Prados de la Escosura, L., Álvarez-Nogal, C., & Santiago-Caballero, C. (2021). Growth recurring in preindustrial Spain? *Cliometrica*, 16 (2), pp. 215-241.

DOI: 10.1007/s11698-021-00232-7

Growth recurring in preindustrial Spain?

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Abstract
Research in economic history has challenged a strict Malthusian depiction of prein-dustrial European economies, highlighting 'efflorescences', 'Smithian' and 'growth recurring' episodes. Do these defining concepts apply to preindustrial Spain? In this paper, we carry out new yearly estimates of output and population for over half-a millennium. We find that our estimates of agricultural output on the basis of tithes largely confirm those obtained using a demand function approach supporting its use in the absence of direct information. We show that, although levels of output per head in the early nineteenth century were not much different from those in the eve of the Black Death, preindustrial Spain was far from stagnant. Phases of simulta-neous per capita output and population expansion and shrinkage alternated, lend-ing support to the recurring growth and frontier economy hypotheses. A long phase of sustained growth and lower inequality collapsed in the 1570s and gave way to another one of sluggish growth and higher inequality. As an alternative to a Malthu-sian interpretation, we hypothesise that, in preindustrial Spain, growth and decline are largely explained by individual and collective economic decisions.

keywords Preindustrial Spain · Frontier economy · Black Death · Malthusian · Growth recurring

JEL Classification E10 · N13 · O10 · O47

1 Introduction

"Prior to 1800, living standards in world economies were roughly con-stant over the very long run: per capita wage income, output, and consump-tion did not grow" asserted Gary Hansen and Edward Prescott two decades

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ago.[1] This stylised fact has spread among economists in more simplified terms: income per person remained stagnant in human societies until the Industrial Revolution heralded the beginning of modern economic growth. The Unified Growth Theory's depiction of preindustrial societies as Malthusian has reinforced this perception (Galor and Weil 2000).[2]

Although the Malthusian depiction of preindustrial economies finds the support of distinguished scholars (cf. Clark 2007, 2008; Madsen et al. 2019), research in economic history has challenged it lately. Historians are now more prone to accept the overcoming of the Malthusian constraint in preindustrial western Europe as capital accumulation and productivity gains permitted higher population and income levels simultaneously, but with the caveat that such achievements were limited in scope and time (i.e. after the Black Death), and only had long-term effects in the North Sea Area (Pamuk 2007). Broadberry et al. (2015) path-breaking research, for example, rejects the term Malthusian to portray the early modern British economy. However, Voigtländer and Voth (2013) claim that, in north-western Europe, the Black Death brought with it an increase in the endowment of land and capital per survivor which resulted in higher output per head within a Malthusian framework.

In an attempt to break the growth-stagnation dichotomy in preindustrial societies, historians have highlighted 'efflorescences' (Goldstone 2002: 333) and 'growth recurring' episodes (Jones 1988; Jerven 2011) that feature a succession of phases of growing and shrinking output per head and only give way to modern economic growth when shrinking phases become less intense and frequent (Broadberry and Wallis 2017). Growth driven by gains from specialisation resulting from the expansion of international and domestic markets (the so-called Smithian growth) may explain these episodes of sustained but reversible per capita income gains.

Did Smithian growth episodes took place in preindustrial Europe beyond the North Sea Area? New research suggests it did in Iberia (Palma and Reis 2019; Álvarez-Nogal and Prados de la Escosura 2013), although qualitative perceptions of early modern Spain as a stagnant economy are deeply rooted (Kamen 1978: 49; Cipolla 1980: 250).

In this paper, we provide yearly estimates of Spanish output and population for more than half a millennium that revise and improve on previous estimates. The new evidence offers empirical grounds to discuss the extent to which Malthusian efflorescences, growth recurring, or Smithian growth are defining elements of preindustrial Spain.

The paper makes some methodological contributions to the literature on historical national accounts. It includes controlled conjectures on population and sectoral and aggregate output estimates. More specifically, it provides the first agricultural output estimates from the supply side, on the basis of a religious tax, the tithe, that fell on

[1] Hansen and Prescott (2002: 1205) aimed at modelling "the transition from stagnant to growing living standards".

[2] That is, assuming a fixed supply of land and population growth as a response to an increase in living standards. It is worth noting that the use of the term "Malthusian" in the growth literature is an over-simplified version of the interpretation Malthus offered in his works in which he distinguished between the (Malthusian) trap of stagnant productivity, as a result of the operation of an unrestricted principle of population and the classical principle of population (Lueger 2018).

total production, for over four hundred years, that are compared to estimates derived with a demand function for the entire time span considered by Álvarez-Nogal and Prados de la Escosura (2013). We find that their levels and long-run trends are rather similar even though some significant discrepancies at specific junctures emerge. This result lends support to the use of the indirect demand approach to draw trends in agricultural output.

The paper is structured as follows. In Section II, we construct quantitative conjectures about the population. Agricultural output is estimated and output per head compared to earlier estimates derived with a demand approach in Sect. 3. Urban population estimates, adjusted to exclude those living on agriculture, are used in Sect. 4 to proxy trends in economic activity outside agriculture. Section 5 constructs aggregate output (total and per capita) estimates on the basis of the results obtained in previous sections and draws their long-run trends. In Sect. 6, these findings are discussed in the context of the historical debate and some conclusions extracted with regard to secular stagnation, the Malthusian model, and income distribution in preindustrial societies. Section 7 provides a long view of Spain's performance in European perspective. Section 8 concludes.

Our findings can be summarised as follows: (1) the peak average income levels reached in the late 1330s and the 1560s were only overcome in the early nineteenth century. (2) However, preindustrial Spain's economy was far from stagnant, exhibiting long phases of output per head growth and contraction. (3) Population and output per head moved together, at odds with the Malthusian narrative and lending support for the hypothesis of Spain as a frontier economy. (4) Spain's performance suggests Smithian growth episodes during distinctive phases: the long rise up to the Black Death, and the century-long expansion up to 1570, and the sustained expansion of the eighteenth century, as larger markets favoured specialization and urbanisation. (5) Income appears less unequally distributed until the early sixteenth century and increasingly more unequally thereafter as the relative importance of land as a production factor increased.

From these results, a puzzling question emerges, why no significant long-run gains in living standards were achieved in Spain's frontier economy? In the absence of a persuasive Malthusian interpretation, an institutional explanation deserves to be explored.

2 Quantitative conjectures on population

Aggregate population figures for late medieval and early modern Spain consist of scattered benchmark estimates from household population surveys usually collected for taxation purposes -the so-called *vecindarios* (literally, neighbourhoods), that present the challenge of converting households into inhabitants-, national censuses for the late eighteenth century, and sporadic assessments for the early nineteenth century.[3] Available benchmark estimates allow us to derive long-run population trends, and historians have relied on baptism records to represent population dynamics.[4]

Baptism data are available from 1580 to the Peninsular War, and most regions are covered from 1700 onwards. Thus, total Spanish population can be derived by weighting each regional index by the regions' population in a benchmark year (See Online Appendix 1 Population, Estimate 1 and Figure A1). However, inferring population trends from baptisms implies assuming that deaths rates kept a stable short-term relationship with birth rates[5] and net migration flows were negligible over time.[6]

Álvarez-Nogal et al. (2016) attempted to reconciling population benchmarks with decadal estimates of baptisms, available since the 1520s, so the resulting estimates capture migration (forced or voluntary) and over time variations in the proportion between birth and death rates (and between births and baptised children) (Online Appendix 1 Population, Estimate 2). Alas, projecting a population benchmark with baptism indices is misleading since population is a stock variable while baptism series, as a proxy for births, represent a flow. In fact, using baptisms as measure of population amounts to proxy capital stock by investment.

Ideally, to reconstruct annual population figures we require a reliable population figure at the beginning of a benchmark year (N_t) adding up annually the natural increase in population, that is, births (b_t) less deaths (d_t), less net emigration (m_t). Thus,

$$N_{t+1} = N_t + b_t - d_t - m_t \tag{1}$$

As there are population estimates available at various benchmarks (see Online Appendix 1 Population), all we need, then, is data on the natural increase in population (births less deaths) and net migration.

On migration, no yearly data are available and only guesstimates can be proposed. As regards emigration to the Americas, we have relied on Morner (1975: 64) who provides aggregate estimates for five periods over 1506–1670 (1506–40, 1541–60, 1561–1600, 1601–25, 1626–50) and have distributed them annually within each

[3] Pre-1850 population estimates from household surveys and censuses are available for 1530, 1591, 1646, 1712–17, 1752, 1768, 1787, 1797, 1821, 1833, and 1842. Cf. Nadal (1984), Bustelo (1972, 1973, 1974), Pérez Moreda (1988) For the conversion of households into inhabitants, cf. Martín Galán (1985).

[4] Cf. Nadal (1988), Reher (1991), Llopis Agelán (2004), and Llopis Agelán and Sebastián Amarillas (2007).

[5] Llopis Agelán (personal communication) discusses the relationship between deceases and baptisms during the eighteenth century showing a 11 per cent decline in this ratio between the early and the late century that, however, does not seem attributable to a decline in infant mortality. This author also warns us that the number of births exceeded that of baptised children and their proportion declined during the eighteenth century. He reckons a 5–6 per cent gap for Old and New Castile.

[6] Some evidence exemplifies how misleading this assumption is. For example, the number of Moorish expelled from Spain (1609–1613) could have reached 300,000 (Pérez Moreda 1988: 380). As regards voluntary migration, flows to Spanish America have been estimated as 250,000 and 100,000 in the sixteenth and seventeenth centuries, respectively, and about 125,000 over 1700–1824 (Martínez Shaw, 1994: 152, 167, 249).

period.[7] We also allowed for the outflow of Moorish population after their expulsion, that Pérez Moreda (1988: 380), reckons in, at least, 0.3 million. Thus, we have added a figure of 60,000 emigrants for each year between 1609 and 1613 inclusively. Estimates from 1670 onwards come from Martínez Shaw (1994: 151, 167, 249) for the periods 1670–1700, 1700–1800, 1800–30, and 1830–50 that have been distributed annually. As regards immigration, a figure around 0.2 million has been estimated for the sixteenth century, mostly French moving to Catalonia (Pérez Moreda 1988: 374), that we have distributed assuming a steady inflow of 2,000 people per year.

We lack yearly crude birth (*cbr*) and death (*cdr*) rates for Spain prior to the 1850s, and although baptisms would roughly amount to *b*, that is, *cbr* times population at the beginning of the year, assuming a fixed *cdr*, or a fixed *cbr/cdr* ratio, is unacceptable, as crude birth and death rates fluctuate widely in the short run, and even more at times of pandemics. Fortunately, David Reher (1991) computed yearly crude birth and death rates for New Castile since 1565 (Online Appendix 1 Population, Figure A2). Hence, a possibility to provide plausible conjectures on annual population levels consists of constructing alternative population estimates in which each population benchmark (N_{bk}) is projected forth by adding the annual natural increase in population derived from yearly crude birth and death rates for New Castile (cbr_{nct} and cdr_{nct}), less net emigration (m_t) guesstimates. This is the procedure to operate when we move forward (that is, when starting from, say, 1787 we want to estimate population in 1788), while we need to subtract the natural increase in population and to add net emigration in the previous year when we project population backwards (namely, when starting from 1787 we want to compute population in 1786).[8] That is,

$$N_{t+1} = N_{bk} + \left(cbr_{nct} - cdr_{nct}\right) * N_{bk} - m_t \quad \text{for } t > bk \tag{2}$$

$$N_{t-1} = N_{bk} - \left(cbr_{nct-1} - cdr_{nct-1}\right) * N_{bk} + m_{t-1} \quad \text{for } t < bk \tag{3}$$

Accepting crude birth and death rates from New Castile assumes implicitly that they are representative for the whole of Spain. Nonetheless, the crude death rate for New Castile matches the main famine mortality episodes for not only inland Spain, but Spain as a whole.[9] However, such arbitrary and unrealistic assumption is largely relaxed by the procedure we propose to reconcile the resulting series. In fact, the exercise suggested by expressions (2) and (3) provides a set of population series, one for each benchmark, that do not match each other for the years in which they overlap

[7] Although Martínez Shaw (1994) argues that Morner's figures for the early seventeenth century are grossly overexaggerated, we have accepted them as a way to offset the population disappeared as a consequence of war in Europe during the second quarter of the century.

[8] This crude approach is inspired by the inverse and back projection (Lee, 1985).

[9] Specifically, the dates of famine mortality in Spain pointed by Pérez Moreda (2017: 54) are matched by the rise of the crude death rate (in brackets): 1591–95 (1591), 1599–1600 (1599), 1605–07 (1606), 1630–31 (1631–32), 1647–52 (1647), 1678–85 (1684), 1706–10 (1707), 1730 (1735), 1741–42 (1740), 1786–87 (1786), 1803–04 (1804), 1809 (1809), 1812 (1812), and 1834 (1834).

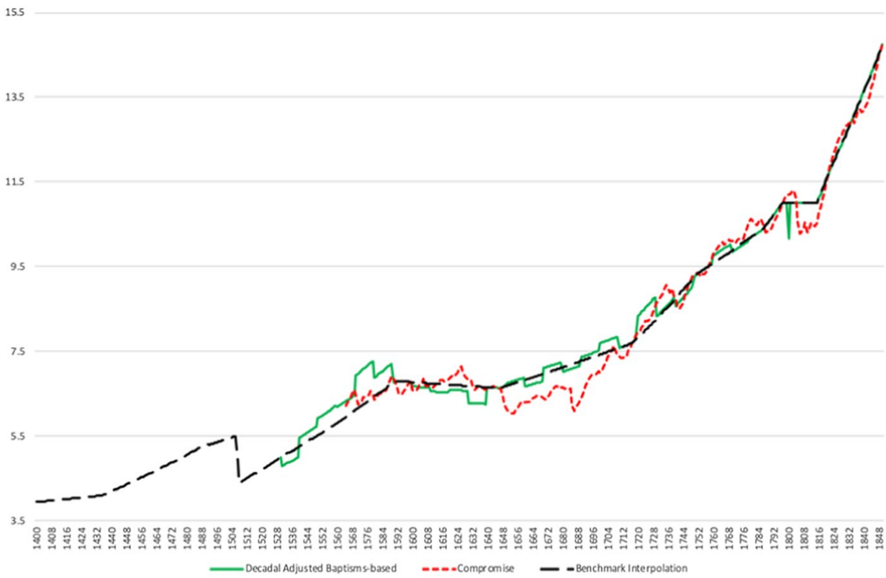

Fig. 1 Population: Benchmarks interpolation, Decadal adjusted baptisms-based, and Compromise Estimates, 1400–1850 (million)

(Online Appendix 1 Population, Figure A3). Therefore, we need to carry out a reconciliation between these alternative estimates.

A solution is to interpolate the series accepting the levels for each benchmark-year as the best possible estimates and distributing the gap or difference between adjacent benchmark series (say, series obtained by projecting the 1752 benchmark forward, N_{1752t}, and the 1787 benchmark backwards, N_{1787t}) in the overlapping year T at a constant rate over the time span in between the two benchmark years.

$$N_t^I = N_{1752t*}[(N_{1787T}/N_{1752T})^{1/n}]^t \quad \text{for } 0 \leq t \leq T \qquad (4)$$

being N^I the linearly *interpolated* new series, N_{1787t} and N_{1752t} the series pertaining to population obtained by projecting two adjacent population benchmarks (i.e. 1752 and 1787) with expressions (2) and (3), respectively; t, the year considered; T, the overlapping year between the two benchmarks' series (say 1787); and n, the number of years in between the two benchmark dates (that is, 35 years, 1787 less 1752, in our example).[10]

Figure 1 presents the compromise estimate along the decadal-adjusted series (Online Appendix 1 Population, Estimate 2) and the benchmarks interpolation. The comparison reveals that the main discrepancies correspond to the pre-1700 period,

[10] Alternatively, a variable-weighted geometric average for each pair of estimates derived using adjacent benchmarks, in which the closest benchmark series gets a larger weight, can be used (expression A2). We have used both approaches with identical results but have kept the ones from the linear interpolation as this is the splicing procedure used in modern national accounts.

and while the decadal-adjusted series peaks in the 1580, the compromise series continues expanding during the first quarter of the seventeenth century and declines thereafter, especially, in the second half of the seventeenth century, with deep contractions in the late 1640s-early 1650s and in the mid-1680s. Also, the compromise series departs from the other two in the early nineteenth century as captures the impact of the demographic crisis in the early 1800s and during the Peninsular War.

In Fig. 2, we present our conjectures about the evolution of Spanish population that combine the compromise series since 1565 with the annual population figures obtained through the decadal adjustment (with baptisms data) of the benchmarks interpolated series for the period 1520–1565, and the benchmarks interpolated series for the pre-1520 period (Online Appendix 1 Population).

3 Agricultural output

In preindustrial Europe, lack of data has led to estimate agricultural output indirectly (Wrigley 1985; Malanima 2011; van Zanden and van Leeuwen 2012). Using a demand function approach, Álvarez-Nogal and Prados de la Escosura (2013) computed agricultural consumption per head over 1277–1850, and assuming the net imports of foodstuffs were negligible, they used it to proxy output per head.[11] As this approach relies on proxies for per capita income and assumptions about income and price elasticities, it is worth exploring alternatives.

Early modern economic historians have used indirect information on a religious tax, the tithe, to draw trends in agricultural output, and Álvarez-Nogal et al. (2016) adopted this approach to infer the evolution of agricultural output in Spain between 1500 and 1800. In this section, we start from their work but extend the coverage of produce and regions as well as the time span back to 1400 and forth to 1835 (See Online Appendix 2 Computing Agricultural Output Indices from Tithes).

Figure 3 presents output for the main crops on the basis of tithes. Cereals show a long-run expansion up to the 1570s. Wine and livestock produce, especially, shadow cereals tendencies. Wine and olive production expanded remarkably during the central decades of the sixteenth century, remaining at high output levels until 1590. Most crops fell during the early seventeenth century recovering at different pace between the mid-seventeenth and the mid-eighteenth centuries. In the late eighteenth century, opposite trends are found: fruits and legumes and olive oil sustained declined while cereals, must, and livestock produce expanded. A fall is observed across the board in the early nineteenth century.

The share of each major crop in agriculture output at current prices is presented in Fig. 4. It can be observed that cereal and animal produce are the main contributors

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[11] Real consumption per head of agricultural goods (***C***) can be expressed as

$$C = a\,P^{\varepsilon}\,Y^{\mu}M^{\gamma}. \tag{5}$$

In which P and M denote agricultural and non-agricultural prices relative to the consumer price index, respectively; Y stands for real disposable income per head; ε, μ, and γ are the values of own price, income and cross price elasticities, respectively; and a represents a constant.

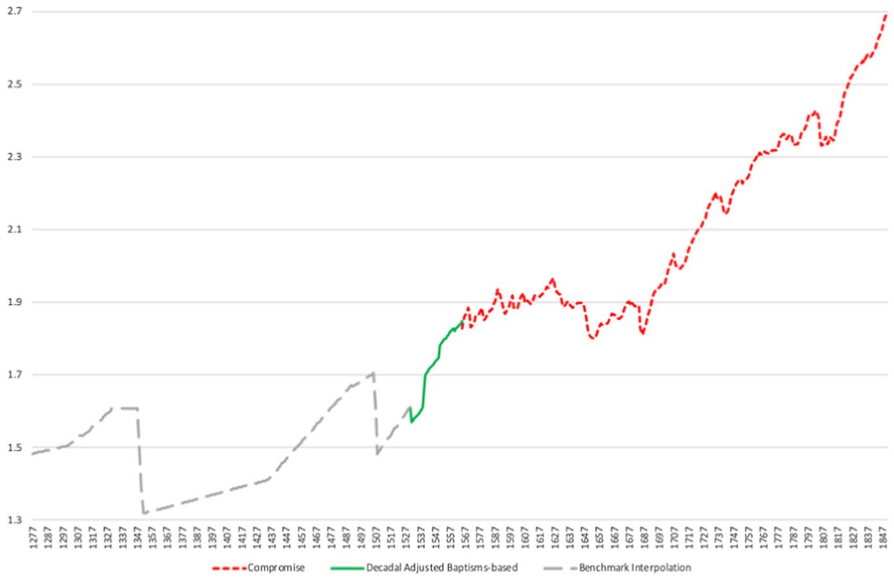

Fig. 2 Population Conjectures, 1277–1850 (million) (natural logs)

to agricultural output and show opposite trends, with the share of animal produce increasing and that of cereals declining up to the 1570s and in the late seventeenth and early eighteenth century, and cereals' share expanding at the expense of animal produce's in the early seventeenth and late eighteenth century.

We have constructed a Törnqvist index of agricultural output by weighting yearly variations in each crop's output by the average shares in adjacent years of each crop in agriculture output, at current prices, and, then, obtaining its exponential. That is,

$$\ln Q_{at} - \ln Q_{at-1} = \Sigma_i \left[\theta_{Qit}\left(\ln Q_{it} - \ln Q_{it-1}\right)\right] \tag{6}$$

with share values computed:

$$\theta_{Qit} = \frac{1}{2}\left[\theta_{it} + \theta_{it-1})\right] \tag{7}$$

Previously, current values, V, for each crop i at year t can be derived by projecting the value of each crop in 1799, V_{i1799}, backwards with the quantity index built on the basis of tithes, Q, and a price index, P (expressed as 1790/99 = 1) and then, added up in order to obtain the value of total agricultural output, Va_j.

$$Va_t = \Sigma V_{it} = \Sigma V_{i1799} * Q_{it} * P_{ijt} \tag{8}$$

Later, the share of each crop, V_{it}/Va_t, needs to be obtained.[12]

[12] See the sources of agricultural prices in Online Appendix 2 Computing Agricultural Output Indices from Tithes.

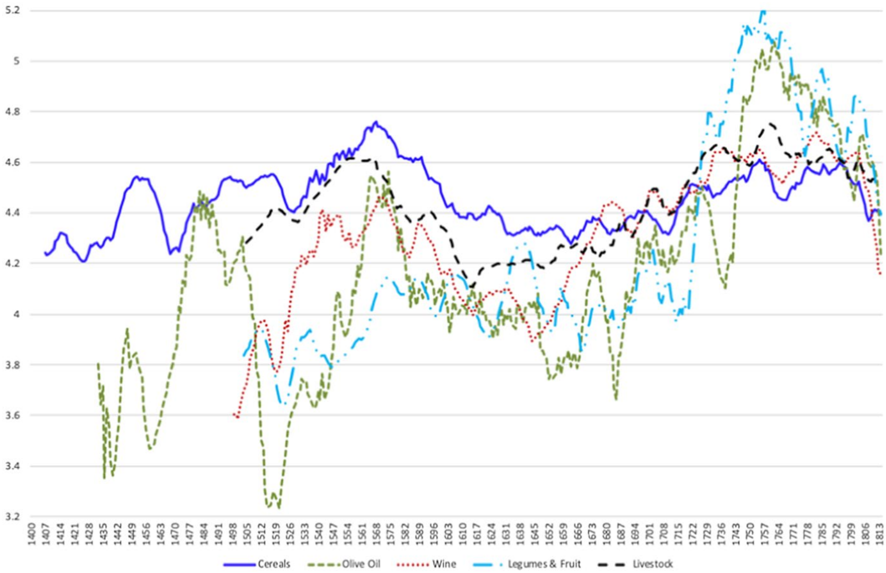

Fig. 3 Output by Main Produce, 1407–1814 (1790/9 = 100). 11-year centred moving average (logs)

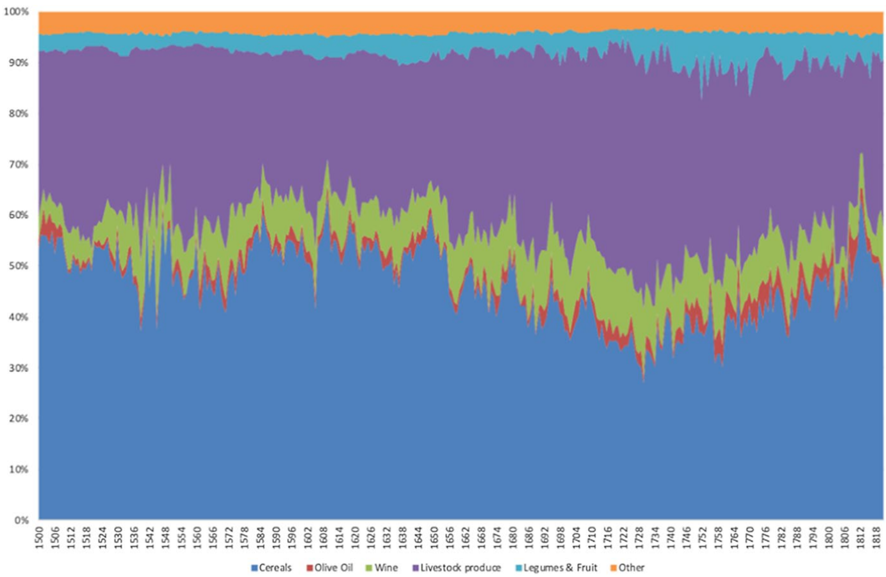

Fig. 4 Output Composition, 1500–1820 (%) (Current Prices)

In the evolution of agricultural output, distinctive phases can be found (Fig. 5). The first one was of sustained expansion that peaked in the early 1560s. A contraction between the mid-1570s and the early 1610s was followed by stagnation until

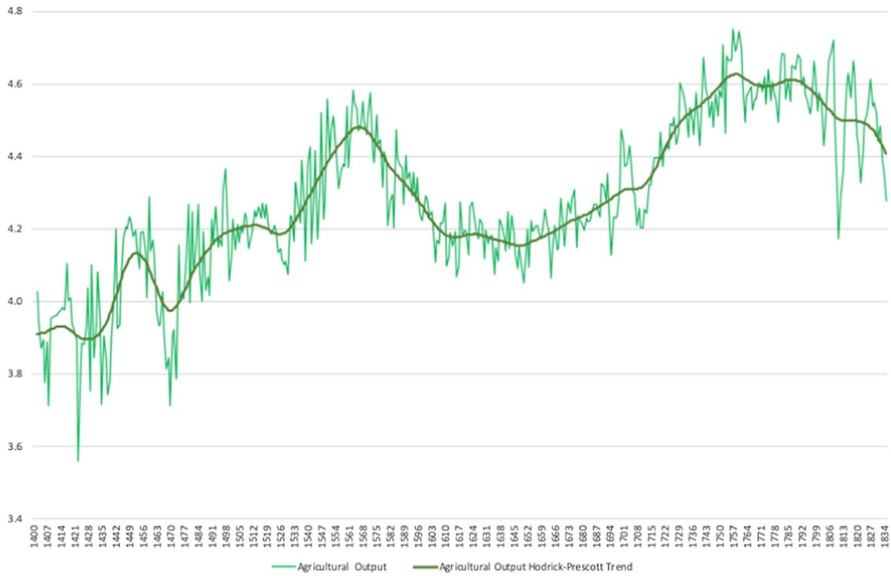

Fig. 5 Agricultural Output Törnqvist Index, 1402–1835: Level and Hodrick–Prescott Trend. (1790/99 = 100) (natural logs). *Sources*: See the text

1650. A long-run expansion from the mid-seventeenth to the mid-eighteenth century, punctuated by the War of Spanish Succession (1701–14), peaked in the 1750s, when the highest output level in four centuries was reached. Output stabilised, then, until the end of the century and declined during the Peninsular War.

If we now focus on agricultural output per person, two main phases can be noticed, a high plateau covering the fifteenth century and up to early 1570s, and a low plateau spanning between the early seventeenth century and the 1750s, with a transitional phase of decline, between the late 1570s and the 1620s, in between, in which output per person shrank by one-third (Fig. 6). A new phase of contraction is found in the late eighteenth century that reached its trough during the Peninsular War and represented one-fourth contraction since the 1750s.

How does the new tithes-based agricultural output per head compare to the consumption per head estimates derived with the demand approach? Both series present roughly the same trends since the early sixteenth century (Fig. 6). However, some differences emerge. While the demand approach series were already on high plateau since 1400, the tithes-based series show lower levels and higher volatility up to the 1500s. The shift from a high to a low path of output per head is also common to both estimates, reaching a trough in the early seventeenth century, but the tithes-based series present a sharper and neater decline, starting in the mid-late 1570s. Lastly, although the lower plateau covers roughly the same period in the two set of estimates, the post-1650 recovery is stronger and exhibits less volatility in the tithes-based ones.

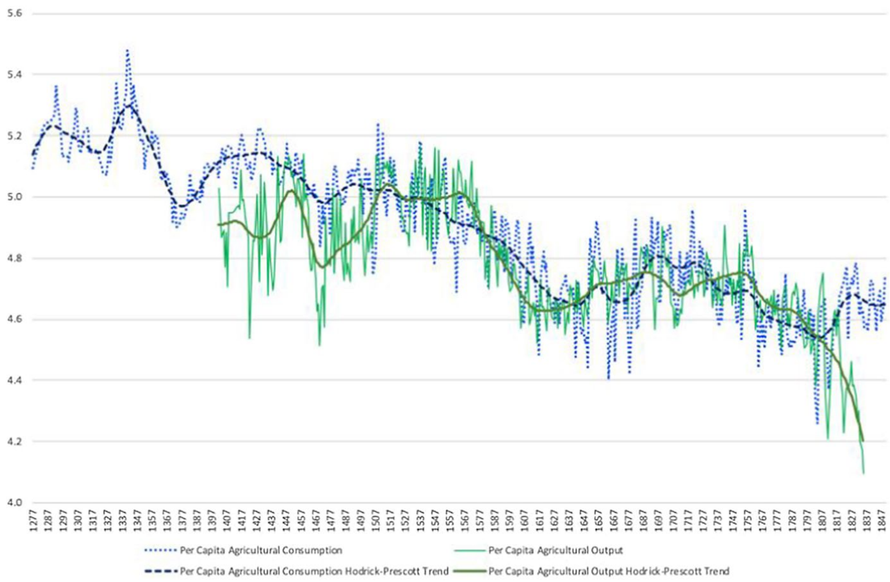

Fig. 6 Agricultural Output and Consumption per Head Törnqvist Indices, 1277–1850: Levels and Hodrick–Prescott Trend (1790/99 = 100). *Sources*: text and Álvarez-Nogal and Prados de la Escosura (2013)

It is worth noting that the parallel behaviour of the demand approach and tithes-based series supports the view that crop and livestock destruction appears as the main factor behind the sharp decline in tithes collection during the Peninsular War, rather than peasants' lack of compliance with the religious tax. However, Fig. 6 also shows that the tithes-based output departs sharply from the demand approach estimates from 1819 onwards, and the fact that the years between 1820 and 1833 correspond to a period of peace, suggests that it is non-compliance with the religious tax what explains the widening gap between the two indices. The so-called Trienio Liberal (1820–23), a phase of liberalisation, weakened Ancien Régime institutions and discouraged tithe compliance (Anes and García Sanz 1982; Canales 1982; Torras 1976). The bottom line is, therefore, that the parallel trends of the tithe-based and the demand approach estimates support the use of tithes as a reliable indicator of agricultural output tendencies until 1818. Moreover, our findings challenge the dismissal of the demand approach as simple controlled conjectures. Lacking direct sources of agricultural production, as it is often the case in preindustrial societies, the demand approach appears to provide a reasonable procedure to infer agricultural output trends.

Since our goal here is to provide the best possible estimate for long-run agricultural output, we propose a new index that accepts the demand approach estimates for 1818–1850 and the tithe-based ones for 1402–1818, and projects its level for 1402 back to 1277 with the demand approach index (dotted and dashed lines in Fig. 7).

4 Output in non-agricultural activities: urbanization as a proxy

A reconstruction of trends in industrial and services output is beyond the scope of this paper. It would require a thorough investigation of industrial output, sector by sector, most probably on the basis of a variety of indirect indicators among which taxes deserve to be explored. In the case of services, the prospects to get a proper assessment of output are even bleaker. A crude short cut to proxy trends in economic activity outside agriculture is urbanization, more specifically, the use of changes in the urbanization rate (ratio between urban and total population) to infer trends in non-agricultural output per head.[13] In this section, we follow Álvarez-Nogal and Prados de la Escosura (2013) and improve on their estimates by including additional urbanization benchmarks and better population data.

We have adopted the definition of 'urban' population as dwellers in towns of 5,000 inhabitants or more.[14] However, a caveat is necessary. Urban population has been accepted here as a proxy for output in non-agricultural activities after excluding those living on agriculture. The reason is that the existence of 'agro-towns' (namely, towns in which a sizable share of the population was dependent on agriculture for living) appears to be a feature of preindustrial Spain. 'Agro-towns' sink their roots in the *Reconquest*. In a frontier economy, towns provided security and lower transactions costs during the re-population following the southwards advance (Ladero Quesada 1981; Rodríguez Molina 1978). In the thirteenth century, Christian settlers from Aragon, Catalonia, and Southern France acquired farms but preferred to live in towns (MacKay 1977: 69). It has been claimed that, in southern Spain, "agro-towns" were the legacy of highly concentrated landownership after the acceleration in the pace of the Reconquest and the Black Death, which increased the proportion of landless agricultural workers (Vaca Lorenzo 1983; Valdeón Baruque 1966), although Cabrera (1989) attributes the rise of latifundia to the generalization of the seigniorial regime during the fourteenth and fifteenth centuries. In our estimates, 'agro-towns' appear mainly located in Andalusia, and since the late eighteenth century, also in Murcia and Valencia. Thus, we have computed trends in the rate of adjusted urbanization—that is, the share of non-agricultural urban population in total population—in an attempt to capture those in industry and services' output per head (See Online Appendix 4 Adjusted Urban Population).[15]

[13] The association between urbanization and the expansion of modern industry and services is not new (Kuznets, 1966: 271). Economic historians have suggested parallels between changes in urbanization rates and per capita income (Acemoglu et al., 2005; Craig and Fisher, 2000; Temin, 2006; van Zanden, 2001; Wrigley, 1985).

[14] Although this is a discretional threshold (Wrigley, 1985: 124), this way, we maintain consistency with Bairoch et al. (1988) large database facilitating international comparisons. Alternative thresholds of 10,000 (de Vries, 1984) and 20,000 inhabitants have been used (Flora, 1981). Bairoch et al. (1988) employed alternatively 2,000, 5,000, 10,000, and 20,000 inhabitants. Moreover, using a fixed threshold may provide a lower bound of the actual level of urbanization as it does not take into account the increase in the population living in towns and cities of larger size.

[15] In order to mitigate the inclusion of 'agro-towns', Malanima (2011) proposed for the south of Italy a limit of 10,000 inhabitants for being considered urban, as opposed to the 5,000 inhabitants limit for the north and centre of Italy. Cf. Llopis Agelán and González Mariscal (2006) for a more astringent definition of 'urban' centre.

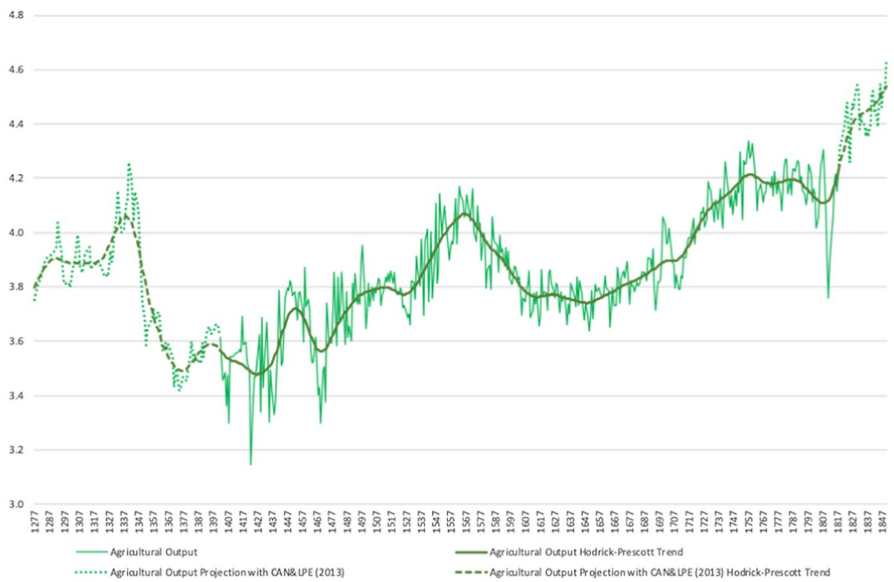

Fig. 7 Agricultural Output Törnqvist Index (spliced), 1277–1850: Level and Hodrick–Prescott Trend (1850/9 = 100) (natural logs). *Sources*: text

Albeit the existence of 'agro-towns', urban economic activity was closely associated with industry and services. In sixteenth century Old Castile, Yun Casalilla (2004) reckons, only one in twelve in the urban labour force worked in agriculture. Pérez Moreda and Reher (2003: 129) suggest, for 1787, a similar proportion of farmers in Spain's urban population.[16] Moreover, rural population carried out non-agricultural activities (storage, transportation, domestic service, construction, light manufacturing) especially during the slack season in agriculture (Herr 1989; López-Salazar 1986).[17]

Spanish urban population, adjusted to exclude population living on agriculture, has been computed at benchmark years for the period 1530–1857 (Correas 1988; Fortea 1995). Total and adjusted urban population levels for 1530 were projected backwards with Bairoch et al. (1988: 15–21) estimates.[18] Urban population for

[16] However, Reher (1990) reckoned half the economically active population living in towns in Spain worked in agriculture by 1787. Nonetheless, 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.

[17] 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).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). Perhaps, a more rigorous option would be to measure employment composition by sector in terms of days or hours worked, rather than assigning each worker to a specific occupation (Wrigley, 1985: 137).

[18] Bairoch et al. (1988) provide benchmark estimates of urban population for 1100–1500. We have assumed Bairoch et al. (1988) value for 1300 as representative of the pre-Black Death peak (1347).

Spain in, 1530, 1561, and 1646 has been inferred from data for the Kingdom of Castile (Fortea 1995). Adjusted urbanization rates, that is, urban population not living on agriculture expressed as a share of total population are presented at benchmark years in Table 1. Annual figures of 'adjusted' urbanization rates have been derived through linear interpolation of the benchmark estimates.

The accelerated expansion of the early sixteenth century slowed down in its second half and was reversed during the first half of the seventeenth century. Then, urbanization recovered slowly accelerating after the Succession War to overcome the late sixteenth century peak by the second half of the eighteenth century. Interestingly, these figures are at odds with the rather stable rate of urbanization (around 20%) widely used estimates by Bairoch et al. (1988).

5 Aggregate output

The next stage is to construct an index of aggregate output (Q). Rather than estimating long-run output with fixed weights which introduces an index number problem, as implicitly assumes that relative prices do not change over time, we have computed a Törnqvist index in which real GDP is obtained by weighting yearly output variations in agriculture, Q_{at}, and industry and services, proxied by 'adjusted' urban population, $N'_{urb\text{-}nonagr\,t}$, with the average, in adjacent years, of the shares of agriculture, θ_{Qat}, and non-agricultural activities, θ_{Qi+st}, in GDP at current prices.[19] That is,

$$\ln Q_t - \ln Q_{t-1} = \theta_{Qat}\left(\ln Q_{at} - \ln Q_{at-1}\right) + \theta_{Qi+st}\left(\ln N'_{\text{urb - nonagr}\,t} - \ln N'_{\text{urb - nonagr}\,t-1}\right) \tag{9}$$

where agricultural, θ_{Qat}, and non-agricultural, θ_{Qi+st}, share values are computed as:

$$\theta_{Qat} = \frac{1}{2}\left[\theta_{at} + \theta_{at-1}\right)\Big] \text{and}\, \theta_{Qi+st} = \frac{1}{2}\left[\theta_{i+st} + \theta_{i+st-1}\right)\Big] \tag{10}$$

and, then, Q_t is obtained as its exponential.

In order to get sector shares in current GDP, θ_{it}, current values, V, for each sector i at year t are derived by projecting each sector's value added average in 1850/9, $V_{i1850/9}$, backwards with the quantity, Q, and price $P_,$ indices previously built for each sector, Q_{at} and P_{at} for agriculture, and $N'_{urb\text{-}nonagr\ t}$ ('adjusted' urban population) and P_{i+st}, for industry and services, respectively, (expressed as 1850/9 = 1) and, then, added up to attain the value of total output, $V._t$

[19] In the case of agriculture, note, as discussed in the section on agriculture, real output estimates with the demand approach (Álvarez-Nogal and Prados de la Escosura, 2013) have been used for 1818–1850 and, then, spliced to the tithes-based index back to 1402 and, then, backwards projected to 1277 with the demand approach index. As regards non-agricultural output, the 'adjusted' index of urban population, that is, the 'adjusted' urbanization rate times population, has been accepted to represent it.

Table 1 Adjusted Urbanization Rates, 1277–1857: Benchmark Estimates (%). *Sources*: Bairoch et al. (1988), Correas (1988), and Fortea (1995); see the text and Online Appendix 4 Adjusted Urban Population

1277	(8.0)
1347	(8.3)
1400	(7.6)
1530	9.5
1561	13.6
1591	14.6
1646	8.7
1700	9.9
1750	13.8
1787	17.4
1857	22.9

Note: Figures in brackets are highly conjectural

$$V_{at} = V_{a1850/9} Q_{at} P_{at} \tag{11}$$

$$V_{i+st} = V_{i+s1850/9} N'_{\text{urb - nonagr}\,t} P_{i+st} \tag{12}$$

$$V_t = V_{at} + V_{i+st} \tag{13}$$

Later, the shares of agricultural and non-agricultural activities were obtained, respectively, as $\theta_{Qat} = V_{at}/V_t$ and $\theta_{Qi+st} = V_{i+st}/V_t$.

As regards price indices, the price index already built in the section on agriculture has been accepted. For non-agricultural activities, an unweighted Törnqvist index was computed with industrial goods and consumer price indices and nominal wages.[20] This amounts to allocating one-third of the weight to industry (the industrial price index) and two-thirds to services (nominal wage and consumer price indices), which represents a good approximation to these sector shares in non-agricultural output in the 1850s (Prados de la Escosura 2017) (For the source of prices see Online Appendix 3. Commodity and Factor Price Indices).

What does the long-run evolution of total output show? Distinctive phases can be distinguished (Fig. 8). Three phases of expansion: (1) between 1277 (the earliest date for which we have estimates) up to the late 1330s (at a 0.4% trend growth rate), whose origins possibly go as far back as to the mid-eleventh century; (2) from the late 1420s to the late 1560s (at 0.5% trend growth), disrupted during the late 1450s and 1460s and the early decades of the sixteenth century; and (3) from the mid-seventeenth to mid-nineteenth century (0.6% trend growth), decelerating only during the Spanish Succession (1701–14) and Napoleonic (1793–1815) Wars. Two phases of sustained decline complete the picture, the first one, triggered by the Black Death (1348), very intense until the 1370s, that lasted until the first quarter of the fifteenth

[20] Thus, average rates of variation for manufacturing prices, the CPI, and nominal wage rates were arithmetically averaged and the price index obtained as its exponential.

century (−0.5% trend growth rate); and a second one, from 1570 to 1650 (−0.4% trend growth).

If we now turn to output per head, its evolution follows a wide W shape, with phases of growth which peak in 1341, 1566, and 1850, separated by deep contractions in the late fourteenth and early seventeenth century (Fig. 9). Each phase of expansion up to the Napoleonic Wars (1277–1341, 1472–1566, and 1643–1850) shows similar pace (0.2–0.3% trend growth) but, as output per head declined sharply during shrinking episodes, each subsequent phase of growth started from a lower level and, hence, evolved along a lower path, with the result that over the very long run the trend growth rate was practically nil and per capita income levels hardly changed (Table 2, Panel A).

Trend growth rates (derived from smoothed series with a Hodrick–Prescott filter) for the new estimates in Table 2 show that in phases of economic expansion and contraction total output responded more than proportionally to population and confirm the view that output per head and population trends were directly associated.

When we compare the new index of output per head to earlier estimates by Álvarez-Nogal and Prados de la Escosura (2013), it is noticeable that in the new series, the economic collapse in the late sixteenth century began earlier, in the 1570s, not in the 1580s and was deeper. Nonetheless, the use of supply and demand methods to assessing trends in agricultural production provides similar long-term results in both levels and trends over 1402–1818 (Fig. 10).[21] This key methodological finding provides support for the use of an indirect approach such as a demand function when no sources for a direct estimation are available.[22]

6 Interpreting the results: evidence and hypotheses

Are there any lessons to be drawn from the new quantitative evidence on preindustrial Spain's performance? Some stylised facts about preindustrial societies can be perhaps put to the test. A first one is that of stagnant average incomes. Although living standards did not experience a noticeable improvement over the very long run, the expansive and contracting phases in the W-shaped evolution of Spain's real output per head contradict this view (Fig. 9). Instead, our results lend support to the idea of growth recurring over six centuries. Moreover, Broadberry and Wallis (2017) claim that, as shrinking phases become shorter and less frequent after growing phases, modern economic growth emerges, appears confirmed by Spain's early nineteenth century experience (Fig. 11).

A second stylised fact is the Malthusian nature of preindustrial economies. Trends in Spanish population and per capita income, expressed in logs, are offered

[21] Álvarez-Nogal and Prados de la Escosura (2013) also computed a Törnqvist index of output per head, using the 'adjusted' urbanization rate as a proxy for non-agricultural activities per person but derived consumption per head of foodstuffs with a demand approach from which agricultural output per head was inferred.

[22] The use of tithes, a fiscal source for which good archival records are available, in the supply side estimate of agricultural production, also represents an indirect approach.

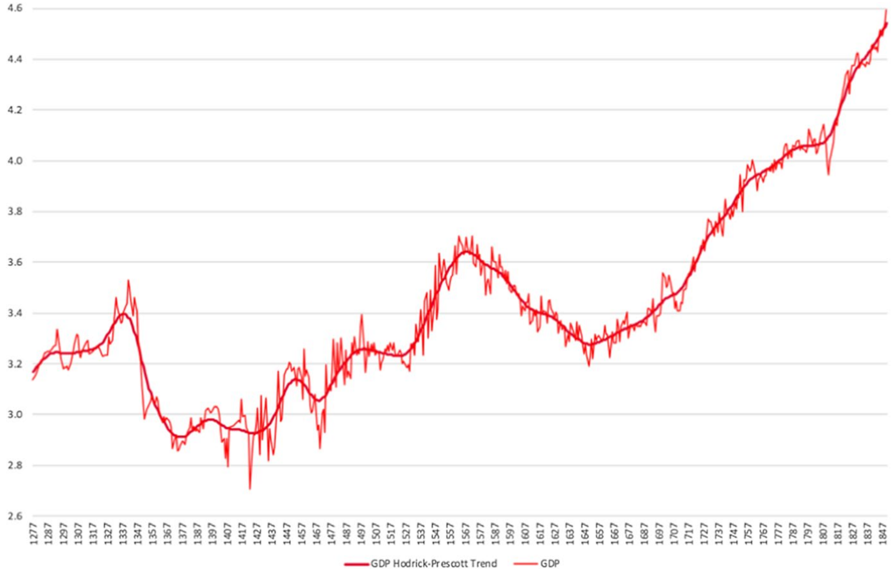

Fig. 8 Real GDP Törnqvist Index, 1277–1850: Level and Hodrick–Prescott Trend (1850/9 = 100) (natural logs). *Sources*: See the text

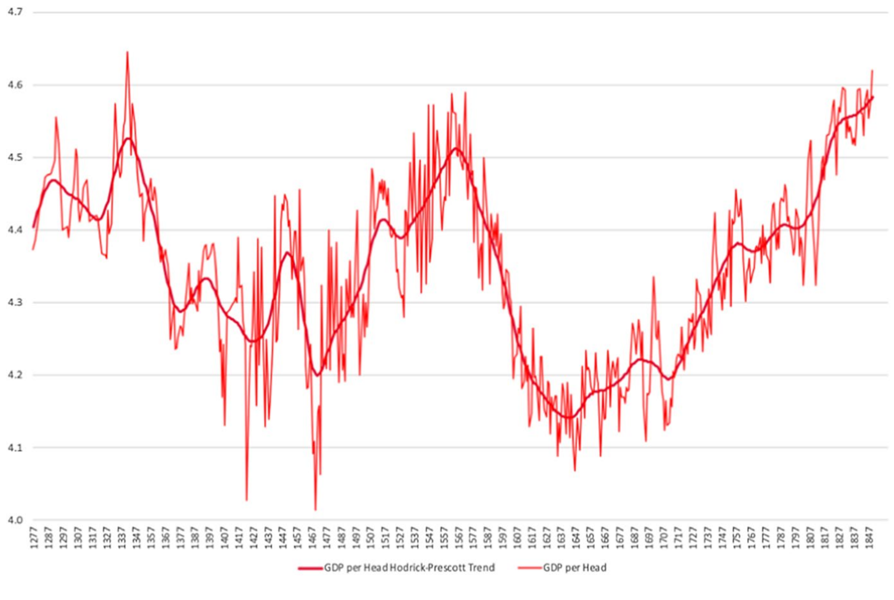

Fig. 9 Real GDP per Head Törnqvist Index, 1277–1850: Level and Hodrick–Prescott Trend (1850/9 = 100) (natural logs). *Sources*: See the text

Table 2 Output and Population Trend Growth, 1277–1850 (%)[a] (annual average logarithmic rates derived from Hodrick–Prescott smoothed series). *Sources*: See the text

	Output	Population	Output per head
1277–1850	0.24	0.21	0.03
Panel A			
1277–1341	0.34	0.15	0.19
1342–1471	-0.25	0.00	-0.25
1472–1566	0.61	0.28	0.33
1567–1642	-0.44	0.04	-0.49
1643–1850	0.60	0.38	0.21
Panel B			
1342–1471			
1342–1377	-1.31	-0.65	-0.66
1378–1471	0.16	0.25	-0.09
1643–1850			
1643–1710	0.27	0.19	0.08
1711–1758	0.92	0.53	0.39
1759–1807	0.30	0.22	0.08
1808–1850	1.09	0.72	0.38

[a]The periodization corresponds to that of output per head

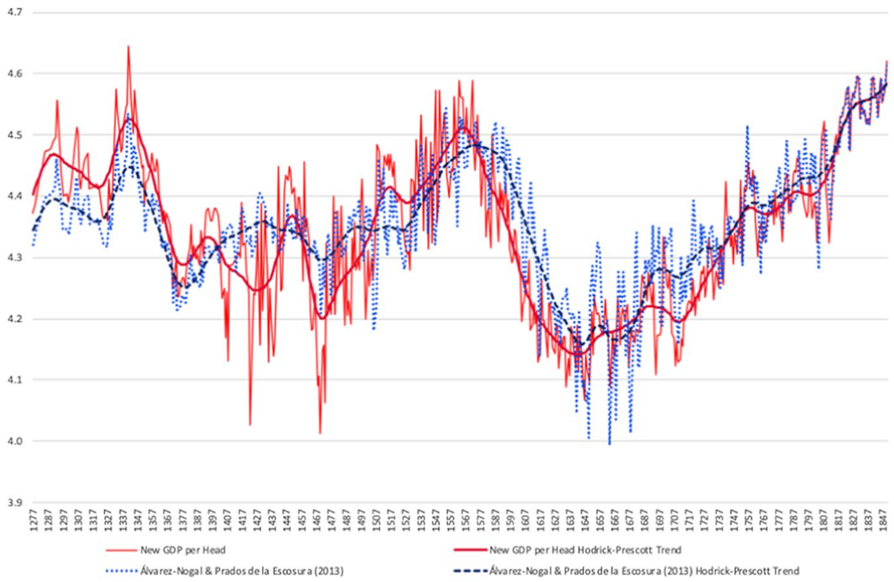

Fig. 10 Real GDP per Head, 1277–1850: New and Álvarez-Nogal & Prados de la Escosura (2013) Törnqvist Indices: Level and Hodrick–Prescott Trend (1850/9 = 100) (logs). *Sources*: See the text and Álvarez-Nogal and Prados de la Escosura (2013)

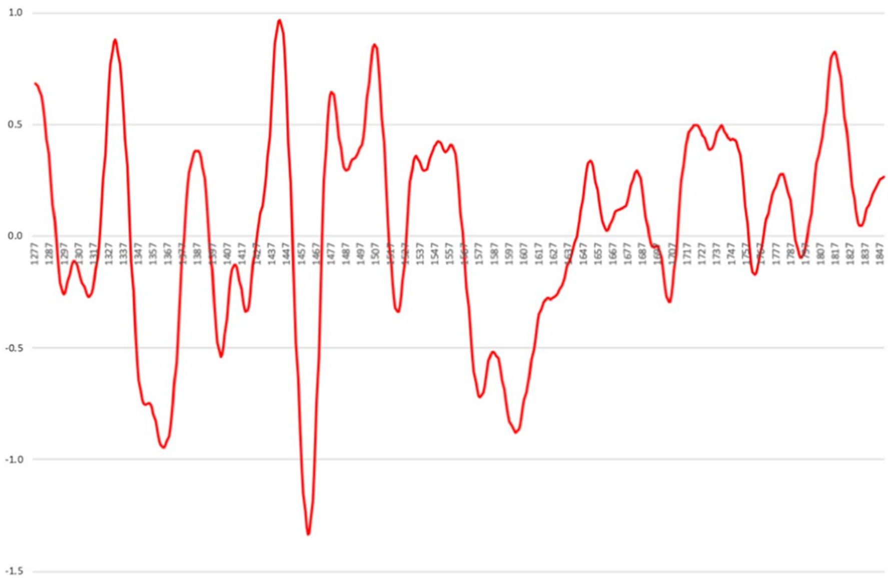

Fig. 11 Real GDP per Head Hodrick–Prescott Growth Rates, 1277–1850 (1850/9 = 100) (natural logs). *Sources*: See the text

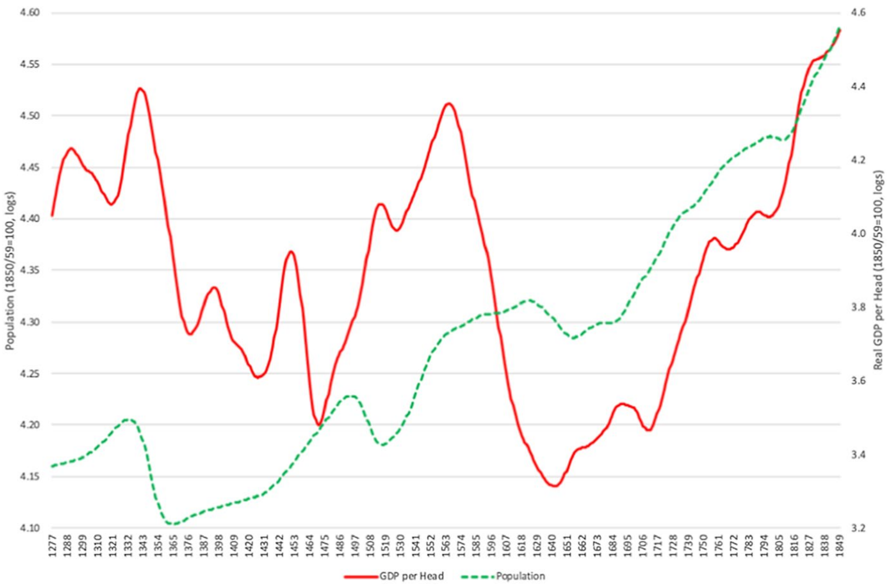

Fig. 12 GDP per Head and Population Hodrick–Prescott Trends, 1277–1850: (1850/9 = 100) (logs). *Sources*: See the text

in Fig. 12.[23] Population and real output per head expanded simultaneously up to the Black Death, during the late fifteenth and the sixteenth century, and from the early eighteenth to the mid-nineteenth century; conversely, population and income per person shrank in the late fourteenth and in the early seventeenth centuries. How can we explain these results at odds with the Malthusian view? A plausible explanatory hypothesis is the existence of a frontier economy, resource abundant in preindustrial Spain, but how long did Spain remain a frontier economy? Labour productivity moved together with the labour force in agriculture so when population and labour declined or grew, labour productivity did it too, and this pattern applied not only to Habsburg Spain but also to Bourbon Spain and may have lasted until mid-nineteenth century. Furthermore, land rent and labour productivity in agriculture also moved together (Álvarez-Nogal et al. 2016: 466–467). Moreover, the fact that the Black Death did not constitute in Spain the watershed it constituted in central and western continental Europe and the British Isles may be explained by its specific traits. In western Europe, by wiping out between one-half and one-third of the population, the Black Death reduced demographic pressure on resources, raised land- and capital-labour ratios, and led to higher returns to labour vis-à-vis land or capital and higher relative prices for non-agricultural goods. Cheaper capital and labour scarcity led to lower interest rates and higher wages that incentivised physical and human capital accumulation and stimulated labour saving technical innovation and female participation (Pamuk 2007). The fact that factor proportions in post-Plague western Europe were apparently similar to pre-Plague Spain's contribute to explain why the negative economic consequences of the Black Death, despite its comparatively milder demographic impact, prevailed in Spain during the late fourteenth and early fifteenth century. In Spain, population density before the Plague (8.9 inhabitants per square kilometre in 1300) was much lower than in most of Western European countries after the Plague in 1400 (Álvarez-Nogal et al. 2020) and the Plague destroyed a pre-existing fragile equilibrium between population and resources (Álvarez-Nogal and Prados de la Escosura 2013).[24] Furthermore, the collapse in the late sixteenth century and its lasting effects do not fit into the Malthusian narrative.[25] The fall in real output per head that, in its early stage (1572–1605), as deep as the one associated with the Black Death (1341–1374) but lasting much longer, seems crucial to Spain's falling behind. During 1570–1650, while population stagnated and per capita income shrank, the economy shifted from commercial and trade-oriented to inward looking and rural.

Long-run performance has been discussed, so far, in average terms, but how were the gains and losses over successive growing and shrinking phases of per capita income distributed among social groups? The Williamson Index, defined here as the

[23] The logarithmic transformation makes trends clearer as the slope of the curves provide the pace at which growth or decline occurred. Trends have been obtained with the Hodrick–Prescott filter.

[24] There were substantial regional difference within Spain, though, as discussed in Álvarez-Nogal et al., 2020). On the case of Catalonia, cf. the survey by Catalan (2020).

[25] This discussion merits econometric testing, but this is beyond the scope of this paper.

nominal (that is, current price) ratio between output per head and unskilled wage rates and expressed with 1790/99 = 100, permits to draw trends in inequality. The rationale underlying the Williamson Index is that GDP captures the returns to all factors of production, while the unskilled wage only captures the returns accruing to one factor, raw labour.[26] This way, average returns are compared with returns to unskilled labourers, that is, those at the middle of distribution are compared with those at the bottom. We cannot say, however, how close to the absolute poverty line unskilled wages were, although attempts to compute welfare ratios (namely, the ratio between a male labourer's yearly returns and the cost on maintain his family) suggest that unskilled workers were living close to subsistence in early modern Spain (Allen 2001; López Losa and Piquero Zarauz 2016). The new Williamson Index improves on the used in Álvarez-Nogal and Prados de la Escosura (2013) by employing current prices and, hence, avoiding the distortions introduced by the use of different deflators for GDP and wages (see Online Appendix 3. Commodity and Factor Price Indices, for the sources of wages) and more reliable GDP estimates.

Inequality trends followed those of GDP per head, expanding and contracting with it. Two phases in the evolution of income distribution can be distinguished. One of lower inequality, from the late thirteenth century (and probably earlier) up to the early sixteenth century and, another, of higher inequality from the mid-sixteenth century onwards (Fig. 13) that presents an upward trend and fits the experience of early modern Europe (Hoffman et al. 2020; Alfani 2021).

7 Spain in international perspective

How did Spain perform internationally? Angus Maddison (1995 2006) compared average incomes across countries and over time in a common monetary unit and at constant prices. Maddison's set of international estimates of real income per head in 1990 Geary–Khamis dollars international prices resulted from projecting per capita GDP levels in 1990 dollars, expressed in purchasing power parity (PPP) terms—that is, adjusted for differences in price levels across countries—back and forth with volume indices taken from historical national accounts. Although Maddison approach has been widely used, it can be seriously objected. Its main shortcoming derives from the severe index number problem it introduces in the comparisons, since the basket of goods and services produced and consumed in 1990, and their prices, become less and less representative as one moves back and forth in time.[27]

If, with all the caveats about the reliability of income levels derived with a remote benchmark, we follow Maddison's approach and express product per head in 1990 Geary–Khamis (G-K) dollars, Spain's average income ranged between G-K $1990

[26] Ideally, one would require GDP and wage dividing by per hour worked in order to normalise them, so our comparison of output per person and wage rates provides a crude metric that may distort inequality tendencies.

[27] In a nutshell, Maddison's approach implicitly assumes that the relative prices of 1990, and therefore, 1990 technology, remained unchanged over time (Cf. Prados de la Escosura, 2000).

600–1,100 over half a millennium.[28] As the absolute poverty line was set by the World Bank at 1985$1 dollar a day per person, that is, $1990 426, preindustrial Spain remained always above the absolute poverty line, more than doubling it in the early fourteenth century, in the late fifteenth and the sixteenth century and, again, since the late eighteenth century (See Online Data Appendix).[29]

And how does Spain compare to major economies in preindustrial Western Europe? At the time of the Black Death, average income levels in Spain were similar to France's and above those of the North Sea Area (Netherlands and the United Kingdom) (Fig. 14). Then, in 1560s, at the peak of its expansion, Spain's per capita GDP still remained ahead the U.K and France's, but way below that of the Netherlands. The collapse from the 1570s represented a watershed and Spain fell behind during the seventeenth century. During the eighteenth century's economic recovery, Spain partially caught up to France but not to the U.K. and, although its growth intensified after the Napoleonic Wars, its growth was not strong enough to prevent another episode of falling behind France and the U.K. in the early nineteenth century.

8 Concluding remarks

In this paper, we have tried to make the most of scattered data. Our results, conjectural as they may be, allow us to offer some preliminary conclusions and hypotheses for further research.

1. Our aggregate output estimates revise and improve on previous work by Álvarez-Nogal et al. (2013, 2016). In particular, our agricultural output estimates based on tithes largely confirm those previously obtained with a demand approach. This represents a relevant methodological finding for the reconstruction of historical national accounts: the use of indirect methods such as a demand function to assess trends in agricultural output is warranted in the absence of direct sources.
2. Although no significant long-term change in per capita output emerges over more than half a millennium, Spanish preindustrial economy was far from stagnant and long phases of absolute and per capita growth and decline alternated. 'Smithian' and 'growth recurring' episodes seem to be present in Spain's performance.
3. Population and output per head moved together, at odds with the conventional depiction of preindustrial societies as Malthusian. This finding is consistent with the high land-labour ratios found in a frontier economy.
4. In a frontier economy, living standards are usually relatively high and incomes not very unequally distributed. These features seem to fit Spain's experience until the early sixteenth century.

[28] Actually, the lowest level, $1990 582, corresponds to 1470 and the highest, $1990 1,094, to 1341, with an average per capita income of $1990 817 (c.v. 0.13) during 1277–1850.

[29] Converted in G-K$ 1990 with the US GDP deflator https://www.measuringworth.com/datasets/usgdp A similar figure is derived by Allen (2013) using the welfare ratio approach.

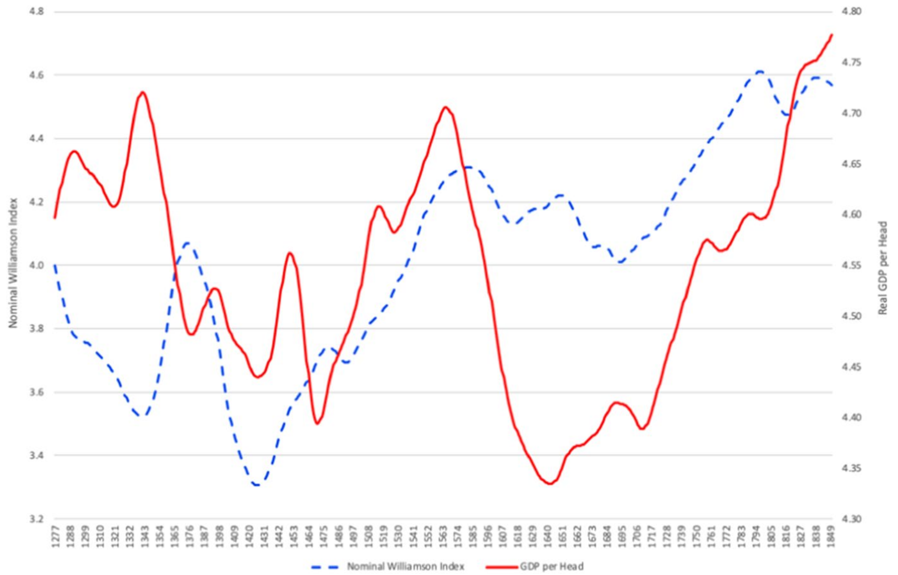

Fig. 13 Nominal Williamson Index and Real GDP per Head Hodrick–Prescott Trends, 1277–1850 (1790/99 = 100) (natural logs). *Sources*: See the text

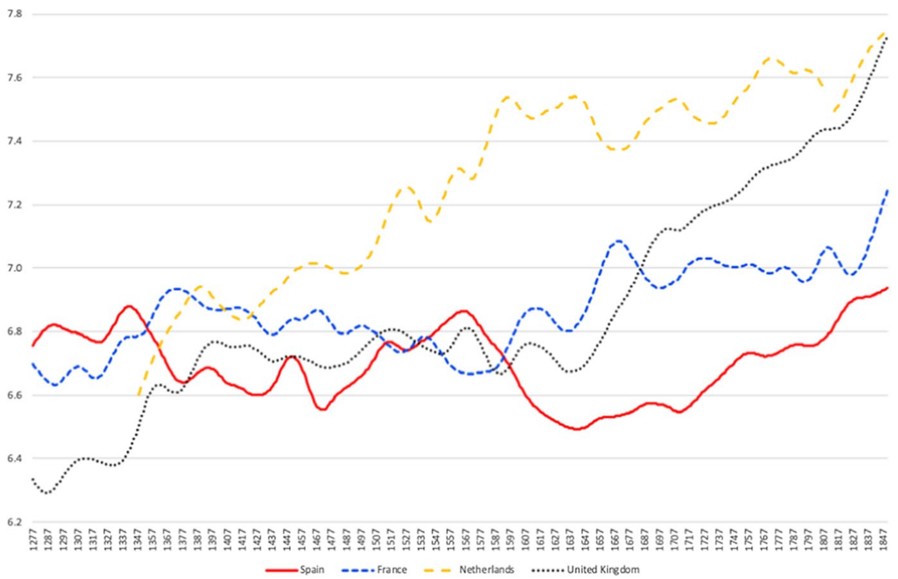

Fig. 14 Real GDP per Head Hodrick–Prescott Trends 1270–1850: European Perspective ($1990) (logs). *Sources*: Spain, see the text; France, Ridolfi and Nuvolari (2020); Netherlands, van Zanden and van Leeuwen (2012); United Kingdom, Broadberry et al. (2015)

5. If we project Spain's per capita income trend growth during 1470–1570 until the onset of the Napoleonic Wars, we get similar levels to the U.K.'s. Why Spain's performance up to the 1570s was cut short giving way to a sustained falling behind? Why Spain never returned to the virtuous path initiated in the late fifteenth and consolidated during the sixteenth century? Conventional Malthusian narratives do not appear persuasive in a context of simultaneous growth or decline of population and per capita income. The answer seems to be in policymakers' economic decisions and new incentives. The long-run unintended consequences of Spain's attempt to preserve its European Empire provide an explanatory hypothesis that needs to be explored. Sustained increases in fiscal pressure on dynamic urban activities to finance imperial wars in Europe triggered de-urbanisation and led to a collapse in average real incomes, from which early modern Spain never fully recovered. Furthermore, post-1570s Spain appears to present an inverted mirror image of the North Sea Area's experience where the pull of urban demand triggered an agricultural revolution as peasants had an incentive to raise their purchasing power to access the new urban goods and services.

Acknowledgements We are indebted to Vicente Pérez Moreda and David Reher for their comments and suggestions on the population section and to David Reher and Enrique Llopis Agelán for sharing their baptisms datasets. Prados de la Escosura gratefully acknowledges Fundación Rafael del Pino research support.

References

Acemoglu D, Johnson S, Robinson JA (2005) The rise of Europe: Atlantic trade, institutional change and
economic growth. American Economic Review 95(3):546–579

Alfani, G. (2021), Economic inequality in preindustrial times: europe and beyond. *Journal of Economic Literature* (forthcoming).

Allen RC (2001) The great divergence in European Wages and Prices in Europe from the middle ages to the first world war. Explor Econ Hist 38(4):411–447

Allen, R.C. (2013), Poverty Lines in History, Theory, and Current International Practice, Oxford Discussion Paper 685.

Álvarez-Nogal C, Prados de la Escosura L (2013) The rise and decline of Spain, 1270–1850. Econ History Rev 66(1):1–37

Álvarez-Nogal CL, de la Escosura P, Santiago-Caballero C (2016) Spanish agriculture in the little divergence. Eur Rev Econ Hist 20(4):452–477

Álvarez-Nogal CL, Prados de la Escosura, Santiago-Caballero C (2020) Economic effects of the black death: Spain in European perspective. Investigaciones de Historia Económica-Economic Hist Res 16(4):35–48

Anes A, Sanz AG (1982) Dime et production agraire dans l'Espagne moderne, de la fin du XVIe au milieu du XIXe siècle. In: Goy J, Le Roy Ladurie E (eds) Prestations Paysannes, Dîmes, Rente Foncière et Mouvements de la Production Agricole à l'époque Préindustrielle. Éditions de l'École des Hautes Études en Sciences Sociales, Paris, pp 453–461

Bairoch P, Batou J, Chève P (1988) La population des villes européennes. Banque de données et analyse sommaire des résultats, 800 à 1850. Librairie Droz, Genève

Broadberry SN, Wallis (2017) Growing, shrinking and long run economic performance: historical perspectives on economic development, CEPR Discussion Papers 11973
Broadberry SN, Campbell BMS, Klein A, Overton M, van Leeuwen B (2015) British economic growth, 1270–1870. Cambridge University Press, Cambridge
Bustelo F (1972) La población española en la segunda mitad del siglo XVIII. Moneda y Crédito 123:53–104
Bustelo F (1973) El Vecindario general de España de 1712 a 1717 o Censo de Campoflorido. Revista International de Sociología 7–8:83–103
Bustelo F (1974) El Vecindario general de España de 1712 y 1717 o Censo de Campoflorido (y II. Revista International de Sociología 11–12:7–35
Cabrera E (1989) The Medieval Origins of the Great Landed Estates of the Guadalquivir Valley. Econ History Rev 42(4):465–483
Canales E (1982). In: Anes G (ed) La economía española al final del Antiguo Régimen. Alianza-Banco de España, I Agricultura, Madrid, pp 105–187
Catalan J (2020) Del crecimiento con crisis a la crisis de crecimiento, 1315–1516 La gran depresión bajomedieval y la economía catalana. Revista de Historia Industrial 29(80):13–83
Cipolla CM (1980) Before the industrial revolution. European Society and Economy 1000–1700, 2nd edn. Norton, New York
Clark G (2007) A farewell to ALMS. A brief economic history of the world. Princeton University Press, Princeton
Clark G (2008) In Defense of the Malthusian Interpretation of History. Eur Rev Econ Hist 12:175–199
Correas P (1988) Poblaciones españolas de más de 5.000 habitantes entre los siglos XVII y XIX. Boletín de la Asociación de Demografía Histórica 6(1):5–23
Craig LA, Fisher D (2000) The European macroeconomy. Growth, integration and cycles, 1500–1913. Edward Elgar, Cheltenham
de Vries J (1984) European Urbanization, 1500–1800. Harvard University Press, Cambridge, Ms.
Flora P (1981) Historical process of social mobilization: urbanization and literacy, 1850–1965. In: Eisenstadt SN, Rokker S (eds) Building state and nation. Sage, London, pp 213–258
Fortea Pérez JL (1995) Las ciudades de la Corona de Castilla en el Antiguo Régimen: una revisión historiográfica. Boletín de la Asociación de Demografía Histórica 13(3):19–59
Galor O, Weil DN (2000) Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond. American Economic Review 90(4):806–828
García Sanz A (1986) Desarrollo y crisis del Antiguo Régimen en Castilla la Vieja. Economía y sociedad en tierras de Segovia, 1500–1814. Akal, Madrid
Goldstone JA (2002) Efflorescences and economic growth in world history: rethinking ‘the rise of the west’ and the industrial revolution. J World Hist 13(2):323–389
Hansen GD, Prescott EC (2002) Malthus to solow. Am Econ Rev 92(4):1205–1217
Herr R (1989) Rural change and royal finances in spain at the end of the old regimen. University of California Press, Berkeley
Hoffman PT, Jacks D, Levin PA, Lindert PH (2002) Real inequality in Europe since 1500. J Econ Hist 62(2):322–355
Jerven M (2011) African growth recurring: an economic history perspective of african growth episodes, 1690–2010. Econ History Dev Reg 25(2):125–154
Jones EL (1988) Growth recurring: economic change in world history. Oxford University Press, Oxford
Kamen H (1978) The decline of Spain: A historical myth? Past and Present 81:24–50
Kuznets S (1966) Modern Economic Growth: Rate, Structure, and Spread. Yale University Press, New Haven
Ladero Quesada MA (1981) Población, economía y sociedad. Historia General de España y América, vol 5. Rialp, Madrid, pp 3–105
Lee RD (1985) Inverse projection and back projection: a critical appraisal, and comparative results for England, 1539 to 1871. Popul Stud 39(2):233–248
Llopis Agelán E (2004) El crecimiento de la población española, 1700–1849: índices regionales y nacional de bautismos. Áreas 24:9–24
Llopis Agelán E, González Mariscal M (2006) La tasa de urbanización en España a finales del siglo XVIII: el problema de las agrociudades, AEHE Documentos de Trabajo 0602
Llopis Agelán E, Sebastián Amarilla JA (2007) La economía española en el Antiguo Régimen: balance y legado. In Dobado R, Gómez Galvarriato A, Márquez G (eds) España y México. ¿Historias económicas semejantes?, Fondo de Cultura Económica, Mexico D.F, pp 77–135

López Losa E, Piquero Zarauz S (2016) Spanish Real Wages in the North-Western European Mirror, 1500-1800. On the Timings and Magnitude of the Little Divergence In Europe, AEHE Documento de trabajo 1607
López-Salazar J (1986) Estructuras agrarias y sociedad rural en la Mancha (siglos XVI-XVII). Instituto de Estudios Manchegos, Ciudad Real
Lueger T (2018) The Principle of Population vs. the Malthusian Trap. A Classical Retrospective and Resuscitation, Darmstadt Discussion Papers 232
MacKay A (1977) Spain in the Middle Ages. From Frontier to Empire, 1000–1500. Palgrave Macmillan, Houndsmill
Maddison A (1995) Monitoring the World Economy 1820–1991. OECD, Paris
Maddison A (2006) The World Economy. OECD, Paris
Madsen JB, Robertson PE, Ye L (2019) Malthus was right: explaining a millennium of stagnation. Eur Econ Rev 118:51–68
Malanima P (2011) The Long Decline of a leading economy: GDP in Central and Northern Italy, 1300–1913. Eur Rev Econ Hist 15(1):169–219
Martín Galán M (1985) Nuevos datos sobre un viejo problema: el coeficiente de conversión de vecinos en habitantes. Rev Int Sociol 43(4):593–633
Martínez Shaw C (1994) La emigración española a América (1492–1824). Archivo de Indianos, Colombres
Morner M (1975) La emigración española al Nuevo Mundo antes de 1810 Un informe del estado de la investigación. Anu Estud Am 32:43–131
Palma N, Reis J (2019) From Convergence to Divergence: Portuguese Economic Growth, 1527–1850. Journal of Economic History 79(2):477–506
Pamuk S (2007) The black death and the origins of the "great divergence" across Europe, 1300–1600. Eur Rev Econ Hist 11(3):289–317
Pérez Moreda V (1988) La población española. In: Artola M (ed) Enciclopedia de Historia de España, I. Economía. Sociedad. Alianza, Madrid, pp 345–431
Pérez Moreda V (2017) Spain. In: Gráda CÓ, Alfani G (eds) Famine in European history. Cambridge University Press, Cambridge, pp 48–72
Pérez Moreda V, Reher DS (2003) Hacia una definición de la demografía urbana: España en 1787. Revista de Demografía Histórica 21(1):113–140
Prados de la Escosura L (2000) International comparisons of real output, 1820–1990: An Alternative Data Set. Explor Econ Hist 37(1):1–41
Prados de la Escosura L (2017) Spanish Economic Growth, 1850–2015. Palgrave Macmillan, London
Reher DS (1990) Town and Country in Pre-industrial Spain. Cambridge University Press, Cambridge
Reher DS (1991) Dinámicas demográficas en Castilla la Nueva, 1550–1900: un ensayo de reconstrucción, in J. Nadal Oller (ed.), *La evolución demográfica bajo los Austrias*, Alicante: Instituto de Cultura Juan Gil-Albert, pp. 17–75.
Ridolfi L, Nuvolari A (2020) L'Histoire Immobile? A reappraisal of French economic growth using the demand-side approach, 1280-1850, CEPR discussion papers 14985
Ringrose DR (1983) Madrid and the Spanish Economy, 1560–1850. University of California Press, Berkeley
Rodríguez Molina J (1978) El Reino de Jaén en la Baja Edad Media: aspectos demográficos y económicos. Universidad, Secretariado de Publicaciones
Temin P (2006) The economy of the Early Roman Empire. Journal of Economic Perspectives 20(1):133–151
Torras Elías J (1976) Liberalismo y rebeldía campesina, 1820–1823. Ariel, Barcelona
Vaca Lorenzo A (1983) Una manifestación de la crisis castellana del siglo XIV: la caída de las rentas de los señores feudales. El testimonio del monasterio de Sahagún. Studia Historica Historia medieval 1:157–166
Valdeón Baruque J (1966) Enrique II de Castilla: la guerra civil y la consolidación del régimen (1366–1371). Universidad de Valladolid, Valladolid
van Zanden JL (2001) Early modern economic growth. A survey of the European economy, 1500–1800. In: Prak M (ed) Early modern capitalism, economic and social change in Europe 1400–1800. Routledge, London, pp 69–87
van Zanden JL, Van Leeuwen B (2012) Persistent but not consistent: the growth of national income in Holland 1347–1807. Explor Econ Hist 49:119–130
Vilar P (1970) Estructures de la societat espanyola cap al 1750. Recerques 1:9–32

Voigtländer N, Voth H-J (2013) Gifts of mars: warfare and Europe's early rise to riches. J Econ Perspect 27(4):165–186

Wrigley EA (1985) Urban growth and agricultural change: England and the Continent in the Early Modern Period. J Interdiscip Hist 10(4):683–728

Yun Casalilla, B. (2004), *Marte contra Minerva. El precio del Imperio Español, c. 1450–1600*, Barcelona: Crítica.