0	3.7	5.9	13.9

Panel B (Computed with agricultural output derived through the Wrigley approach)

	1530	1591	1700	1750	1787	1857
Spain	20.8	34.8	34.0	45.8	58.1	100.0
Asturias	0.3	0.6	0.5	1.1	1.6	2.6
Basque	0.7	0.8	1.4	1.1	1.7	3.0
Navarre	0.5	0.7	1.0	0.9	1.1	1.9
New Castile	2.6	9.8	5.5	8.9	10.7	14.0
Andalusia	4.2	6.1	9.4	10.7	12.6	22.5
Murcia	0.4	0.7	1.3	1.9	2.7	3.0
Old Castile/ Leon	7.4	9.4	5.1	7.2	7.9	13.2
Extremadura	1.0	2.3	1.0	1.6	1.8	3.7
Galicia	0.6	1.0	1.7	2.6	2.7	5.6
Aragon	1.2	1.5	2.2	2.5	4.0	6.3
Valencia	1.3	1.9	1.8	3.3	4.7	7.8
Balearic Is.	0.6	0.9	1.1	1.1	1.2	2.3
Catalonia	1.3	1.9	2.7	3.5	6.3	13.9

***Note*: *** Demand Approach (e = -0.5; g = 0.4; b = 0.1)
Sources: Relative regional levels for 1857, Rosés (2003, background computations) and Álvarez Llano (1986) for Basque and Navarre; national level, Prados de la Escosura (2003); output by sector, Tables 10 and 12. See the text.

Table 13

Total Output Per Head (Spain in 1857 = 100)

Panel A (Computed with agricultural output derived through the demand approach*)

	1530	1591	1700	1750	1787	1857
Spain	87.2	93.0	82.7	80.1	81.0	100.0
New Castile	98.6	150.2	109.6	154.3	143.2	144.9
Andalusia	113.6	92.6	108.8	101.5	100.4	117.2
Murcia	90.4	96.1	105.5	98.1	93.3	78.2
Old Castile/ Leon	89.6	93.2	70.1	62.0	61.0	82.3
Valencia	97.1	93.6	72.2	78.9	85.0	94.8
Balearic Is.	128.2	133.7	146.2	110.4	97.0	132.6
Catalonia	88.2	78.9	88.6	73.5	100.0	128.1
c.v.	0.15	0.25	0.26	0.31	0.25	0.24

Panel B (Computed with agricultural output derived through the Wrigley approach)

	1530	1591	1700	1750	1787	1857
Spain	65.9	77.6	69.0	75.0	85.0	100.0
Asturias	60.3	68.0	55.7	49.4	71.0	75.8
Basque	67.2	70.2	69.1	70.3	83.8	109.6
Navarre	69.3	83.8	72.3	76.1	75.6	99.4
New Castile	65.9	132.3	93.6	141.5	145.4	144.9
Andalusia	84.5	87.9	99.8	103.4	104.1	117.2
Murcia	65.2	71.7	81.0	83.4	94.0	78.2
Old Castile/ Leon	73.1	77.1	55.5	57.7	65.4	82.3
Extremadura	49.3	80.1	43.1	69.6	66.2	83.0
Galicia	33.7	29.6	31.5	31.4	31.0	48.3
Aragon	73.1	74.5	62.2	75.2	98.5	108.6
Valencia	73.3	77.8	61.3	71.6	91.2	94.8
Balearic Is.	108.6	114.4	108.7	113.5	106.2	132.6
Catalonia	79.1	78.4	79.0	70.5	105.7	128.1
c.v.	0.25	0.30	0.32	0.36	0.31	0.27

Note **: *** Demand Approach (e = -0.5; g = 0.4; b = 0.1)
Sources: Total output, Table 13; population, as in Table 4.

Table 14

Annual Growth of Total Output per Head (%)

Panel A (Computed with agricultural output derived through the demand approach)

	1530-1591	1591-1700	1700-1787	1787-1857	1530-1787	1591-1787	1530-1857
Spain	0.11	-0.11	-0.02	0.30	-0.03	-0.07	0.04
New Castile	0.69	-0.29	0.31	0.02	0.15	-0.02	0.12
Andalusia	-0.34	0.15	-0.09	0.22	-0.05	0.04	0.01
Murcia	0.10	0.09	-0.14	-0.25	0.01	-0.02	-0.04
Old Castile/ Leon	0.07	-0.26	-0.16	0.43	-0.15	-0.22	-0.03
Valencia	-0.06	-0.24	0.19	0.16	-0.05	-0.05	-0.01
Balearic Is.	0.07	0.08	-0.47	0.45	-0.11	-0.16	0.01
Catalonia	-0.18	0.11	0.14	0.35	0.05	0.12	0.11

Panel B (Computed with agricultural output derived through the Wrigley approach)

	1530-1591	1591-1700	1700-1787	1787-1857	1530-1787	1591-1787	1530-1857
Spain	0.27	-0.11	0.24	0.23	0.10	0.05	0.13
Asturias	0.20	-0.18	0.28	0.09	0.06	0.02	0.07
Basque	0.07	-0.01	0.22	0.38	0.09	0.09	0.15
Navarre	0.31	-0.13	0.05	0.39	0.03	-0.05	0.11
New Castile	1.14	-0.32	0.51	-0.01	0.31	0.05	0.24
Andalusia	0.07	0.12	0.05	0.17	0.08	0.09	0.10
Murcia	0.16	0.11	0.17	-0.26	0.14	0.14	0.06
Old Castile/ Leon	0.09	-0.30	0.19	0.33	-0.04	-0.08	0.04
Extremadura	0.80	-0.57	0.49	0.32	0.11	-0.10	0.16
Galicia	-0.21	0.06	-0.02	0.63	-0.03	0.02	0.11
Aragon	0.03	-0.17	0.53	0.14	0.12	0.14	0.12
Valencia	0.10	-0.22	0.46	0.06	0.09	0.08	0.08
Balearic Is.	0.08	-0.05	-0.03	0.32	-0.01	-0.04	0.06
Catalonia	-0.01	0.01	0.33	0.27	0.11	0.15	0.15

Sources: Table 13.

Table 15

New Proposal for Per Capita GDP: Comparative Perspective

Panel A. Levels

	1530*	1591**	1700	1750	1787***	1857
New Estimates Demand approach	93.7	100.0	88.9	86.1	87.1	107.5
Wrigley approach	84.9	100.0	88.9	96.6	109.5	128.9
Yun Casalilla** **(a)**		100.0		84.8	97.4	
(b)		100.0		108.8	118.2	
Carreras	134.6	100.0	108.9		150.4	
Maddison	77.5	100.0	100.0		118.2	126.5
van Zanden (2005b)	106.4	100.0	97.0		89.3	
van Zanden (2005a)						
lower bound		100.0	90.7	85.4	100.0	
upper bound		100.0	91.7	93.0	111.6	

Panel B. Growth Rates (%)

	1530-1591	1591-1700	1700-1787	1787-1857	1530-1787	1591-1787	1530-1857
New Estimates Demand approach	0.11	-0.11	-0.02	0.30	-0.03	-0.07	0.04
Wrigley approach	0.27	-0.11	0.24	0.23	0.10	0.05	0.13
Yun Casalilla** **(a)**						-0.01	
(b)						0.08	
Carreras	-0.30	0.08	0.32		0.04	0.20	
Maddison	0.26	0.00	0.14	0.10	0.13	0.08	0.15
van Zanden (2005b)	-0.09	-0.02	-0.08		-0.06	-0.05	
van Zanden (2005a)							
lower bound		-0.10	0.08			0.00	
upper bound		-0.09	0.16			0.05	

Sources: Yun Casalilla (1994), Carreras (2003), Maddison (2003), van Zanden (2005a, 2005b) and Table 14
Notes:
***** 1500 for Carreras, van Zanden (2005b), and Maddison estimates
****** 1600 for Carreras, van Zanden (2005a), and Maddison. 1570 for van Zanden (2005b)
******* 1800 for Carreras and van Zanden (2005b), and 1820 for Maddison and van Zanden (2005a)
******** Yun Casalilla (1994)
(a) converted into grams of silver and deflated with Reher and Ballesteros (1993) consumer price index (in grams of silver)
(b) deflated with a composite consumer price index for 8 goods from Hamilton (1934) with weights from Vela and Marcos (1978)

Figure 1. Early Modern Spain

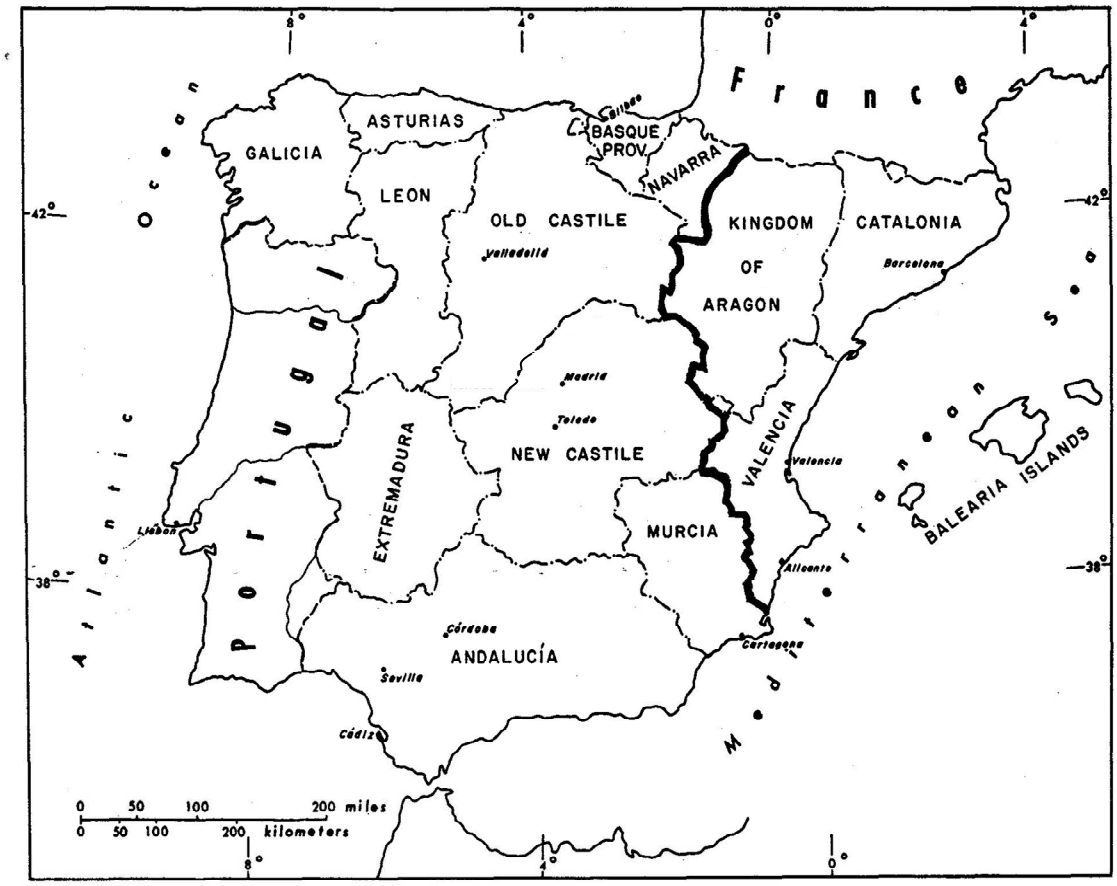
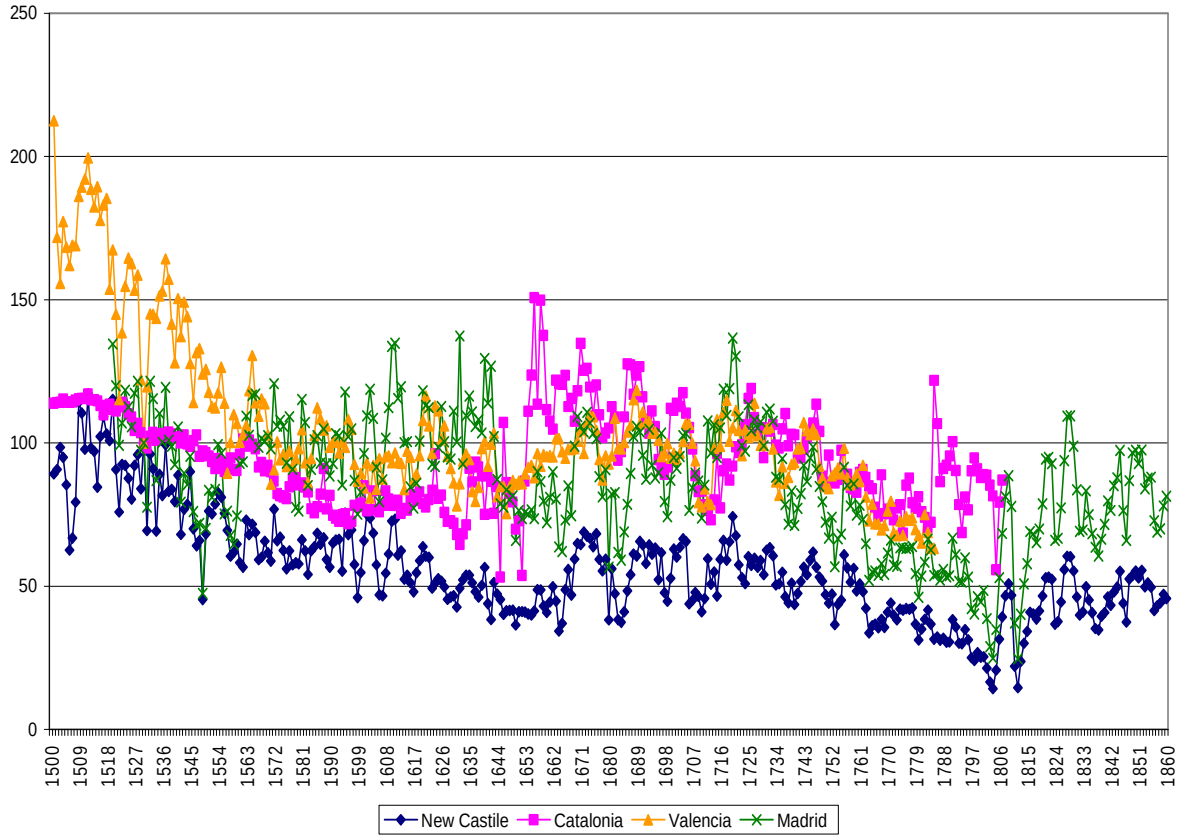
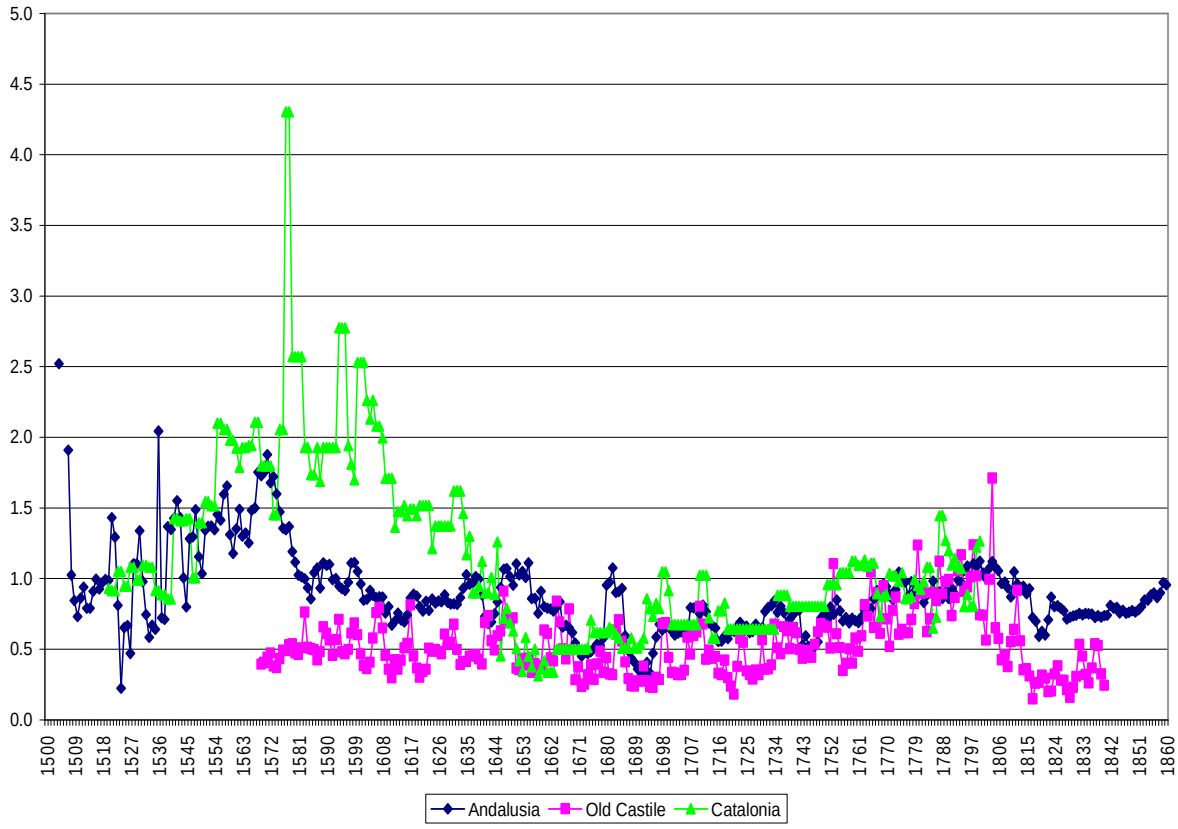


Figure 2. Regional Trends in Real Wages, 1500-1860 (1530 = 100)



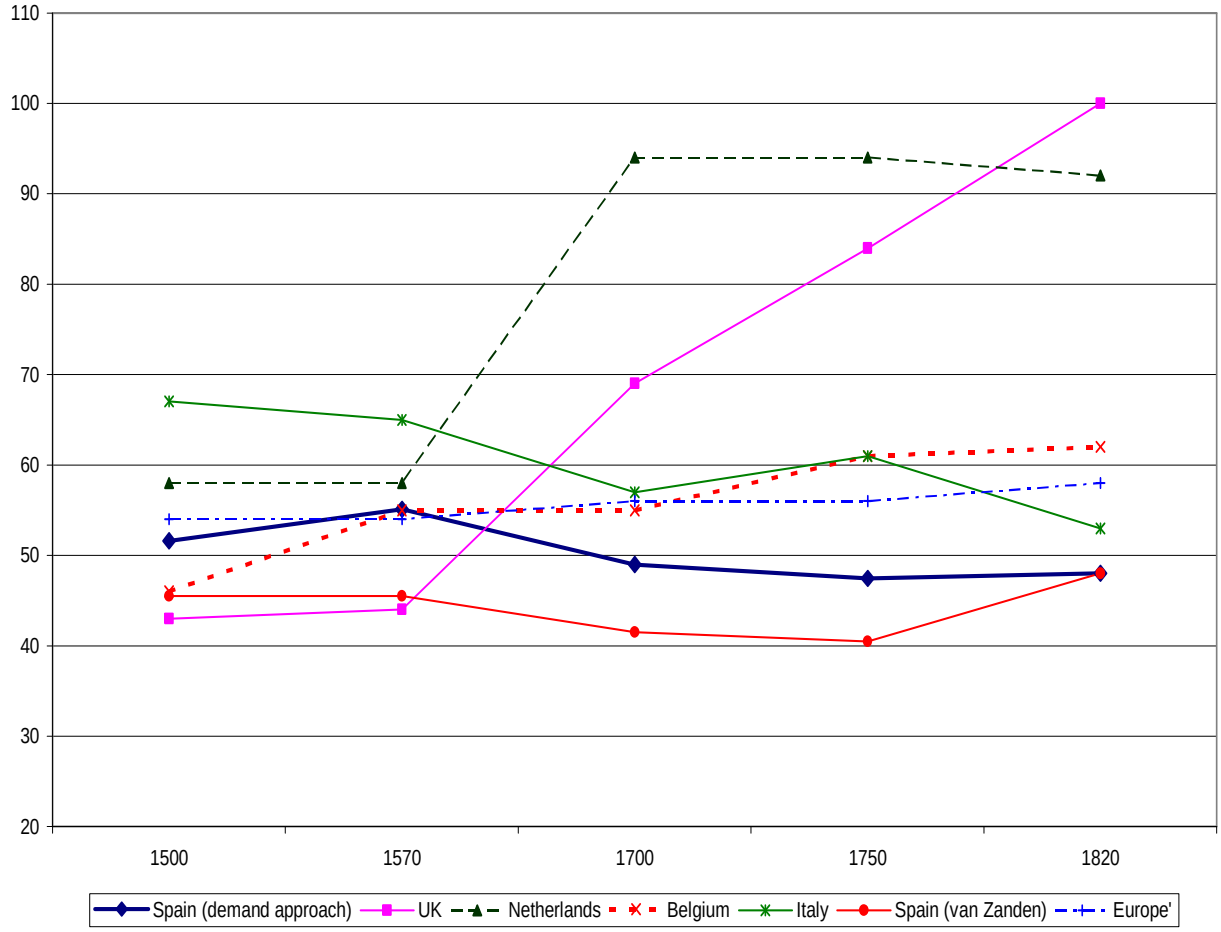
Sources: New Castile, Reher and Ballesteros (1993), Catalonia, Felíu (2004), Valencia and Madrid, Allen (2001, background data set).

Figure 3. Land Rent /Wage Ratios, 1500-1860 (1790/99 = 1)



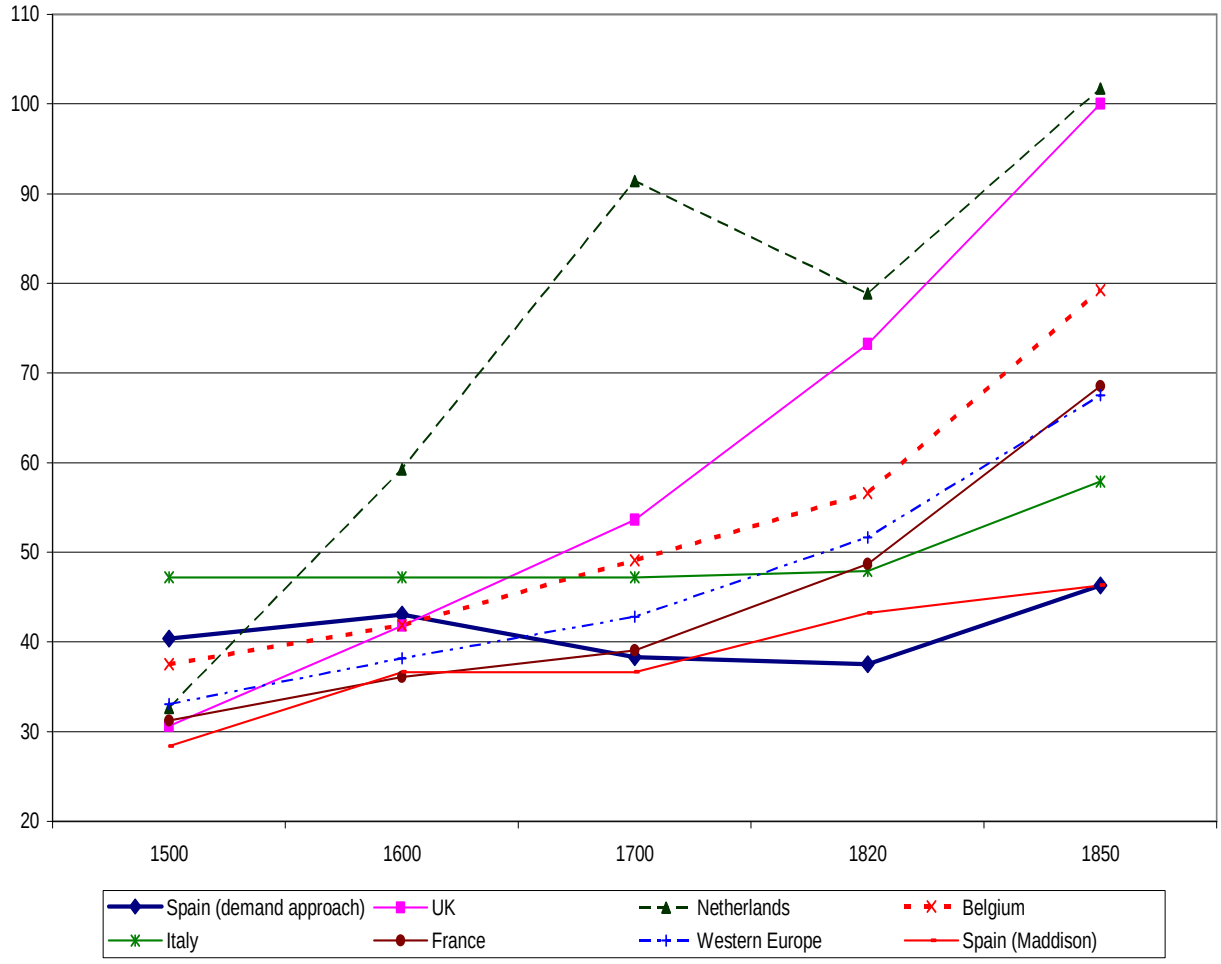
Sources: Land rent, Andalusia (Ponsot 1986), Old Castile (Sebastián Amarilla 1990), Catalonia (Duran 1985); wages, for Andalusia we used New Castile's (Reher and Ballesteros (1993), Old Castile (Moreno 2002), Catalonia (Felíu 2004).

Figure 4 Real GDP per Head in Europe: New Estimates and van Zanden's (2005a) (U.K. in 1820 = 100)



Sources: van Zanden (2005a) for all countries except Spain, from Table 13 (assuming Spain's real output per head in 1820 was equal to that of 1787).

Figure 5 Real GDP per Head in Europe: New Estimates and Maddison's (2003) (U.K. in 1850 = 100)



Sources: Maddison (2003) for all countries except Spain, from Table 13.