DEMOGRAPHIC CAUSES OF URBAN DECLINE IN 17TH CENTURY SPAIN[1]

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INTRODUCTION

Some years ago, Jan de Vries (1987) put forward the idea that the Modern Age was characterized by the rise of the large city in Western Europe. Building on the medieval urban network (consisting of around 500 small local markets), the new cities (mainly capitals of the new Nation-States and large commercial ports) came to organize both the national and international markets (one of the most significant economic achievements of the commercial capitalist era). While the capital cities organized the political and institutional aspects of these new markets, the ports played their part in their economic organization. De Vries (1982, 179) suggested that this transformation, the most decisive period of which was between 1550 and 1650, was the key development that made the Commercial Revolution possible in the long term. The large cities of the day acted as a catalyst on their surroundings in such a way that the market economy penetrated into broad sectors of the rural population, encouraging agricultural specialization and proto-industry, which led to significant increases in productivity and a rising standard of living among the population, preparing society as a whole for the industrial era which was to come.

At the beginning of the Modern Age, this process of metamorphosis observed throughout Europe also started up in Spain. The two major metropolises of the time reflected the pattern described by De Vries: Seville was responsible for organizing trade with America, while Madrid took care of the political and institutional aspects of the national market. These developments also match with the chronological model proposed by the same author: the process of transformation accelerated in the period 1550-1650. However, around 1650, the process came to an abrupt halt and the country fell into a deep crisis.

The most characteristic trait of the large nuclei of population during the Modern Age was that their natural increase was negative, which meant that they had to depend on a constant migratory influx in order to subsist and grow. Wrigley (1967, 44-70) suggested the demographic stagnation of England during part of the seventeenth century was due to the rise of its cities, whose population was growing at such a rate that they absorbed all the natural growth of the rural areas.

In this article, we examine the role of demographic factors in the crisis of the Spanish urban network during the Modern Age. The data suggest that the rate of urbanization in the late sixteenth century was not equalled until two

hundred years later. What were the reasons for the intensity of the seventeenth-century demographic crisis and the sluggishness of eighteenth-century urban growth?

In recent years, studies conducted on a local level have predominated in Spanish historical demography. This focus on local and regional diversity had the effect that the overview has been somewhat obfuscated. Our aim in this paper is to estimate the demographic evolution of rural Spain (which in a sense supplied the population for the country as a whole) in order to establish to what extent the growth of the urban network affected the country's development as a whole. The underlying assumption is that cities in Spain, like their counterparts in Holland or England, acted as "parasites" from a demographic point of view.

SOURCES AND METHODOLOGY

One of the main achievements of Spanish historical demography in recent years has been the gathering of large quantities of data from parish series. This material has already been used to carry out regional reconstructions covering long periods of time (Reher, 1991; Ardit, 1991; Muñoz Pradas, 1991 and Sánchez Barricarte, 1998a, 1998b and 2002), and even a national reconstruction for the second part of the Modern Age (Llopis Agelán, 2004). None the less, to date no attempt has been made to reconstruct the entire country over the whole Modern Age.

We carried out a double demographic reconstruction: 1) of the whole country, on the basis of baptismal data (the historical data that are most widely available and most reliable[2]) and 2) of

the cities[3] on the basis of census data and births and deaths. These data (census population and natural increase) enabled us to estimate real and natural growth in the large centres of population. One of our aims in this research was to estimate the migratory flow from the countryside to the urban areas in order to assess the demographic impact of the urban network on the rural population. Our basic underlying hypothesis is that both the construction of the modern urban network and the maintenance of the Spanish Empire, be it in its territorial and military expansion or in its attempt to eliminate religious differences (the expulsion of the *moriscos*[4]), were sustained in the last instance by the population coming from the rural areas.

Given the limitations of the sources available, we had to make certain assumptions in order to carry out this research. In the course of this paper, we shall explain the methodological issues that we have tackled in order to establish as accurately as possible what the historical development of the demographic variables in question may have been.

Estimate of births

In Spanish historical demography there is a certain tradition of representing statistics for the number of baptisms over ten-year periods as index numbers. That is, the real number of baptisms is not shown, but rather the ten-year series which reflects the variation in each decade with respect to the reference value (which is taken as base 100). Since all the series are reduced to base 100, the different regional trends can be compared with each other in the medium term. This method is used, for example, by Nadal

Oller (1984) and Llopis Agelán (2004), whose work forms much of the basis for our present study. To their data, we also added information gathered from more recent publications.

We also calculated four regional models of marital fertility by age group, based on monographic studies from various different Spanish provinces (see Appendix I). Using this information, as well as data concerning the married female population provided by the 1787 census, we estimated legitimate births for each region during the decade 1780-89.[5] To calculate all births, we considered a 5.1% rate of illegitimate births in Spain, as suggested by Flinn (1989, 120).

On the basis of this ratio (between series of baptisms expressed as index numbers and total numbers of births) calculated for the years 1780-89, and by simple cross-multiplication we transformed the other available regional series of baptisms into total numbers of births (see Appendix II)".[6]

Reconstruction of urban demographic

In recent years, studies of the urban network in Spain have concentrated on reconstructing the map of towns and cities in great detail for those periods when the census data are most reliable. What we might term a "geographical" vision of the subject has predominated (Correas, 1988; Reher, 1990 and 1994; Fortea Pérez, 1995 and Pérez Moreda & Reher, 1997). By contrast, we applied a "historical" view: we examined only the main cities in Spain in the greatest possible chronological detail in order to pinpoint the chronology of the changes that occurred in the period from 1500 to 1860. In the last

analysis, as De Vries (1987) states, it was in the large cities that countries' economic fate in the Era of Commercial Capitalism was decided.

Using the information from parish registers from a sample of 6 large cities,[7] we calculated the numbers of births and deaths, and the birth and mortality rates.[8] We applied these rates to all Spanish towns with more than 10,000 inhabitants to calculate the total number of births and deaths in the urban sector (the results are displayed in Appendix III).[9]

Finally, although we have no information about deaths in urban areas before 1600, we estimated these on the basis of the natural increase rate for cities, and the number of baptisms. We considered that the natural growth rate of cities remained stable during the sixteenth century, being equal to the mean over a long period of decades in the seventeenth century (except for the most problematic years). According to our estimates, the natural increase in urban areas was negative in a structural sense throughout the whole of the period of our study.

The low birth rate in Spanish cities is striking. The mean from the whole period (1500-1860) was 31.3‰. Mortality was much higher (37.3‰). The resulting natural increase rate over the period was -0.6%. Urban demographic growth therefore relied on considerable migration from the countryside. We estimate that in the 350 years examined here, 3.1 million emigrants from rural areas were needed so that cities could increase by 1.2 million inhabitants.

Estimate of migratory balance

For the period 1504-1650, we used the estimates reported by Nadal Oller (1984) for the number of emigrants to the Americas. For the period 1650-1859, we estimated emigration from the statistics for the tonnage of ships sailing to America in each decade. We calculated the number of emigrants per ton for the periods for which information is available, and extrapolated it for those periods for which no data are available.[10] We considered the rural migratory balance to be the result of the sum of the migratory flow to the towns, emigration to America, and the expulsion of the *moriscos* in 1609-1612. That is, we assumed that all the people emigrating to America and all the *moriscos* who were exiled came from rural areas. It could be objected that some of these people came from the towns and cities but, in a certain sense, this does not matter, because in the end, the gap left by these urban emigrants would have had to be filled by people coming from rural areas. Whatever the case, we shall see that in quantitative terms the decisive type of emigration was that from the countryside to the town.[11]

The final migratory balance calculated is shown in Appendix IV. In total, the countryside lost 3.73 million inhabitants in the period of our study, most of whom went to the towns (3.1 million). Emigration to America (630,000) and the expulsion of the *moriscos* (270,000), occupied a secondary position from a quantitative point of view, although their impact was far from negligible.

Estimate of the Spanish rural population (1550-1860)

In 1981 Wrigley and Schofield published *The population history of England, 1541-1871*, which marked a before and after in historical demography. Using the technique of Back Projection (BP), starting from a nineteenth-century census, they were able to calculate population totals, age distributions, birth, death, migration and marriage rates for the entire period in their study. None the less, the validity of this technique has been questioned by various authors (Lee, 1985; Oeppen, 1985; Van Vianen, 1988). Oeppen (1993) deve-loped a new algorithm, the Generalized Inverse Projection (GIP), which is a refined version of Back Projection. Oeppen (1993) himself acknowledged that readers may be misled into thinking that the model (*i.e.* BP-GIP) somehow captures the true populations from the data available, but it does not. Since then, other methodological developments in this field have led to the spread of new techniques such as the Differentiated Inverse Projection (DIP) and the Stochastic Inverse Projection (SIP) (Bertino & Sonnino, 2003, 2004; McCaa & Barbi, 2004; Rosina, 2004; Ediev, 2011; Wheldon *et al.*, 2013).

Different backward population projection techniques have been used to construct population histories of states (England 1541-1871, Norway 1735-1974, Sweden 1750-1875, Denmark, Philippines, Italy 1750-1911, Chile 1855-1964, Bulgaria, Costa Rica, and Cuba 1900-1959), regions (Northern Italy 1650-1881, Sardinia 1862-1921, Tuscany 1640-1940, Scania 1650-1760, Valencia 1610-1899, Castille 1550-1900 and the Canary Islands 1680-1850), cities, and parishes or missions (Colyton 1545-1834, Pays de Caux 1530-1700, Lucerne 1700-1930, Berne 1720-1920, Amsterdam 1680-1921, and Velletri

1595-1740) (Ardit, 1991; Balthasar, 1989 and 1990; Brunborg, 1976; Galloway, 1994; González Quiñones & Ramos Piñol, 1996; Leeuwenn & Oeppen, 1993; McCaa, 1989; Muñoz Pradas, 1991; Oeppen & Bengtsson, 1993; Rosina, 1995; Smith & Ng, 1982).

Although we are aware of the difficulties and limitations posed by the use of such techniques, we consider that applying them to the case of Spain could be extremely useful to obtain an overview of its demographic dynamics. However, we did not perform a back projection, opting instead to do a forward projection: starting from the population distribution within a given census, and taking into account the migratory structure, we tried to calculate the level of life tables on Coale and Demeny (1966)'s model which would best generate the population structure to be found in the next census.

Once the deaths per decade had been estimated for the rural areas, the deaths across the whole country were calculated by adding rural and urban deaths. We used these data to build a general reconstruction of the whole country. We estimated the number of deaths in the countryside on the basis of the simplest possible assumption: we assumed that the underlying rural mortality remained constant during the period between two censuses.[12] We used the life tables (southern model) by Coale and Demeny (1966) which best reflected the population observed in the censuses of 1530, 1591, 1768, 1787 and 1860 (the most reliable census records).[13] That is, on the basis of births, and taking into account migrations, we sought to establish the level of mortality that must have been present in the population reported in the censuses. The most delicate issue

that we had to face in our reconstruction was that there are no reliable censuses between 1591 and 1768, which means that we lack objective references to define the mortality rates between these years. We therefore used the following criteria: we applied the mortality table needed to produce the population in 1767 from the 1590s onwards (Fig. 1). The results had quite a good fit with the estimates concerning particular periods during this time made by other researchers (Cachinero Sánchez, 1985, 63-70; Dopico, 1987, 173-179, Dopico & Rowland, 1990, 597-602 and Moreno Almárcegui, 1998, 128-129). According to our calculations, the mean life expectancy at birth in rural areas between 1550 and 1859 was 27.1 years.

What is interesting in this reconstruction is that it was scarcely necessary to change the mortality rates between 1550 and 1767 to produce the population reported in the censuses. However, it is striking that between 1768 and 1860 it proved necessary to "raise" the life expectancy to generate the population found in the censuses: it rose from 25.9 years in the 1760s to 30.6 years in the 1850s. The life expectancy at birth in the later period of our study was the highest in all three centuries.

The fact that we used urban series to reconstruct the whole country means that we now have to qualify slightly something that we have maintained up until now. In general, life expectancy is lower when cities are included (26.8 years over the whole period), which seems to make sense. The greatest differences between the two series are to be found in the seventeenth century, particularly the decades from 1640 to 1680, and then from 1800 to 1809.

Fig. 1 *Estimate of life expectancy at birth in Spain*
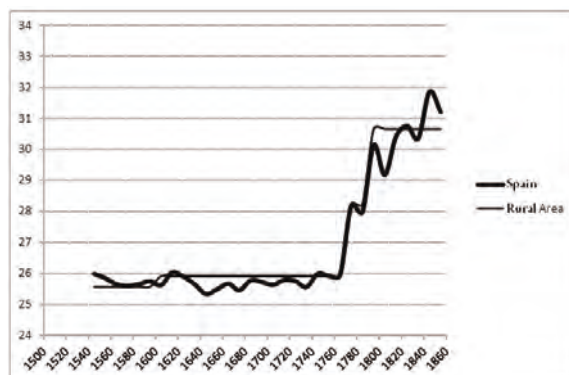
These results confirm that mortality also had a major impact on the demographic crisis of the seventeenth century. At the end of the period, the differences in life expectancy at birth throughout Spain, on the one hand, and in the rural areas, on the other, tend to converge. This suggests that in towns and cities the level of mortality improved, particularly from the 1840s onwards.

THE IMPACT OF THE URBAN NETWORK AND MIGRATION ON NATURAL POPULATION INCREASE IN THE COUNTRYSIDE

To what extent did the urban network (and its insatiable demand for incomers) condition the natural increase in rural areas, resulting in depopulation and the demographic collapse of vast areas of the country during the seventeenth-century crisis? Fig. 2 compares natural increase with the migratory balance in the rural areas of Spain. It shows us how from 1630 to 1669 (the point at which the urban network disintegrated) the emigration needed to "sustain" towns and cities was greater than the natural population increase produced by the countryside. If our estimates are accurate, it would mean

that at least in the 50 years from 1630 to 1680, the weight of the Spanish urban network dragged the rural population into decline. Maintaining the urban network required more people than the countryside could provide.[14] No other period in these 350 years can be compared with this one. During the rest of this time, although emigration accounted for a large percentage of the natural population increase in the countryside, it never overtook it.

The data show that after the decade 1560-69, the natural increase in rural areas of Spain declined, reaching its nadir in the period 1660-69. However, Fig. 2 also shows that this drop in natural increase cannot be explained by migration from the countryside alone. Other causes must also be sought.

In a ground-breaking article which had little impact on subsequent research, David Reher (1991, 46-47) suggested, in his study of the Castile-La Mancha region, that the seventeenth-century demographic crisis was due to a marked reduction in nuptiality.[15] This discovery was of far-reaching importance, because it showed that even in populations with a high level of mortality, the marriage rate had a decisive role

Fig. 2 *Estimate of natural increase and migratory balance in rural areas of Spain*
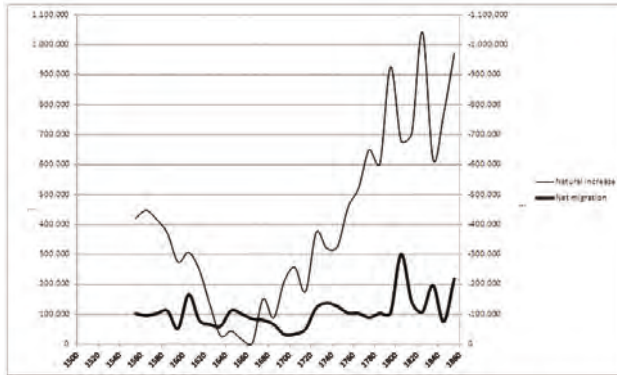
in regulating demographic growth. This consideration led us to analyse in detail what the role of marriage was in regulating demographic growth in Spain as a whole during the Modern Age.

To perform this analysis, we developed an index of nuptiality similar to the well-known Princeton nuptiality index (I_m) designed by Coale (1986) for the European Fertility Project. Like the Princeton index, our index is intended to measure the intensity of nuptiality within the Spanish population during the Modern Age. We shall call our index I'_m to distinguish it from that of Coale. It is calculated as follows:

$$I'_m = \sum \left[{}_nP_x^{wm} \, {}_nF_x^{marital \, Spain} \right] / \sum \left({}_nP_x^{wt} \, {}_nF_x^{marital \, Spain} \right)$$

where, ${}_nF_x^{marital \, Spain}$ = age-specific marital fertility rates observed for married women of age x to x+n in Spain during the Modern Age, estimated on the basis of family reconstructions from the period in question (Appendix I).

${}_nP_x^{wm}$ = number of married women half-way through the year, with ages x to x+n

${}_nP_x^{wt}$ = total number of women half-way through the year, with ages x to x+n

Although we do not know the number of married women (${}_nP_x^{wm}$), we can estimate the variations in the intensity of

nuptiality during the Modern Age from fertility data, as long as we accept certain premises. We must accept that: 1) illegitimacy rates were fairly stable,[16] 2) age-specific marital fertility rates obtained from family reconstructions carried out in Spain using data from this period are representative of the whole of the country, and 3) these rates remained constant throughout the entire period of this study.[17] If we accept these assumptions, the variations in the index I'_m must be due to the different proportions of women who married, since the fertility rates (${}_nF_x^{marital \, Spain}$) are the same in both the numerator and the denominator.

The I'_m values that we obtained are shown in Fig. 3. We show the values for Spain as a whole, and for the countryside. This Fig. suggests that the marriage rate significantly reduced total fertility and played an important part in regulating demographic growth during the Modern Age. According to our estimates, there were two moments at which the nuptiality indices plummeted, thereby significantly reducing fertility: 1580-1670 and 1770-1850. In a sociological context, when illegitimacy rates are very low, severe restrictions on access to marriage have a devastating

Fig. 3 *Evolution of the nuptiality index I'$_m$ in Spain (30 years moving average)*
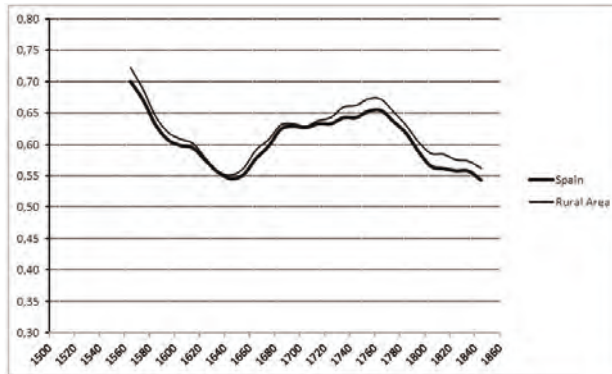

effect on the number of births and therefore on demographic growth.

Since the structure of marital fertility used to calculate the index I'$_m$ is not that of married Hutterite women, logically enough, the values of I'$_m$ are not equivalent to those of the Princeton index I$_m$. By analysing historical data from different countries, we have been able to show that when the age-specific marital fertility rates observed in Spain during the Modern Age are used (Appendix I) instead of those for married Hutterite women, the I$_m$ values fall by 5-6%. It is therefore possible to perform a fairly reliable approximate calculation of the I$_m$ values, by applying a 6% increase to the I'$_m$ values. We did this in Fig. 4, to show that the estimated I$_m$ values in our reconstruction for the whole of Spain and for rural areas fit very well with those obtained by other authors for Spain as a whole, or for rural areas in the province of Navarre, during the first half of the nineteenth century (Coale & Watkins, 1986; Sánchez Barricarte, 1998a and 1998b).

Fig. 4 *Changes in nuptiality (I$_m$) in Spain*
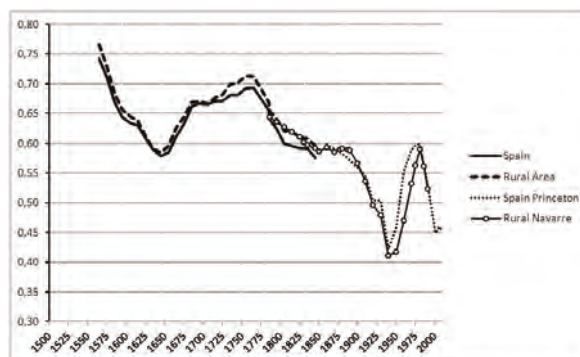
Note: The I$_m$ values for "Spain" and "Rural Area" were estimated by increasing the I'$_m$ values by 6%. The "Spain Princeton" data are the values for I$_m$ calculated for the whole of Spain by the Princeton European Fertility Project (Coale and Watkins, 1986). The data for "Rural Navarre" rely on the I$_m$ values calculated by Sánchez Barricarte (1998a and 1998b) for rural areas in the Spanish province of Navarre.

Fig. 4 shows that for over 150 years (from the late eighteenth to the mid-twentieth century) the marriage rate experienced a constant decline. Without in any sense suggesting that a causal relationship exists, we would like to point out that in general terms this fall in nuptiality coincided with a gradual increase in life expectancy. The nuptiality pattern suggests that the increase in life expectancy was balanced by a decrease in the marriage rate. If this is the case, this Fig. confirms that for Spain, nuptiality had a fundamental role in regulating demographic growth, at least between 1550 and 1950. Along the lines suggested by Reher (1991), in his study of Castile-La Mancha, our reconstruction seems to indicate that nuptiality indeed had a major role in the Spanish demographic crisis of the 17th century.

Many authors of the period also pointed to the problem of access to marriage as one of the main reasons for Spain's demographic stagnation. Both González de Cellorigo (1600) and Fernández de Navarrete (1619), when analysing the causes of Spain's depopulation, emphasized the importance of marriage. It is interesting that these authors were writing precisely at the point when the marriage rate plummeted. González de Cellorigo explicitly attributed the demographic crisis besetting Spain to the decline in marriage. In fact, he gave the title "De lo mucho que importa para fertilizar la República disponer bien las cosas tocantes al estado del matrimonio" to one of the chapters of his book. His chapter depicts marriage as a heavy burden or "yoke" which women flee, "abandoning procreation" (González de Cellorigo, 1600, 58-59).

The high cost of dowries at that time clearly placed restrictions on marriage.

Although Fernández de Navarrete (1619, 96-100) does not explicitly discuss nuptiality, we can deduce from his critique of the spreading of primogeniture and majorat that he regarded the difficulties encountered by younger sons wishing to marry as one of the main causes of rural depopulation.[18] A century later, summing up the causes of the demographic stagnation which Spain had experienced through the seventeenth century, Uztáriz (1724) still regarded the limitations on marriage as the main factor responsible for depopulation. In his view, depopulation was caused by the lack of good jobs, which meant that people could not marry and form families. In the early nineteenth century, at another time when the marriage rate was low, Sempere Gaurinos (1805) returned to the same point, relating the existence of majorats to the decline in marriage rates.

Repeated references are made to the low marriage rate as being an important factor, if not the main cause, underlying demographic stagnation in the seventeenth century, above all at the times when these authors were writing (when marriage rates were at their lowest, according to our estimates of the nuptiality index), and these provide sound support for our own hypothesis.

We created a database using material from the charitable institutions founded in Spain from the sixteenth to the nineteenth century with the purpose of providing dowries so that young girls could marry (Fig. 5). Institutions of this kind, though particularly common in large cities, were found all over Spain. Curiously, the highest number of institutions was present between 1580 and 1670, which coincided with the moment at which the marriage rates

were at their lowest according to our estimates.[19] These figures are important, because they show that not only the elite had problems when trying to contract marriage, but that this concern had spread to broad layers of the population. The creation of thousands of institutions all around Spain to provide dowries indicates that society was not impervious to the difficulties of the sizeable sector of the population who wanted to marry, and tried to aid unmarried girls, which indirectly confirms our own results: between 1580 and 1660 (the decades with the lowest levels of nuptiality according to our estimates), people found it very difficult to marry.

Fig. 5 *Number of charitable institutions created in Spain to provide dowries for young women (30 years moving average) and I'$_m$ values*
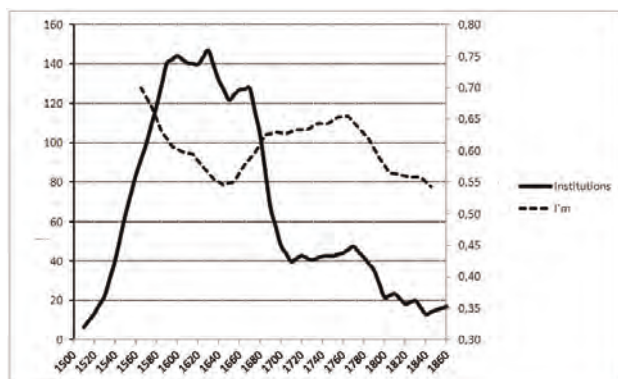
Source: Own data on the basis of information from the Ministerio de la Gobernación *(1912-1918: 1-408). The Fig. shows only institutions founded in the 16th to 19th centuries that survived into the 20th century, that is, only presents a sample of the total number of institutions that were founded.*

Fig. 6 *Migration rate and nuptiality index I'$_m$ in rural Spain*
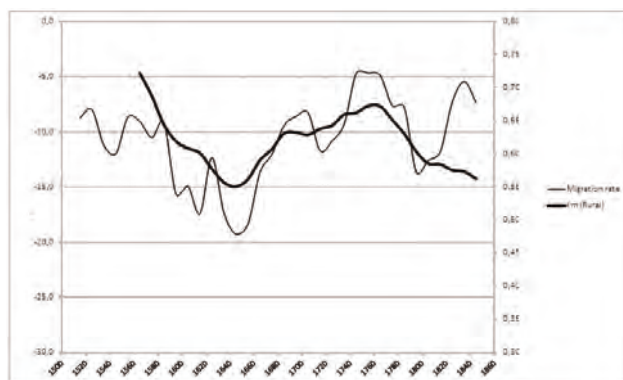
Finally, Fig. 6 compares the emigration rate and the I'$_m$ index for rural areas in Spain. We can see that where the migratory balance is very low, the I'$_m$ values are also at their lowest. That is, in rural areas the population had two strategies to survive moments of economic hardship (high tax burden): emigration, or remaining single.

NUPTIALITY AND TAX BURDEN

The fact that marriage and emigration had a major impact on the demographic crisis of the seventeenth century, and that mortality was not the only factor (as so many historians have traditionally maintained[20]), has certain obvious consequences. Among all demographic factors, the ones which are most obviously social in nature are marriage and migration. Let us first consider nuptiality. Just why did people feel less inclined to form families during the seventeenth century, and from the late eighteenth century to the mid-nineteenth century?

Some writers of these periods emphasize the effects of taxation on economic and demographic growth. The Castilian system imposed taxes on the consumption of everyday products that were essential for life (the so-called "alcabalas"[21] or "millions"[22]), which doubtless affected the cost of living, the income available to families, and the decisions people might make as to when to found a family. In the case of cities, where the tax burden was much higher, there would seem to be no doubt about its effects (Artola, 1982, 125-127; Ucendo, 2006, 41-70). But was the Monarchy of the day powerful enough for its fiscal policy to influence marriage patterns among inhabitants of rural areas?

We performed an estimate of the way the tax burden may have developed in Spain as a whole during the period of this study, using data from the Spanish regions of New Castile, gathered by Hamilton (1975 and 1988), and Navarre, collected by Fernández Romero (2005) (Fig. 7). The first of these is an example of a region with more urban settlements, while the second is a more rural area. Although it might seem rather pretentious to estimate the cost of living throughout Spain on the basis of data from two regions, we believe that this is sufficient to obtain a general impression of these costs. Appendix VI explains the methodology for calculating the tax burden and cost of living in Spain from 1540 to 1849.

Fig. 7 *Tax as percentage of family income in Spain*
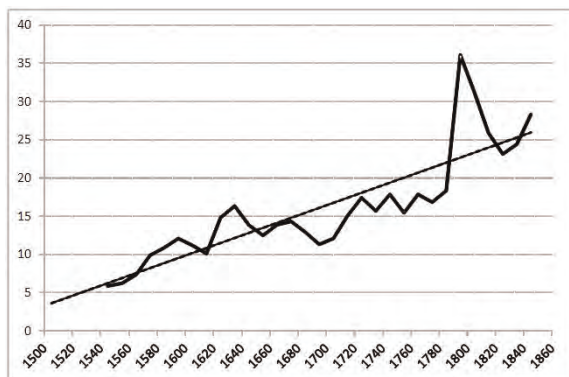
Source: These data are from column F of Appendix VI.

As Fig. 7 shows, in the long term the Monarchy's spending tended to increase. Tax went from 5% of family living costs in the early sixteenth century to 36% in the period of the Napoleonic Wars. We do not know whether this long-term upward trend reflects the real cost of the fiscal burden, or was due to an increase in State income at the expense of other institutions, such as the Church or the nobility. To sidestep this problem, arising in the course of a very long series covering three-and-a-half centuries, we decided to use the deviation of each decade from the line representing the long-term tendency as an indicator of the tax burden on families (column G in Appendix VI). We believe that sudden changes in our indicator in the short term resulted in sharp increases in fiscal pressure on families, whereas long-term changes only partly show the variation in this aspect (for example, the financial victory of the State over the Church and nobility is a structural change that came into effect very slowly over the course of time, while short-term variations in the Monarch's spending reflect an urgent need to finance military operations). Fig. 8 compares the percentage of deviation of the tax burden with long-term trends concerning the nuptiality index I'_m.

Fig. 8 *Nuptiality and fiscal burden (%) in Spain*
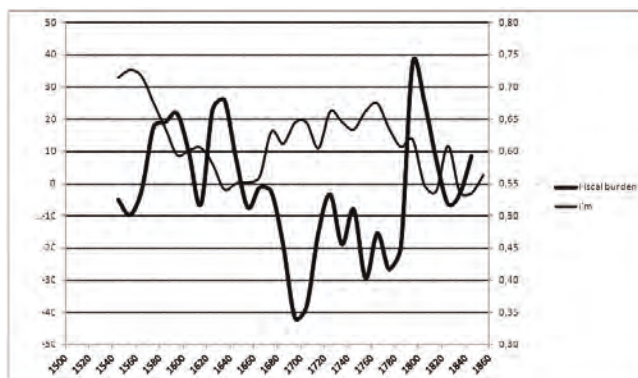
Note: The tax burden is expressed as the percentage of deviation from the long-term trend (see text for further details).

The relationship between the variation in fiscal burden and the I'_m index is noteworthy. The years in which tax increased correspond to the years with low nuptiality. Conversely, the years with low tax see a rise in the marriage rate. The agreement between the two curves can be seen in both the medium and long term. For example, the reduction in tax ushered in by the Twelve Years' Truce[23] from 1609 onwards was accompanied by a swift but short-lived increase in the marriage rate.

The same was the case during the wars of the late eighteenth and early nineteenth century: the increase in military spending (and therefore in taxation) went hand in hand with a drop in the rate of marriage.

CONCLUSIONS

We may draw three main conclusions from the analysis explained above:

1) As far as mortality is concerned, we estimated mean life expectancy for

the whole period as being around 27.03 years for rural areas (very close to that calculated by other authors using other sources for particular points within our time span). Particular attention should be paid to the variations in life expectancy that have to be taken into account in the reconstruction to achieve the census population for the second half of the sixteenth century and from the 1780s onwards (particularly, the first half of the nineteenth century). While life expectancy at birth in the first half of the eighteenth century was around 25.9 years, it rose to 28.2 in the 1780s, reaching 30.7 in the decade from 1850 to 1859.

If our assumptions are right, these results are significant: the transition from the Old to the New Regime was accompanied by a slight improvement in the standard of living among the Spanish population. At the same time, we observed a dramatic fall in the marriage rate, which confirms that during this period of political transition there was also a modest demographic transition, in the form of a fall in mortality, and a decline in ferti-lity (as a result of the drop in the marriage rate).

2) Secondly, we have tried to gauge the impact of the urban network on Spanish rural demographic growth. The results of this were slightly unexpected for us. The collapse of the seventeenth century urban network was not only a result of excessive population loss from the countryside through emigration, even if we include emigration to Ame-rica and the expulsion of the *moriscos* as aspects of migration from the countryside. Our estimates suggest that one key issue

was the fall in total fertility caused by the marked drop in the marriage rate from the 1580s onwards. Later, during a second period, the generations that had dwindled as a result of this fall in nuptiality reached maturity and generated a poor natural population increase in the countryside from the 1630s onwards, which was incapable of supplying the migratory flow that the cities required, at least until the 1660s. However, there is no doubt that the roots of the demographic crisis lay in the sharp decline in marriage rates from the 1580s onwards. Our study of what contemporary authors thought about "depo-pulation", and the statistics showing the creation of institutions to provide dowries, would seem to confirm that broad sectors of society were conscious of the difficulties that hindered people from marrying from the late sixteenth century to the early seventeenth century, which seems to confirm our own interpretation.

3) Lastly, the discovery of the key role of marriage at two turning points in Spanish history (the seventeenth-century crisis and the transition from the Old to the New Regime) is important in that it enables us to relate demographic changes to social history more closely. In concrete, we suggest that the increase in the tax burden as a result of the rise in military spending as a consequence of Spanish foreign policy at two specific times in our period of study (1570-1660 and 1780-1815)[24] affected the standard of living of the population and prevented a significant percentage of people from marrying, which led in turn to a fall in overall fertility and put an end to demographic growth. None the less, there is one difference between the

seventeenth-century crisis and that of the early nineteenth century. In the latter, the fall in nuptiality was partially compensated for by a reduction in mortality rates, which meant that acceptable levels of demographic growth were maintained. However, the seventeenth-century crisis was accompanied by very low life expectancy, which brought rural growth to a slow halt.

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NOTES

1. This study received financial support through a research project granted by the Spanish *Ministerio de Economía y Competitividad* (reference CSO2012-31206).

2. The absence of large religious minorities after the expulsion of the *moriscos* (1609-1612) means that the baptismal registers offer a high degree of reliability and homogeneity. The register of deaths, however, raises problems that we currently consider to be insurmountable. The most serious of these is that infant deaths are often not reported. This means that the quality of the series of deaths that have been gathered is very varied across space and time, which makes them very difficult to use.

3. We have taken all centres of population with more than 10,000 inhabitants at some time during the Modern Age to be urban areas. For the data obtained about the urban network, see Appendix III.

4. *Moriscos* were moor converted to Christianity after the Spanish reconquest.

5. For each region, the mean number of legitimate births in 1780-89 is equal to the mean in the five-year periods 1780-84 and 1785-89. We considered that the births estimated from the 1787 census are equivalent to the mean of the five-year period 1785-89. The mean number of births in the five-year period 1780-84 is estimated from the annual growth rate for baptisms between the decades 1770-79 and 1789-89.

6. We had two reasons for this. The first was practical: it enabled us to use all the available material, particularly the series reconstructed by Nadal Oller (1984, 78) for the period 1580-1789 and those by Llopis (2004, 13) for 1700-1860. The other was technical: the proportion between births and population is not stable. As we know, the birth rate (which measures this proportion) depends on the population structure, the death rate, legitimate births, and the marriage rate. We know that all these factors varied enormously from one region of Spain to another (Dopico & Rowland, 1990, 602-607; Moreno Almárcegui, 2004, 47-48). Estimating the total number of births on the basis of the proportion of the population in each region could give rise to a major bias in the final result: this would tend to underestimate the figures for the regions with a higher birth rate, and overestimate that of regions with a lower birth rate.

7. The cities used for our study were Barcelona (we used the series from the parishes of Sant Just and Pastor; we thank Francisco Muñoz for kindly allowing us to use his data), Cadiz (Pérez Serrano, 1992 and Molina Martínez, 2004), Granada (Rabasco Valdés, 1975; Sanz Sampelayo, 1980 and Sánchez-Montes González, 1989), Madrid (Carbajo Isla, 1987), Valladolid (Enciso Recio, 1984 and Gutiérrez Alonso, 1989) and Seville (García-Baquero López, 1982 and Álvarez Santaló, 1974, 1980 and 1983).

8. Using census data, nominal counts, etc., we tried to reconstruct the evolution of the absolute population of these cities by decades. When various sources were available for the same city and period, we used the most reliable one. When we had no clear criterion to go by (and the differences were unimportant) we used the mean of the numbers provided by the different authors. In decades for which no information was available, we reconstructed the figures by interpolation.

9. In the reconstruction of natural increase in large centres of population, the most serious problem is how to calculate the number of deaths. Infant and hospital deaths were often not reported. To address this issue, we proceeded as follows: when there was no register of infant mortality (almost always) we assumed that these accounted for 50% of baptisms. We also assumed that the proportion of hospital deaths during the periods for which no registers are available was the same as that for periods for which data are available.

10. Applying this criterion may give rise to inexactitude because in the years for which data are available we have found that the ratio of emigrants/tonnage is not constant.

11. We did not include French immigration to the Ebro Valley regions (which was significant until 1640) or the impact that the Imperial wars had on the Spanish population, particularly in the period 1580-1650. These two migratory flows bore a certain resemblance to each other (both mainly affected young men) but went in opposite directions (the French came into Spain, whereas the Spanish soldiers left the country to go to war), and so the net effect of both may be rather small.

12. Other reconstructions have shown that in the medium term the mortality rates changed little (Reher, 1991, 27-32 and Wrigley & Schofield, 1981, 228-236). Unlike the situation in towns, which were much more open to outside influences, the countryside was affected much less by epidemiological, economic and political factors.

13. For each decade, we assumed that half the emigration happened at the start of the years ending in 0 and the other half at the start of the years ending in 5. The emigrants are distributed according to the age structure specified in Appendix V.

14. Emigration to America exacerbated this situation somewhat, although it paled into insignificance in comparison with the migratory flow to the towns and cities.

15. Along the same lines, for the 16th and 17th centuries, Pérez Moreda & Rowland (2001, 421-424) pointed to the importance of nuptiality and its influence on total fertility and demographic growth.

16. We believe that this is a reasonable assumption, since the illegitimacy rates have traditionally been very low in Spain (Floristán Imízcoz, 1982; Sánchez Barricarte, 1998a and 1998b; Reher, 1988; García-Sanz Marcotegui, 1985; Flinn, 1989).

17. We do not believe that it would be unreasonable to assume that marital fertility remained high during the Ancien Regime. The studies that are available suggest that this is the case (see bibliography in Appendix I).

18. Younger sons were those who did not inherit.

19. These foundations experienced a crisis in the 18th century and were replaced by other credit-granting institutions of a completely different kind: the "Montes Píos" and savings banks.

20. Nadal Oller (1984: 23-27 and 35-72), when discussing the seventeenth-century crisis, practically confines himself to listing the main crises of mortality during that period. However, (Pérez Moreda, 1980, 471-72) had already noted that mortality in inland Spain was actually no higher in the seventeenth century than in the sixteenth or eighteenth centuries.

21. The "alcabala" was a 10% tax on the consumption of some commodities.

22. During the sixteenth and seventeenth centuries, the "millions" were a tax paid to the king on the consumption of six foods

(wine, vinegar, oil, meat, soap and tallow candles).

23. The Twelve Years' Truce was ushered in by the Treaty of Antwerp signed in 1609 between Spain and the United Provinces of the Netherlands. It meant a recess in the eighty-year war of independence between the Dutch and the Spanish Empire that lasted from 1568 onwards.

24. In the period 1570-1660 Spain was constantly at war, first with the Netherlands, and then with France (from the 30-years war to the Peace of the Pyrenees); the period 1780-1815 was marked by the Revolutionary and Imperial Wars and the struggle against England for control of the seas.

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APPENDIX I

Table A.1. Age-specific marital fertility rates in the Modern Age
in different regions of Spain.

	South	North inland	Crown of Aragon	North	Total Spain
15-19	0.4000	0.3360	0.3320	0.1870	0.2860
20-24	0.3800	0.4170	0.3840	0.3690	0.3790
25-29	0.3830	0.3850	0.3660	0.3480	0.3620
30-34	0.3500	0.3440	0.3420	0.3230	0.3340
35-39	0.2670	0.2670	0.2670	0.2390	0.2580
40-44	0.1440	0.1260	0.1230	0.1090	0.1250
45-49	0.0190	0.0210	0.0230	0.0130	0.0210

Regions:

South: Andalusia, Extremadura, Castile-La Mancha and Murcia;

Northern Inland Spain: Leon, Old Castile and La Rioja;

Aragon Area: Aragon, Catalonia and Valencia;

Northern Coastal Spain: Galicia, Asturias, Basque Country, Navarre.

Source: Own data using information from local research in various provinces: Alicante (Pla Alberola, 1983), Córdoba (Ramírez Gámiz, 2001), Cuenca (Reher, 1988), La Coruña (Barreiro Mallón, 1973), Gerona (Nadal Oller and Sáez, 1972); Guipúzcoa (Urruticoechea Lizarraga, 1992), Pontevedra (Pérez García, 1979), La Rioja (Gurría García, 1985), Lérida (Planes Closa, 1995), Lugo (Rey Castelao, 1981), León (Rubio Pérez, 1987), Madrid (Soler Serratosa, 1985), Tarragona (Martínez Rodríguez, 1987), Toledo (Fernández de la Iglesia and Gámez-Cabrero Ortiz, 1991), Navarre (Sánchez Barricarte, 2002; Floristán Imízcoz, 1982 and García-Sanz Marcotegui, 1985), Valencia (Iborra Lerma, 1988 and Ardit, 1991) and Vizcaya (Arbaiza Villalonga, 1991).

APPENDIX II

Table A.2. Estimates of annual mean births in Spain for each decade.

Years	Births
1500 - 1509	174 117
1510 - 1519	182 823
1520 - 1529	193 083
1530 - 1539	215 552
1540 - 1549	239 452
1550 - 1559	259 975
1560 - 1569	277 698
1570 - 1579	284 026
1580 - 1589	286 167
1590 - 1599	280 043
1600 - 1609	286 463
1610 - 1619	284 341
1620 - 1629	272 848
1630 - 1639	258 312
1640 - 1649	261 961
1650 - 1659	255 530
1660 - 1669	252 577
1670 - 1679	279 593
1680 - 1689	271 067
1690 - 1699	292 327
1700 - 1709	303 121
1710 - 1719	295 654
1720 - 1729	334 801
1730 - 1739	335 986
1740 - 1749	343 614
1750 - 1759	375 741
1760 - 1769	398 391
1770 - 1779	397 345
1780 - 1789	409 428
1790 - 1799	447 494
1800 - 1809	422 356
1810 - 1819	441 103
1820 - 1829	520 888
1830 - 1839	478 556
1840 - 1849	510 139
1850 - 1859	568 690

The profile that emerges from our table has essentially the same behaviour as that proposed by Pérez Moreda & Rowland (2001: 422) using a sample of 200 parishes.

APPENDIX III

Table A.3. Demography of the urban network in Spain.

	Population of the 6 cities sample (in thousands)*	Total population in towns over 10,000 inhabitants (in thousands)	Births	Deaths	Natural growth	Real growth
1500 - 1509	164 000	373 100				51 532
1510 - 1519	172 900	424 700	167 962	189 796	-21 834	25 676
1520 - 1529	187 500	450 400	94 165	117 177	-23 012	21 536
1530 - 1539	200 900	471 900	113 370	138 439	-25 069	60 861
1540 - 1549	227 900	532 700	144 002	172 108	-28 106	60 861
1550 - 1559	254 900	593 600	178 609	209 659	-31 050	57 118
1560 - 1569	279 300	650 700	217 203	250 741	-33 537	42 578
1570 - 1579	290 400	693 300	233 895	269 421	-35 527	37 140
1580 - 1589	328 800	730 400	235 945	273 215	-37 270	32 719
1590 - 1599	370 100	763 200	226 224	263 575	-37 351	-29 450
1600 - 1609	356 300	733 700	240 695	306 946	-66 251	39 904
1610 - 1619	406 100	773 600	255 929	277 685	-21 755	1 453
1620 - 1629	422 000	775 100	247 921	287 282	-39 361	-29 595
1630 - 1639	403 500	745 500	232 912	294 938	-62 026	-41 451
1640 - 1649	375 400	704 000	237 757	318 043	-80 286	3 661
1650 - 1659	368 900	707 700	217 816	293 720	-75 904	13 605
1660 - 1669	371 500	721 300	214 354	275 749	-61 395	12 114
1670 - 1679	372 700	733 400	236 873	307 366	-70 493	-1 594
1680 - 1689	370 000	731 800	241 877	288 567	-46 690	6 154
1690 - 1699	375 100	738 000	262 164	304 399	-42 235	-22 431
1700 - 1709	363 500	715 500	256 053	307 439	-51 385	-16 455
1710 - 1719	334 200	699 100	270 267	292 708	-22 441	24 222
1720 - 1729	342 600	723 300	294 798	312 845	-18 047	91 677
1730 - 1739	378 300	815 000	304 178	347 130	-42 952	84 100
1740 - 1749	411 300	899 100	308 301	324 020	-15 719	96 641
1750 - 1759	456 900	995 700	336 534	365 971	-29 437	51 059
1760 - 1769	475 900	1 046 800	342 716	386 676	-43 959	34 220
1770 - 1779	484 800	1 081 000	342 440	383 844	-41 405	22 472
1780 - 1789	475 800	1 103 500	369 100	429 422	-60 321	37 593
1790 - 1799	481 800	1 141 100	409 540	453 513	-43 973	57 092
1800 - 1809	514 400	1 198 200	326 966	547 329	-220 363	77 478
1810 - 1819	561 800	1 275 600	321 907	409 145	-87 238	55 089
1820 - 1829	590 500	1 330 700	379 573	418 628	-39 054	68 848
1830 - 1839	618 000	1 399 600	372 054	501 377	-129 324	67 889
1840 - 1849	665 600	1 467 500	302 128	298 811	3 317	79 307
1850 - 1859	708 100	1 546 800	340 335	435 960	-95 625	123 388

*The sample of cities consists of: Madrid, Barcelona, Granada, Valladolid, Seville and Cadiz.

APPENDIX IV

Table A.4. Estimation of demographic burden of the urban network in Spain.

	Urban migratory balance*	Emigration to America	*Expulsion of moriscos*	Total rural migratory balance
1500 - 1509	73 366	1 503		74 870
1510 - 1519	47 511	4 327		51 838
1520 - 1529	44 549	7 118		51 667
1530 - 1539	85 930	10 670		96 600
1540 - 1549	88 967	16 439		105 406
1550 - 1559	88 167	14 861		103 029
1560 - 1569	76 115	20 328		96 443
1570 - 1579	72 666	30 405		103 072
1580 - 1589	69 989	41 887		111 875
1590 - 1599	7 901	45 802		53 703
1600 - 1609	106 155	60 359	136 070	166 514
1610 - 1619	23 209	57 181	136 070	80 389
1620 - 1629	9 766	57 094		66 859
1630 - 1639	20 575	40 596		61 172
1640 - 1649	83 947	29 151		113 098
1650 - 1659	89 509	11 940		101 448
1660 - 1669	73 509	11 473		84 982
1670 - 1679	68 898	12 229		81 127
1680 - 1689	52 844	13 885		66 729
1690 - 1699	19 804	13 672		33 476
1700 - 1709	34 931			34 931
1710 - 1719	46 662	4 680		51 342
1720 - 1729	109 725	11 555		121 280
1730 - 1739	127 052	10 667		137 720
1740 - 1749	112 360	14 658		127 018
1750 - 1759	80 496	23 919		104 415
1760 - 1769	78 179	25 086		103 265
1770 - 1779	63 876	26 074		89 951
1780 - 1789	97 915	5 861		103 775
1790 - 1799	101 065	3 954		105 019
1800 - 1809	297 841	2 727		300 567
1810 - 1819	142 327			142 327
1820 - 1829	107 902			107 902
1830 - 1839	197 212			197 212
1840 - 1849	75 990			75 990
1850 - 1859	219 013			219 013
Total	3 095 924	630 101	272 140	3 726 025

*Obtained from Appendix II: on the basis of natural and real increase. Centres of population with over 10,000 inhabitants

APPENDIX V

Table A.5. Probability of emigration according to age.

Age group	Probability
0 - 9	0.083
10 - 14	0.132
15 - 19	0.242
20 - 24	0.191
25 - 29	0.127
30 - 34	0.081
35 - 39	0.055
40 - 44	0.029
45 - 49	0.029
50 - 54	0.031

The migration structure in this table is an average calculated from the data obtained from the Spanish region of the Ulla basin (Galicia) in 1898 (Rey Castelao and Turnes Mejuto, 1989), the Spanish province of Guipuzcoa (Basque Country) in the years 1876-1881 (Fernández de Pinedo, 1988), and the Spanish immigrants who arrived in Puerto Rico in 1880-1910 (Sonesson, 1988). We thought it would be interesting to include the age structure of the immigrants to Puerto Rico because they came from all over Spain, and their age structure might be representative of that of the migrants from the whole country.

We ruled out the possibility of using the statistics on migration from the Spanish cities of Santiago de Compostela (Galicia) (Pose Antelo, 1989 and López López, 1989) or Sabadell (Catalonia) (Camps, 1995) because of their migratory profile (the main bulk of emigrants were around the age of 25-34, but there were also many emigrants aged 0-4 years, a balance between men and women, and a certain number of very old migrants). We think that this emigration mainly involved whole families and that it was therefore very different from that observed in the sixteenth, seventeenth, eighteenth and early nineteenth centuries, which consisted mainly of young men.

APPENDIX VI

Table A.6. Tax burden and cost of living in Spain.

*	Annual income of "Real Hacienda" (in maravedies)	Mean population in decade (in thousands)	Estimate of mean number of families (in thousands)	Tax burden / family / year (in maravedies)	Annual cost of living in Spain (in maravedies)	Percentage of family spending absorbed by tax	Percentage deviation from trend
	A	B	C	D	E	F	G
1540 - 1549	1 202	5 008	1 301	924	15 493	5.9	-4.9
1550 - 1559	1 435	5 356	1 391	1 031	16 358	6.2	-9.7
1560 - 1569	1 936	5 739	1 491	1 299	17 458	7.4	-1.8
1570 - 1579	2 818	6 111	1 587	1 776	17 771	9.9	17.6
1580 - 1589	3 121	6 431	1 670	1 868	17 009	10.9	19.1
1590 - 1599	3 894	6 673	1 733	2 247	18 421	12.1	21.7
1600 - 1609	4 243	6 790	1 764	2 405	21 292	11.2	9.6
1610 - 1619	4 031	6 830	1 774	2 272	22 275	10.1	-6.5
1620 - 1629	5 620	6 865	1 783	3 152	21 092	14.8	22.8
1630 - 1639	6 773	6 846	1 778	3 809	23 114	16.3	26.0
1640 - 1649	6 025	6 777	1 760	3 423	24 528	13.8	7.9
1650 - 1659	5 622	6 708	1 742	3 227	25 632	12.5	-7.4
1660 - 1669	5 442	6 638	1 724	3 156	22 518	13.9	-1.2
1670 - 1679	5 675	6 638	1 724	3 291	22 747	14.3	-2.6
1680 - 1689	5 004	6 687	1 737	2 881	22 094	12.9	-18.9
1690 - 1699	4 710	6 778	1 760	2 676	23 431	11.3	-41.6
1700 - 1709	4 973	6 958	1 807	2 752	22 564	12.1	-38.0
1710 - 1719	6 499	7 135	1 853	3 507	23 088	15.1	-15.1
1720 - 1729	7 901	7 380	1 917	4 122	23 466	17.4	-3.4
1730 - 1739	7 942	7 684	1 996	3 980	25 126	15.7	-18.8
1740 - 1749	9 815	7 964	2 069	4 745	26 324	17.9	-8.0
1750 - 1759	9 407	8 313	2 159	4 356	27 989	15.4	-29.3
1760 - 1769	12 153	8 741	2 271	5 353	29 749	17.9	-15.4
1770 - 1779	13 390	9 259	2 405	5 568	32 891	16.8	-26.5
1780 - 1789	16 632	9 818	2 550	6 522	35 339	18.4	-19.6
1790 - 1799	28 387	10 525	2 734	10 384	28 605	36.1	37.4
1800 - 1809	26 597	11 191	2 907	9 150	29 163	31.2	25.5
1810 - 1819	17 292	11 727	3 046	5 677	21 800	25.9	7.7
1820 - 1829	16 502	12 537	3 256	5 068	21 800	23.1	-6.3
1830 - 1839	18 462	13 283	3 450	5 351	21 800	24.4	-3.3
1840 - 1849	22 406	13 913	3 614	6 200	21 800	28.3	8.6

The mean number of families (column C) is calculated by dividing the population (column B) by 3.85 (the mean estimated size of household). The annual tax burden (column D) is obtained by dividing column A by column C. The annual cost of living in Spain (column E) was estimated using data from New Castile and Navarre calculated by Hamilton (1975: 337-365 and 1988: 273-308) and Fernández Romero (2005), respectively. Since the rural population of Spain at that time was much greater than the urban population, to calculate the total cost of living in Spain we used a weighted average in which 10% of the value reflects New Castile (basically data from the cities of Madrid and Toledo) and 90% Navarre (a rural area). Column F shows the tax burden as a percentage (column D) of the annual cost of living (column E).

SUMMARY

This article presents the results of our reconstruction of the entire Spanish population for the period 1500-1860 carried out using census data and estimates of births and deaths. The purpose is to establish the impact of the urban network on population growth in the country as a whole, and more particularly, on the demographic crisis of the seventeenth century.

The results suggest that, despite the relatively low life expectancy (around 25-30 years), the low marriage rate also played a leading role in regulating demographic growth. In concrete, in the periods of high military spending when Spain was fighting to retain its hegemonic position (first against the Netherlands and then against Great Britain), higher taxation also had an important influence on the regulation of demographic growth. Substantial taxes affected families' standard of living, which meant that the marriage rate dropped, leading to demographic stagnation.

RÉSUMÉ

Cet article presente les résultats d'une reconstruction de l'ensemble de la population espagnole, pour la période 1500-1860, réalisée à partir des données de recensements et des estimations des naissances et des décès. Il se propose d'évaluer l'impact du réseau urbain sur la croissance de la population dans son ensemble, et plus particulièrement sur la crise démographique du 17e siècle.

Les résultats suggèrent que, en dépit de la faible espérance de vie (autour de 25-30 ans), le faible taux de nuptialité a joué un rôle détetminant dans la régulation de la croissance démographique. Concrètement, dans les périodes de forte dépense militaire où l'Espagne se battait pour maintenir sa position hégémonique (d'abord contre les Pays-Bas puis contre la Grande Bretagne), le niveau plus élevé de la fiscalité a également eu une influence importante sur la régulation de la croissance démographique. Les lourdes impositions ont affecté le niveau de vie des familles, ce qui s'est traduit par une chute des taux de nuptialité, conduisant à une stagnation démographique.