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Trends in the proportion of married women of reproductive age in Spain, 1887-1991

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Abstract

Using the Princeton nuptiality index I_m we analyzed historical developments in the proportion of married women of reproductive age in Spain. We show the internal diversity in nuptiality patterns and offer an explanatory statistical model based on panel data analysis to identify the main variables influencing these changes over more than a century (1887-1991). We found that Spain has been the developed country with the greatest contrasts in its provincial nuptiality patterns (measured by I_m) even though this diversity has lessened over the course of time. We also found that some socioeconomic variables (the gross domestic product per capita and the percentage of population living in cities) do not have a linear relationship with female nuptiality but rather a U-shape or inverted U-shape. This may partly account for some of the controversy that has raged on this topic over the last few decades on an international level.

Key words

Female nuptiality, Spain, Western countries, panel data analysis, provinces.

1- **Introduction.**

The study of nuptiality has never aroused as much interest among researchers as that of fertility or mortality, which means that the bibliography on this subject is much smaller. Historical research on marriage in Spain has produced practically no studies covering the whole country over a lengthy period of time which also breaks the data down by province. There are far more – and more detailed – articles on the developments in marriage from 1975 onwards, from various different viewpoints (Pujadas and Solsona, 1988; Cabré-Pla, 1993; Castro-Martín, 1993, 1999 and 2003; Martínez-Pastor, 2009; Castro-Martín and Seiz-Puyuelo, 2014). However, we consider that when looking at marriage patterns in modern times it is important to examine the changes within a broad historical perspective (and, where possible, in a comparative framework).

It is well worth making the effort to gain deeper historical knowledge of this demographic phenomenon, since it has many repercussions, particularly as regards the total fertility rate. Until recently, in societies where only a tiny percentage of children were born outside marriage (that is, in the vast majority of Western countries until recent times), marriage was the main control valve which regulated the number of children who were born, and was thus one of the most important mechanisms in controlling population growth (Ohlin, 1961; Wrigley and Schofield, 1981; Wrigley, 1983).

Although there are few historical studies of marriage taking in the whole of Spain, there is an even greater shortage of research intended to explain the reasons for the changing patterns in marriage (most studies are primarily descriptive). Livi-Bacci (1968)

studied nuptiality in Spain disaggregated by major historical regions from 1787 to 1910. Rowland (1988) went back to the 16th century to examine marriage in the data from a dozen municipal areas, although he also provides information from regions from the mid-18th and 19th centuries. Using techniques of back projection, Moreno-Almárcegui and Sánchez-Barricarte (2015) make estimations of the Princeton nuptiality index I_m for Spain as a whole from 1565 to 1845. Almost none of the studies conducted so far on the historical developments in nuptiality in 20th century Spain uses the Princeton nuptiality index I_m[1].

Reher (1991) studied marriage patterns in the period 1887-1930 using disaggregated data for provinces and even judicial districts. He established a framework for understanding nuptiality and included the calculation of various statistical models to assess the impact of particular socioeconomic variables on the indicators used to measure nuptiality. Watkins (1986) included data from Spanish provinces in her analysis of the regional patterns of nuptiality in Western Europe from 1870 to 1960, although she did not perform a specific analysis of the idiosyncrasies in Spanish trends.

Various authors have analyzed nuptiality in Spain between 1920 and 1970 in a secondary manner, in studies whose main focus lies elsewhere (Leasure, 1963; Díez-Nicolás, 1967; De Miguel, 1973; Valero-Lobo and Lence-Pérez, 1995). Esteve et al. (2009)

[1] As we will see later, Reher (1991), Lesthaeghe and López-Gay (2013) and Miret-Gamundi (2002) include these data in their articles, but do not go beyond 1930 in the two first cases, and 1940 in the second. Some regional research performed in Spain did use this index (see, for example, Reher, 1990; Sánchez-Barricarte, 1997). Many studies on changes in marriage patterns in European countries (many of which were also linked with the Princeton European Fertility Project) also used the index I_m to measure nuptiality (Van de Walle, 1974; Livi-Bacci, 1977; Lesthaeghe, 1978; Coale et al., 1979; Engelen and Hillebrand, 1986).

analyzed age differences between spouses in Spain as a whole from 1922 to 2006. The first historical study covering most of the 20th century was that by Cachinero-Sánchez (1982), which is mainly descriptive in nature, providing data on both a national and a provincial level from 1887 to 1975.

The PhD dissertation (unpublished) by Miret-Gamundi (2002) also contributes provincial data from the late 19th century to 1991 (even though the analysis centers mainly on the post-1975 period). His main methodological approach (though not the only one used) consists of longitudinal reconstruction of patterns in the intensity and timing of marriage from information in the *Encuesta Sociodemográfica* carried out by the Spanish National Statistics Institute (Instituto Nacional de Estadística de España) in 1991 (a survey with a markedly retrospective approach). Using data from the same survey, Baizán et al. (2003) investigate, for the whole of Spain, the mutual causal relationship between first marriage and first childbirth, and the existence of constant common determinants of these two events.

Muñoz-Pérez and Recaño-Valverde (2011) provide a general overview of Spanish marriage patterns from the beginning of the 20th century to the present day. This study does not take into account differences on a regional or provincial level, nor does it offer any statistical analysis to confirm the causal relationship between particular variables and changes in marriage. The study by Recaño-Valverde (2011) is very similar to this, although it does include some information concerning differences between provinces.

Lesthaeghe and López-Gay (2013), in a study of Spain and Belgium (1880-2010), using data by province, show how the synergies between cultural and structural factors played a major role during the historical fertility and nuptiality transition (first

demographic transition) and have continued to condition demographic innovations connected to the "second demographic transition".

Martínez-Pastor (2008) analyzed how the increase in women's educational attainment influenced marriage in Spain in the cohorts of women born between 1921 and 1985. Finally, Requena and Salazar (2014) published an article based on a longitudinal analysis of cohorts of Spanish women born in the first half of the 20th century. They center exclusively on examining the impact of women's educational level on marriage and reproductive behavior. They provide no information about the situation in different provinces, which means that they overlook any possible geographical differences that may have influenced marriage patterns.

The interest in the historical study of marriage patterns in Spain can be justified not only by the need to fill a large gap in the literature. As we shall see below, until the late nineteenth century, Spain was a country that had traditionally had a substantially higher marriage rate than other European countries. In 1940, however, it had one of the lowest nuptiality index. Spain was the country where the marriage boom that happened in all western countries during the twentieth century started latest (and where the boom was the smallest) (Sánchez-Barricarte, 2017b). Spain is therefore a unique case, and is well worth studying, not least because of the extremely rapid changes in marriage behaviour that happened there.

The sociological and geographical diversity of Spain provides us with an ideal scenario for contrasting some of the main theories that have been devised to explain historical developments in marriage patterns, which are related to the level of economic development, life expectancy, urbanization, migratory flows and the employment rate.

The purpose of the present study is twofold. In the first place, we present an analysis over a length timespan (1887-1991) which is disaggregated (by province) in order to detect both changes and regional differences, the latter being particularly significant in the case of Spain. Secondly, we contrast the information on Princeton nuptiality index I_m with other socioeconomic variables in order to isolate some factors which may have influenced these changes using panel analysis techniques. That is, we aim to identify the main determinants of the proportion of married women of reproductive age (15-49) in Spain over the 20th century as a whole.

2- **Methodology and data.**

The index on which our study is based is that known as the Princeton nuptiality index I_m. It is the ratio of the number of births married women would experience if subject to the maximum age-specific fertility schedule to the number of births all women would experience if subject to that same maximum fertility schedule. This is an index of the extent to which the marital status distribution would contribute to the attainment of maximum fertility in a population in which all births were to married women. It is a fertility-weighted aggregate index of nuptiality that gives more weight to the female proportions married at the prolific ages (less than 30) than at the less prolific ages (Watkins, 1986). The values of I_m go from zero (no married woman) to one (all married women aged 15 to 49). The index is calculated from the proportions of women reported as currently married in the census:

$$I_m = \frac{\sum m_i \times F_i}{\sum w_i \times F_i}$$

Where for age group i, m_i is the number of married women, w_i is the total number of women, and F_i is the marital fertility rate taken from the Hutterite[2] schedule, one of the highest fertility schedules on record.

The Princeton index I_m gives more weight to marriage of women in their most fertile years. As an index, it indicates what proportion of a population's potential fertility is being lost either through delayed marriage or through failure to marry. The index does not indicate which of the two elements reduce a population's rate of nuptiality, nor whether the two are acting together. Therefore, it is mostly a complement to the analysis of fertility. We will use this index in this research as a measure of the proportion of women in a relationship.

Two of the great advantages of this index are that it is simple to calculate and that there is a large database available (at Princeton University) with information from all European provinces over a lengthy period of time, which means that it is much easier to carry out comparative studies. Over the last twenty years, many studies have appeared based on longitudinal microdata obtained from family reconstructions, which make it possible to analyze mortality, fertility and nuptiality in detail (Knodel, 1988; Wrigley et al., 1997; Reher and Sanz-Gimeno, 2007; Van Bavel and Kok, 2010; Van Poppel et al., 2012; Reher et al., 2017). The problem with this type of study based on individual data is that they are extremely laborious and they cannot cover long periods of time or large

[2] Hutterites are a Protestant sect (Anabaptists) founded in the sixteenth century. To escape persecution for their beliefs, they fled Western Europe to Russia in the eighteenth century, and then emigrated to the northern mid-west of the USA in the nineteenth century. Hutterite women have high fertility because contraception and abortion are forbidden and mothers only breastfeed for a few months.

geographical areas, which means that it is hard to draw general conclusions on this basis. Although the use of aggregated data on a national level has been criticized because it masks regional diversity, using aggregated data from provinces can remedy this limitation. Brown and Guinnane (2007) point out that the studies linked to the Princeton European Fertility Project failed in methodological terms because they were unable to address satisfactorily the temporal analysis of the massive volume of demographic data gathered for all European provinces over a period of 150 years. When modern econometric techniques were applied (like panel analysis statistical techniques), promising results were indeed obtained, which were able to confirm the basic assumptions that underpin the traditional Theory of the Demographic Transition.

One of the limitations of the index I_m is that it is only applicable to women and therefore cannot be used to analyze the differences between sexes. Another drawback is that, due to the way it is computed, its values are underestimated if women who are actually cohabitating or in legally recognized civil unions are registered in the census as "single". This is why the time-frame of our study only extend as far as 1991 because after that date, the percentage of unmarried couples in Spain increased considerably. According to Timberlake and Heuveline (2005: Table 1), the expected probability of experiencing cohabitation for females by age 44 in the period 1991-93 in this country was 14.9%.

Most of the values for I_m were obtained from the Princeton European Fertility Project (PEFP), but we also had to take considerable pains to complement the information from

this database (for example, we calculated the indices for the Spanish provinces for 1950, 1970, 1981 and 1991[3]).

In order to test some of the socioeconomic hypotheses devised to explain historical trends in the nuptiality, we gathered information from all 49 Spanish provinces for eight independent variables: gross domestic product at factor cost per capita in constant 1995 pesetas (old Spanish currency) (GDPpc), life expectancy at birth for both sexes (e_0), percentage of illiterate population (unable to read or write) aged over 10 years (Illit), female sex ratio (number of women aged 15-49 years divided by the number of men in the same age group) (FSR15-49), percentage of urban population in each province (people living in towns with 10,000 or more inhabitants) (Urbpop), percentage of the female labor force that is employed (female employment rate FER), percentage of the total labor force that is employed (total employment rate TER), and the rate of employment in the secondary and tertiary sector per 1,000 people aged 16-64 (ER2-3). These are only a subset of all potentially influential variables. It was not possible for us to gather historical information on a provincial level about other factors which might also have been relevant in this context. For example, it would have been very useful to have an indicator to measure trends in the degree of secularization of the population, or the percentage of the population that reaches a given educational level (primary or secondary school).

[3] In 1927 the province of the Canary Islands was divided into two (Santa Cruz de Tenerife and Las Palmas) and so the total number of provinces in Spain rose to 50, but we have decided to keep the Canary Islands as a single unit throughout the entire period of this study, that is, we worked with a list of 49 provinces.

The Appendix provides detailed information about the sources from which all these variables were obtained. All the sources used were reliable, and the data were calculated by researchers of proven competence. This is reassuring, since it guarantees that the information we have used is robust and contains no grave methodological defects. This does not mean that the sources might not contain some errors (mainly of under-representation), perhaps particularly those with data from the early twentieth century[4], but a critical analysis of these would fall beyond the scope of the present paper.

For some variables we were able to gather data from 1887 onwards (I_m, GDPpc, e_0 and Illit). For others, the information was available from 1900 (FSR15-49, Urbpop, TER and FER). For the variable ER2-3, we were only able to obtain information from 1930 onwards. This is why the time periods in the statistical models in Table 2 vary (the introduction of new variables shortens the period of analysis).

3- Brief description of changes in I_m patterns: Spain in the international context.

Trends in I_m suggest that the proportion of married women of reproductive age in Spain from the early 18th century to the first half of the 19th century was fairly high in comparison with other Western countries (Figure 1). In Moreno-Almárcegui and Sánchez-Barricarte's (2015) view, the proportion of married women was high in order to make up

[4] As Borderías-Mondéjar indicates (2011: 19), "it is widely known that the [Spanish] National Population Censuses and the Municipal Registers have under-represented female and child activity in historical societies […] None of this differs greatly from what has been observed in other countries".

for the high mortality rates of the era: since the vast majority of children were born within marriage, it had to be made easy for young people to marry in order to prevent shrinkage of the population.

At the end of the 18th century, a lengthy period of decline in the Spanish I_m index set in, which was not reversed until 1940. Figures dropped from values close to 0.69 in 1760 to 0.43 in 1940 (a decrease of 38%). Livi-Bacci (1968: 217) detected an increase in the age of marriage between 1787 and 1900, which corresponds to the data for I_m mentioned previously. This long period of decline in I_m (which went on for almost two centuries) was not unique to Spain, as these values also fell from the mid-18th century to the early 19th century in France, and until the early 20th century in Nordic countries.

From the end of the 19th century until 1940, a series of events occurred which may have discouraged marriage in Spain as a result of the appalling socioeconomic consequences which ensued: the Spanish-American war of 1898, the war in Morocco and the events known as the "Tragic Week" (*Semana Trágica*) in Catalonia in 1909, the First World War, the so-called "Spanish flu" in 1918 and the Spanish Civil War (1936-1939)[5]. As we shall see below, the wave of emigration among men (mainly to America) during this period (Sánchez-Alonso, 2012) certainly affected the marriage market for women, making marriage less likely. We should therefore not be surprised that the nuptiality index (I_m) plummeted during these decades.

[5] None the less, there is mixed evidence about the negative economic consequences of some of these events. For instance, some authors think that World War I brought substantial economic benefits to Spain (Sudriá, 1990).

The plummeting of I_m during this period was so acute that Spain went from having the highest values of any Western country in 1860 to having one of the lowest in 1940 (only in Ireland was the value for I_m lower than in Spain).

From 1940 to 1979, Spain underwent a significant female "marriage boom" (Figure 1), which was not due only to the celebration of weddings that had been canceled or postponed as a result of the Spanish Civil War (1936-1939), since this increase in I_m lasted until the end of the 1970s. This marriage boom began later in Spain than in other Western countries and did not prevent Spain from being, together with Ireland, the country with the lowest values of I_m during the years 1940-1975. From around 1979 onwards, the I_m index began to decline very sharply. The reasons for this marriage bust have been investigated in depth by Spanish researchers, as we mentioned in the section "1- Introduction".

[Figure 1 here]

Changes and continuities in territorial patterns in I_m

The national means for any indicator conceal the variability that exists between provinces. To measure diversity we calculated the coefficient of variation[6] (CV) of the provincial values of I_m. Figure 2 shows that, from 1887 (the year when our Spanish data begin), the coefficient of variation has clearly followed a downward tendency. There is a notable trend towards uniformity in nuptiality patterns. This phenomenon is not unique to Spain, and can also be observed elsewhere in Europe (Watkins, 1986 and 1991). That is,

[6] The coefficient of variation is defined as the quotient: standard deviation / arithmetical mean. It is normally expressed as a percentage.

differences between provinces in the index I_m in Spain were much more striking at the end of the 19th century than 100 years later. Nevertheless, despite the decrease in the CV, Spain has traditionally been (at least until 1990) one of the countries with the greatest differences between provinces in terms of the proportion of marriage women of reproductive age.

[Figure 2 here]

Rowland (1988), focusing on the 16th and 19th centuries, Reher (1991) for the period 1887-1910, and Miret-Gamundi (2002) centering on the 20th century all concur in pointing to the great diversity of marriage patterns across Spain. According to Rowland (1988), Spanish regional nuptiality patterns follow a consistent trend that goes back to at least the 16th century. This stability is associated with the persistence of specific regional ways of regulating access to marriage. Reher (1991: 14) takes the view that "stable regional marriage patterns are firmly anchored in Spain's past". Have the traditional nuptiality patterns been maintained into the present day? Table 1 shows the bivariate correlation coefficients of the provincial values of I_m since (*circa*) 1887 to 1991 in Spain and other Western countries. As we can see, the Spanish provincial patterns of the I_m index present in 1887 were maintained until the middle of the 20th century. The same also happened in other Western countries. In fact, very few countries (only Ireland and Denmark) did not maintain the same trends over several decades of the first half of the 20th century. From 1970 onwards, there was a complete disintegration of the nuptiality traditional pattern in Spain.

[Table 1 here]

Map 1 shows the provinces with the highest (red) and lowest (purple) nuptiality index at four big periods in history[7]. There are two degrees of intensity: the provinces with the most intense shades of red and purple are those with the most extreme (highest and lowest) values. The provinces that are white have intermediate values. This map is designed to show not the development of I_m over time, but to display visually the provinces with the highest and lowest values at different historical times. The first point that should draw our attention is that during the periods 1887-1910 and 1911-1940, the provinces with the lowest levels of I_m were those along the north coast (from Galicia to Navarra), in Madrid and in the Canary Islands. The explanation for this phenomenon is almost certainly to be found in the imbalances in sex ratios which are heavily linked to selective migration by gender. At that time, a considerable proportion of males in these provinces (except for Madrid) emigrated to America, which meant that many women had no possibility of finding a partner to marry. We have estimated that in the period 1900-1940, for every 100 males aged 15-49 years on the census list in the north-eastern provinces of Spain, there were 119-149 women of the same age. These imbalances in sex ratios obviously brought down the value of I_m. In the case of Madrid, the excessive number of women in the population was due to the fact that the city attracted a large number of women seeking work in domestic service or in certain types of business[8].

[7] The different periods reflect the mean values observed.

[8] In the period 1900-1940, for every 100 men aged 15-49 years on the census in the province of Madrid, there were 110 women.

In the view of Reher (1991), at least in 1887-1930, differences between provinces as regards nuptiality were conditioned to a considerable extent by mortality rates and inheritance practices. Livi-Bacci (1968: 223) considers that they could be the result of factors with deep historical roots, such as different patterns in emigration, the way land was owned (the presence of *mayorazgos*[9] and latifundia, or their absence), the disproportionate number of priests, monks and nuns due to various other factors (which were religious, but also economic) and the large number of people claiming a noble origin "whose class prejudices and privileges were certainly not in favor of an ample and free marriage choice". Lesthaeghe and López-Gay (2013) find that the best correlates of the spatial nuptiality patterns observed in Spain during the early 20th century are closely related to the land tenure system (later marriage in northern regions with small-scale subsistence farming, and earlier marriage in central and southern regions with latifundia and a rural proletariat). However, there is no doubt that the imbalances in sex ratios at marriageable ages caused by migratory flows also underlie many of the geographical changes in nuptiality patterns during the 19th and early 20th century.

As time passed, the geographical center of the low nuptiality (I_m) regions moved to what is now the Autonomous Community of Castilla-León (the inland provinces of North-Western Spain). In the period 1971-1990, these provinces (alongside others, such as Madrid, Navarra and Guipúzcoa) were the geographical areas with the lowest nuptiality indices in Spain. On the other hand, the provinces with the highest values are generally

[9] There were greater restrictions on marriage in areas where *mayorazgo* prevailed, as it meant that the family property went to a single heir (generally the oldest son). Subsequent children were in practice disinherited and found it hard to marry (many joined the army or church).

found in the eastern areas of the Iberian peninsula. While in the first half of the 20th century I_m was high in the inland eastern provinces, in the period 1971-1990 it came to be the coastal provinces bordering the Mediterranean which had the highest values.

[Map 1 here]

4- Our statistical explanatory model and the theoretical debates concerning the changes in nuptiality patterns.

The bibliography abounds with theories devised to account for changes in marriage rates, but few of these have an explanatory basis (Bronson and Rossman, 2013). Here, we provide an overview of some of the main theories, which we shall attempt to validate below using statistical models to interpret the data from Spanish provinces.

We assembled a large historical database with sociodemographic and economic information for a series of variables which we have described in detail in section 2 (Methodology and data). We have information for 49 Spanish provinces at different times between 1887 and 1991[10]. That is, our data combine a time dimension with another transversal dimension (provinces). This data structure allows us to apply panel analysis statistical techniques, which have many advantages over time analysis or transversal sections techniques. For example, they can handle data for a large number of years, which increases the sample size and can be used to generate more reliable estimates. They also

[10] Data available from these Spanish censuses: 1887, 1900, 1910, 1920, 1930, 1940, 1950, 1960, 1970, 1981 and 1991

enable us to eliminate the specification bias inherent in time series which do not take into account the unobservable characteristics of units that could be conditioning their behavior. Since we have many observations for each province, this type of technique allows us to include controls for fixed and time effects whose omission would produce a bias in the relationship estimated between variables (Hondroyiannis and Papapetrou, 2005: 145).

Previous graphic inspection of the relationships between "I_m and GDPpc" showed that they were not linear, but rather followed an inverted U-shape. Also, the relationship between "I_m and Urbpop" followed a U-shape (see Graphs A1 and A2 in the appendix). For this reason, we include the quadratic terms of these two variables in our statistical model:

$$I_{m_{it}} = \beta_0 + \beta_1 GDPpc_{it} + \beta_2 GDPpc^2{}_{it} + \beta_3 e_{0_{it}} + \beta_4 Illit_{it} + \beta_5 Urbpop_{it} + \beta_6 Urbpop^2{}_{it} + \beta_7 TER_{it} + \beta_8 ER2\_3_{it} + \beta_9 FSR15-49_{it} + \Upsilon_t + \alpha_i + \varepsilon_{it} \qquad (1)$$

Where Υ_t is a vector of yearly dummies controlling for time effects and α_i is a vector of dummies for each province controlling for fixed effects. Apart from the classic problems of heterogeneity which appear in panel models, due to the nature of our data where T (time) is much greater than N (cross-section units or provinces), we also have to take into account the possible problems of autocorrelation that are characteristic of time series. On the other hand, following Wooldridge (2002), we observed that there is a problem of first order serial

correlation, which could seriously affect the standard errors in our estimations[11]. In our case, the errors would be an AR(1):

$$\varepsilon_t = \rho\varepsilon_{t-1} + v_t$$

In this case, ordinary least squares regression (OLS) would not be the best methodology since it underestimates the true variance in the presence of autocorrelation and it makes the t-statistics look too good and reject the null hypothesis too often (Beck and Katz, 1995). Once we had identified the problem with autocorrelation, we used the statistical model of panel corrected standard errors (PCSE). This model has already been used with success in others demographic research (Pampel, 2001; Prskawetz et al., 2010; Vos, 2009; Bergh and Nilsson, 2010; Herzer et al., 2012; Ferrarini and Wesolowski, 2014; Lagerlöf, 2015; Emara, 2016; Sánchez-Barricarte, 2017a and 2017b). This methodology makes use of a Prais-Wisten regression to estimate the parameters. The main point is that when calculating the standard errors and the variance-covariance estimates, this methodology assumes that the errors are heteroskedastic and contemporaneously correlated across panels. In accord with Beck and Katz (1995), with a temporal dimension T greater than N, the standard errors calculated by the PCSE function are much better than with other alternative methodologies such as Generalized Least Squares (GLS). Table 2 shows the results of this model for the entire period 1887-1990. Readers can also find the results of this model in Table A2 in the appendix for the subperiods 1887-1940 and 1941-1990. In both, the results are practically identical. The only difference is that in 1887-1940,

[11] Both tests are significant at 1%.

the variable GDPpc has a linear relationship (not a quadratic one) with index I_m (this is to be expected, as the change of sign in the relationship between the two variables did not occur until Spanish society reached a high level of income, which happened after 1940).

The nature of our variables might reveal a possible problem of multicollinearity, given the close relationship that might exist between them. Table A1 in the Appendix shows the variance inflation factor (VIF)[12] for the different independent variables used in the model. According to this indicator, we can conclude that there are no serious issues of multicollinearity in our variables.

[Table 2 here]

Gross domestic product per capita (GDPpc)

One of the basic prerequisites for starting a family is having the economic means to maintain it. It is reasonable to think that the number of new couples starting out on this path is likely to increase during years of economic growth. Many researchers believe that the economic boom following the Second World War (WWII) acted as a powerful stimulus to marriage, while the low incomes in the years following the crash of 1929 were the main reason underlying the low marriage rates in those years (Easterlin, 1987; Cherlin, 1992; Emeka, 2006; Ryder, 1990). None the less, the positive relationship between income and

[12] The variance inflation factor (VIF) quantifies the severity of multicollinearity. It provides an index that measures how much the variance (the square of the estimate's standard deviation) of an estimated regression coefficient is increased because of collinearity. A rule of thumb is that if VIF > 10 then multicollinearity is high (Kutner et al., 2004: 408; Hair et al., 1995).

nuptiality has not been validated successfully in different historical periods (Bronson and Rossman, 2013). For example, Wolfers (2010) and Hill (2015) reject the hypothesis that such a positive relationship is present in specific periods of history.

Table 2 confirms the non-linear relationship between I_m and GDPpc. In all six models, the inverted U-shape relationship is statistically significant. This would explain why some authors (Wolfers, 2010; Hill, 2015) reject the idea of a positive linear relationship between the level of income per capita and some indicators of the intensity of nuptiality. In our data, for low values of income per capita, an increase in GDPpc generates a rise in I_m. As the GDPpc increases, the impact becomes progressively smaller, and once a certain income level has been reached, the impact may even be negative, that is, a higher GDPpc may decrease I_m. The same relationship between these two variables in the form of an inverted U-shape was found by Sánchez-Barricarte (2017b) when he used data from 25 developed countries.

The rise in I_m which accompanies historical periods of economic growth is not apparent in current societies with high income levels. At present Spanish women may not regard marriage as the only strategy for preparing for the possible challenges that might arise in their future lives (illness, accidents, unemployment, aging, etc.). In societies with high income levels, the welfare state provides a series of basic services (healthcare, pensions, etc.) and there are mechanisms on the market (insurance covering accidents or dependency, private pension schemes, savings schemes) which offer protection and help in case of difficulties. Using data from 15 developed countries, Sánchez-Barricarte (2017b: 12-13) found that welfare policies aimed at meeting the needs of the adult or elderly population act as a disincentive to marriage. In these highly developed societies, the large

proportion of women who work have a high level of independence, which means that they have less incentive to marry or, if they are married, they find it easier to end their marriage when they no longer feel comfortable. In short, once a certain income level is reached, alternatives to marriage become available (if marriage is understood as an institution that promotes mutual care among the couple and their children).

Life expectancy at birth (e_0)

Much has been published on the mechanisms through which a decrease in mortality may have influenced changes in nuptiality (Ohlin, 1961; Eversley, 1965; Alter and Oris, 1999; Devos and Kennedy, 1999). In places where mortality was high, access to marriage had to be made easier in order to stop the population from shrinking. Until very recently, almost all children were born within marriage, which meant that enabling younger people to marry was essential for the continuity of society in places where the death rate was high. Moreover, if couples had to be able to support themselves economically in order to marry, it is natural to think that when mortality was high, children would inherit their parents' land at an earlier age, and marriage would therefore occur sooner. In a high mortality regime society, the number of opportunities available to young people (jobs, inheritance, etc.) is greater, which favors union formation. Moreover, historian demographers have often seen large increases in nuptiality after a mortality crisis (Hermalin and van de Walle, 1977).

As we might expect, in all the models in Table 2, life expectancy has a negative sign which is also statistically highly significant. Our statistical models confirm for the period 1887-1990 what other researchers found in studies focusing on the early 20th century (Livi-Bacci, 1968; Reher, 1991: 22). That is, during the period analyzed, increases in life

expectancy were related to a decline in the proportion of married women of reproductive age. The relationship between I_m and mortality could have led to one of the unconscious mechanisms through which societies regulated population growth in historical times. Wrigley (1978) made reference to this notion, calling it a kind of "unconscious rationality".

Educational level (Illit)

One of the most influential theories on nuptiality is that known as the "new home economics" devised by Becker (1981) which accords a key role to the level of education among women. According to this theoretical model, as the level of women's education rises, their participation in the workforce increases, as do their purchasing power and their general independence; this, in turn, lowers their likelihood of marrying. However, Oppenheimer (1997 and 2000) considers that there is no explanatory basis for this, and maintains that women's educational attainments and professional activities actually make it easier for them to marry. The results obtained using our models confirm what other authors found in various studies concerning Spain (Miret-Gamundi, 2002; Martínez-Pastor, 2008; Requena and Salazar, 2014): when the level of education rises within the population (or the percentage of illiteracy drops) the intensity of nuptiality falls.

Imbalances in sex ratios due to migration factors (FSR15-49)

Lesthaeghe and López-Gay (2013) find that the imbalance in the sex ratios at marriageable ages in Spain in the first decades of the past century was heavily linked to selective migration by gender and marital status. Selective outmigration of men from densely populated rural areas depressed I_m values. And many urban areas, which offered

employment opportunities for single women in textile industries, education, and domestic service, also had a shortage of single men, reducing I_m values as well. There were considerable migratory flows within Spain during the 19th and 20th centuries, and these have been analyzed in great detail (see the studies by Silvestre-Rodríguez, 2002, and Susino-Arbucias, 2011, for a detailed bibliography). Obviously, the imbalances in the sex ratios at marriageable ages caused by migration (within the country and abroad) significantly changed the marriage market and affected (by depressing or raising) the values of I_m. Table 2 shows that, as would be expected, the provinces with a higher female sex ratio (FSR15-49) also had the lowest female nuptiality indices (I_m). The fact that there were more women made it harder for some of them to marry. The statistical models confirm, for the period 1887-1990, what Lesthaeghe and López-Gay (2013) found in the first three decades of the 20th century, that is, the provinces with more male emigrants than women, or those which attracted more women than men, all had lower nuptility indices (I_m).

Urban population (Urbpop)

Lynch (1991: 83) identified an urban marriage pattern that is "an exaggerated version of the Western European marriage pattern", mainly because of the high turnover of migrants. Moreels and Matthijs (2011) and Oris (2000) found that in cities, the age at first marriage was always higher for migrants than for natives. Historically speaking, the age at first marriage and the proportion of single people were higher in cities than in the countryside. Lynch (1991) pointed out that craftsmen's guilds restricted access to younger people, who waited until they had acquired good enough skills and sufficient material

resources. In some towns in Switzerland and Germany, there were laws which could be used to limit access to marriage, particularly in the case of people coming from elsewhere (Walker, 1971).

However, this negative relationship may have changed over time, as the industrialization process mainly took place in cities, and these offered more opportunities for employment in the secondary and tertiary sectors. The statistical models in Table 2 show that the relationship between urban population and I_m in Spain is not linear but follows a U-shape. In historical times, where the number of people living in the cities was low, we can confirm that an increase in the urban population brings the female nuptiality index I_m down. In pre-industrial cities, living in towns appears to discourage marriage. Reher (1991: 22) looked at the year 1887 and found that level of urbanization was negatively associated with marriage rates in Spain.

However, once the urban population reaches a certain level, an increase in the number of people living in towns results in a rise in nuptiality, which is surely because once industry is properly established, a large number of employment opportunities become available, which makes it easier for people not only to start a family earlier (moreover, in the case of Spain, industrialization was more intense in the larger cities) but also to marry in higher proportions. This positive relationship echoes that found by Burke (2001) for urbanization in Canada.

Employment rate (FER, TER and ER2-3)

Many researchers have explored the relationships between changes in nuptiality and occupational patterns (Habakkuk, 1955; Eversley, 1965; Levine, 1977; Oppenheimer,

1994; Haines, 1996; Fitch and Ruggles, 2000; Cvrcek, 2012; Ruggles 2015a and 2015b). The industrialization process meant that a vast proportion of the population moved from the primary to the secondary and tertiary sectors. Without doubt, this process had a huge impact on the process of forming families. In the societies of the past, in which people lived from agriculture, "geography was destiny" (Watkins, 1986: 335). The geographical wealth of a particular region determined the age and the proportion to access to marriage. Young people could only start a family when they inherited their parents' land. The Industrial Revolution led to an increase in the number of jobs in the secondary and tertiary sectors, thus freeing a huge number of young people from the limitations of their geographical surroundings and offering them the possibility to marry without needing to wait for their inheritance. Table 2 includes the variables "female employment rate" (FER) and "total employment rate" (TER), but in none of the models did these variable attain statistical significance. That is, when we control for other variables, the employment rate does not correlate with the marriage rate.

Just for the period 1930-1990 we can classify the population in each province according to the sector in which people worked. In model 6 we find that there is a positive relationship between the proportion of people employed in the secondary and tertiary sectors (ER2-3) and the proportion of married women in the reproductive age group, even when we control for many other variables. The process of industrialization in Spain during those decades enabled many young people to find work outside the traditional primary sector. This gave them greater freedom to form a family without having to wait until they inherited a piece of land from their parents. When most of the population works on the

land, it is the areas with the most fertile land that have the highest I_m values[13]. The process of industrialization freed a growing proportion of young Spanish people from the confines of their geographical environment and made it easier for them to marry (sooner and in higher proportions).

5- Conclusions.

Using the Princeton nuptiality index I_m we analyzed developments of the proportion of married women in the reproductive age group in Spain over more than one hundred years. We found that Spain went from having one of the highest values of nuptiality index I_m in the period 1887-1910 in the European context to having one of the lowest in 1941-1970, as its marriage boom was moderate and short-lived. Spain always headed the ranking of countries with the greatest internal variability (although this diversity has lessened over time). The heterogeneous nature of nuptiality patterns in the different provinces was one of the most striking features of Spanish demography, and one which remained historically stable until 1960. These patterns were subject to a certain geographical mobility although

[13] In a historical study on marriage patterns in the province of Navarra from 1786 to 1991, Sánchez-Barricarte (1997) found major differences concerning both the age of access to marriage and the marriage rate itself. Areas in the rich agricultural regions of the south of the province had much higher marriage rates than those in the mountainous north.

in broad terms we found that low values of I_m are typical of North-Western Spain. By contrast, the eastern provinces had higher nuptiality.

Except for the female employment rate (FER) and the total employment rate (TER), the other variables proved highly significant in the panel data models which we developed. Growth in the per capita income, life expectancy at birth, literacy, the imbalances in sex ratios, the urban population and the percentage of people employed in the secondary and tertiary sector have all been shown to be variables that exert a major influence on the historical development of provincial I_m patterns in Spain. All the statistical models confirm the different hypotheses set out. One of the main contributions of this article is precisely that by using modern panel data techniques and eight independent variables over a long time period, we have been able to confirm many of the findings that previous researchers obtained in studies covering shorter periods of time and taking into account considerably fewer variables. By putting together all these independent variables in a single statistical model, we were able to weigh up the effect of each one of these on the I_m index by keeping all the other variables constant.

We found that a range of variables which have traditionally been proposed as being responsible for historical developments in nuptiality actually have no linear relationship to female nuptiality. This may explain why such an intense debate has raged concerning the type of effect which each one of these exerts. For example, we have shown that "I_m and GDPpc" have an inverted U-shape relationship, whereas the relationship between "I_m and Urbpop" follows a U-shape. This kind of relationship should not be particularly surprising, given the long period under examination (1887-1990).

6- **Bibliography.**

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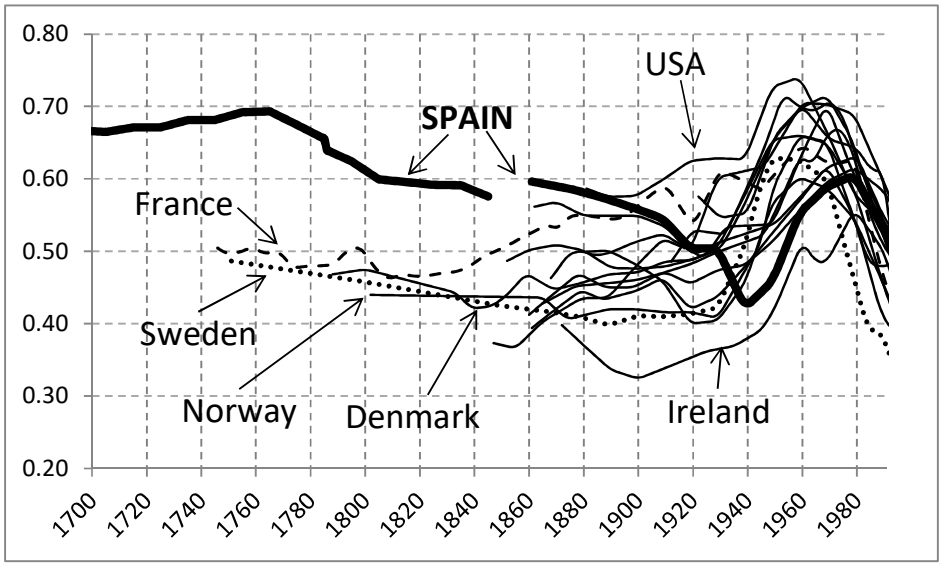
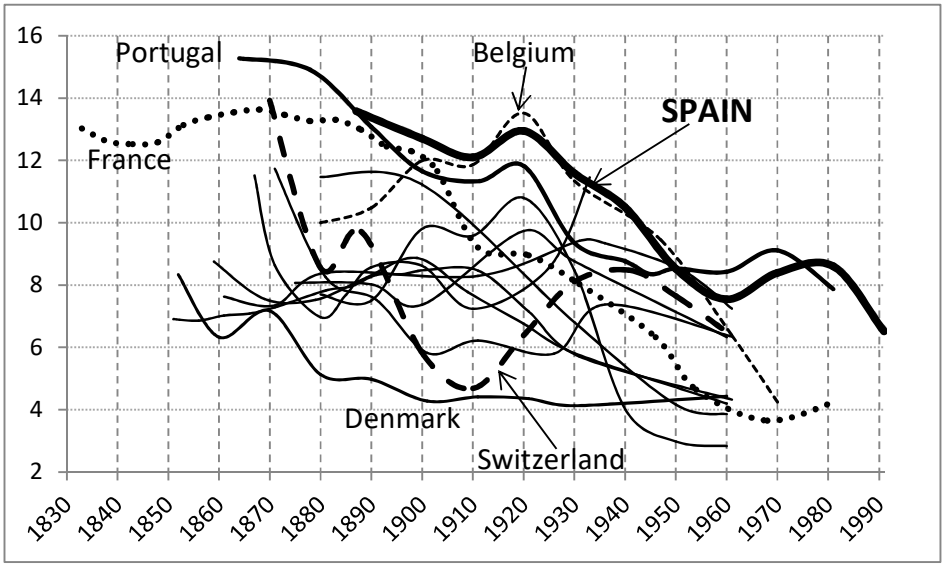
Figure 1. Developments in the Princeton nuptiality index I_m in selected Western countries.



Countries included in the Figure: Australia, Belgium, Canada, Denmark, England and Wales, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and USA.
Source: see appendix.

Figure 2. Evolution of the coefficients of variation in provincial I_m values (in percentages) in selected Western countries.



Countries included in the Figure: Belgium (*arrondissement*), Denmark, England and Wales, Finland, France, Germany, Ireland, Italy (provinces), Netherlands, Norway, Portugal, Spain, Sweden and Switzerland.
Source: see appendix.

Table 1. Bivariate correlation coefficients for female nuptiality (I_m), variation in provincial values. Reference year: *circa* 1887.

	Spain	Belgium (*Arrondissement*)	Denmark	England and Wales	Finland	France	Germany	Italy (Regions)	Ireland	Netherlands	Norway	Portugal	Switzerland
1887	1	1	1	1	1	1	1	1	1	1	1	1	1
1900	0.94*	0.96*	0.83*	0.97*	0.92*	0.96*	0.96*	0.95*	0.83*		0.93*	0.93*	0.78*
1910	0.94*	0.94*	0.66*	0.92*	0.90*	0.91*	0.83*	0.89*	0.47*	0.95*		0.85*	0.36
1920	0.91*	0.91*	0.36	0.85*	0.73*	0.91*	0.80*	0.54*		0.85*	0.79*	0.83*	0.28
1930	0.91*	0.82*	0.21	0.78*	0.47	0.85*	0.80*	0.60*	0.12	0.81*	0.69*	0.70*	0.27
1940	0.73*				0.57			0.58*				0.41	0.25
1950	0.62*	0.77*			0.69	0.69*		0.03	0.01			0.22	0.00
1960	0.33*	0.76*	0.26	0.48*	0.72*			0.11	0.12	0.74*	0.36	0.02	0.01
1970	-0.21	0.23				0.57*		-0.29				0.35	
1981	-0.40*					0.23*		-0.32				0.76*	
1991	-0.02							0.59*					

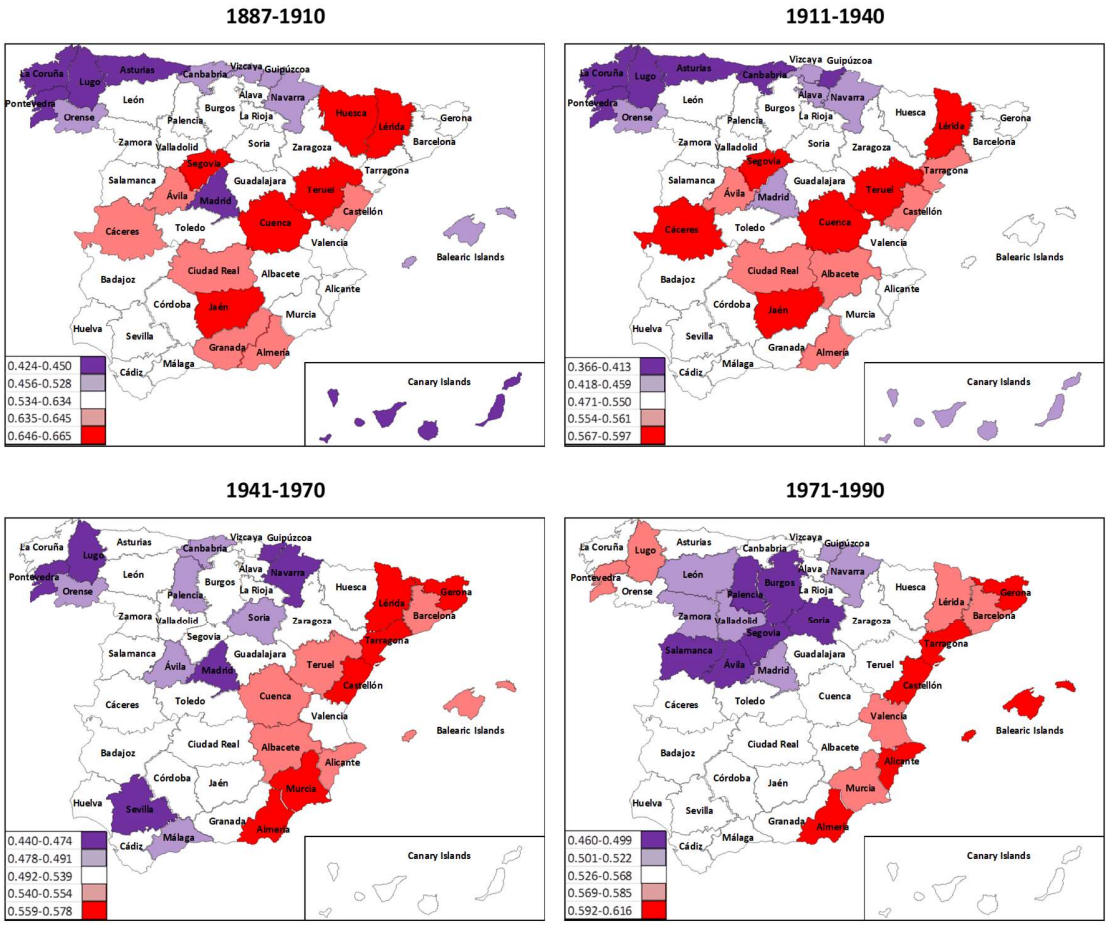
Signif. codes: p-value <0.05 '*'
Source: see appendix.

Table 2. Fixed effects and time effects panel corrected standard errors (I_m, dependent variable), Spanish provinces, 1887-1990.

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
GDPpc	9.05E-05 ***	9.10E-05 ***	7.75E-05 ***	7.85E-05 ***	7.83E-05 ***	9.86E-05 ***
	1.54E-05	*1.37E-05*	*1.30E-05*	*1.30E-05*	*1.29E-05*	*1.84E-05*
$GDPpc^2$	-2.55E-08 ***	-2.68E-08 ***	-2.36E-08 ***	-2.37E-08 ***	-2.37E-08 ***	-3.16E-08 ***
	4.61E-09	*3.97E-09*	*3.88E-09*	*3.88E-09*	*3.88E-09*	*4.94E-09*
e_0	-1.84E-03 ***	-1.37E-03 ***	-1.54E-03 ***	-1.56E-03 ***	-1.55E-03 ***	-1.85E-03 ***
	2.82E-04	*2.79E-04*	*2.54E-04*	*2.55E-04*	*2.56E-04*	*3.30E-04*
Illit	6.19E-04 ***	6.85E-04 ***	8.50E-04 ***	8.49E-04 ***	8.52E-04 ***	1.50E-03 ***
	1.83E-04	*1.89E-04*	*1.69E-04*	*1.69E-04*	*1.69E-04*	*1.94E-04*
Urbpop		-1.50E-03 ***	-1.68E-03 ***	-1.64E-03 ***	-1.67E-03 ***	-3.35E-03 ***
		3.99E-04	*3.54E-04*	*3.47E-04*	*3.49E-04*	*4.68E-04*
$Urbop^2$		3.16E-05 ***	3.12E-05 ***	3.11E-05 ***	3.13E-05 ***	4.16E-05 ***
		4.38E-06	*3.92E-06*	*3.85E-06*	*3.87E-06*	*4.73E-06*
FSR15-49			-2.19E-01 ***	-2.19E-01 ***	-2.18E-01 ***	-3.54E-01 ***
			1.40E-02	*1.39E-02*	*1.40E-02*	*1.91E-02*
FER				6.18E-05		
				7.24E-05		
TER					7.13E-05	-7.04E-05
					9.51E-05	*1.33E-04*
ER2-3						7.02E-05 ***
						1.32E-05
Constant	6.18E-01 ***	6.03E-01 ***	8.33E-01 ***	8.29E-01 ***	8.27E-01 ***	9.46E-01 ***
	1.82E-02	*2.20E-02*	*2.32E-02*	*2.31E-02*	*2.37E-02*	*2.90E-02*
Observations	5083	4459	4459	4459	4459	2989
Adj. R^2	0.93	0.95	0.95	0.95	0.95	0.97
Time period	1887-1990	1900-1990	1900-1990	1900-1990	1900-1990	1930-1990
Units	49	49	49	49	49	49

Standard errors in italics
Signif. codes: p-value <0.01 '***' <0.05 '**' <0.1 '*'
Source: see appendix.

Map 1. Spanish provinces with the lowest (purple) and highest (red) Princeton nuptiality index (I_m) in different periods.



Note: The different periods reflect the mean values obtained.
Source: see appendix.