

The Neverending Story of Low-Skills Workers. Fertility Control due to Economic Stress in Rural Aragon (Spain) 1801-2012.

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Abstract

This article deals with the permanent existence of deliberate fertility control due to short-term economic stress among low-skills workers. We take three periods: the first before the Demographic Transition, from 1801 to 1899, the second during the Demographic Transition, from 1900 to 1975, and the last during the 21st century, from 2003 to 2012. We focus on whether the same groups remained as vulnerable to short-term economic shocks despite the economic growth per capita experienced during the study's periods and the changes in demographic patterns. Our micro-level analysis is composed by life courses from ten Spanish villages. The father's socioeconomic level is regarded as an indicator of family's socioeconomic status. The results between 1801 and 1975 show a negative fertility response among all agrarian groups, especially strong among landless and semilandless (HISCLASS 12). But at the same time, low-skills workers (HISCLASS 12) also they control their fertility during the 21st century crisis. The less prepared without large properties remain the most affected by economic shocks. The existence of such a rapid fertility control response suggests that deliberate fertility control was a voluntary decision.

Keywords

Economic Stress, Aragón, Microdata, Deliberate fertility control, Socioeconomic status, Historical demography.

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“Overcoming poverty is not a gesture of charity. It is an act of justice”

Nelson Mandela

INTRODUCTION

Since prehistoric times, there have been social classes. The highest classes, the minority, began to concentrate wealth. The lower classes, the majority, have remained more precarious positions. In the pre-modern period, family income depended not only on the social balance but also the economic context. A severe economic crisis could determine the survival of the family. Or, at least, it affects seriously their biological situation. From the Industrial Revolution Western countries, including Spain, have experienced a rapid growth in per capita GDP. However, differences in family income between socioeconomic groups have persisted over time. In the twentieth century, with the social and economic modernization, Europe developed welfare states. These welfare states should be developed a context of equal opportunities. Therefore, the relationship between economic shocks and changes in demographic behaviour among low-skills workers should have been reserved for past situations.

Different studies (with aggregate and microdata) have shown that when there was a short-economic stress situation in Western Countries due to high grain prices or real wages crisis there were also strong responses in mortality, nuptiality and fertility during the Modern Ages and the nineteenth century (for example, Galloway, 1988). At the same time, people in poor areas had more risk than those people in rich areas (Galloway, 1986, 1993). In Spain, some authors have also established a relationship between short-term economic stress and mortality during the same period (for example, Catalán and Lanza, 2015). Rather these responses reflect an important degree of life uncertainty among individuals (Bengtsson and Ohlson, 1985). Using aggregate data, we can see that fertility response was stronger than mortality and nuptiality responses (Galloway, 1988). In this paper, we are interested in knowing whether the same socio-economic groups were affected over time and, hence, we can consider them more vulnerable socioeconomic groups to short-term economic stress until the 21st century. The results show that the individuals employed in jobs with lower skill levels (according to the HISCLASS classification), despite being the largest group, who else are affected by economic stress. We can do this analysis using demographic microdata for a particular area of study. The aim of this paper is to know whether these groups less skilled, and relatively poorer, still changing their fertility to face economic stress. All this, despite the

enormous growth in GDP per capita experienced in the 20th century in Spain and the development of the welfare state. Economic stress would be, therefore, a variable associated with the fertility of social groups less prepared. The relationship between economic stress and low-skills workers is a never-ending story. No matter how it has evolved the standard of living and improving institutions in the Spanish countryside. Fertility would be strongly affected by economic shocks. The same occurs in a premodern period, during the demographic transition, or during the first decade of the 21st century. Contextual variables continue explaining demographic behaviour in the Aragonese countryside. This paper is structured as follows. First section explains the area of study and the sources used. Second section describes the background, an approximation to the question in Spain and Other Western Countries. Third section gives details about the methodology employed to analyse our microdata and the selection of the population. Forth section presents the results about how affected the short-term economic stress to demographic behaviour between 1801 and 2012. Finally section analyse the critics to this method from our area the study and results.

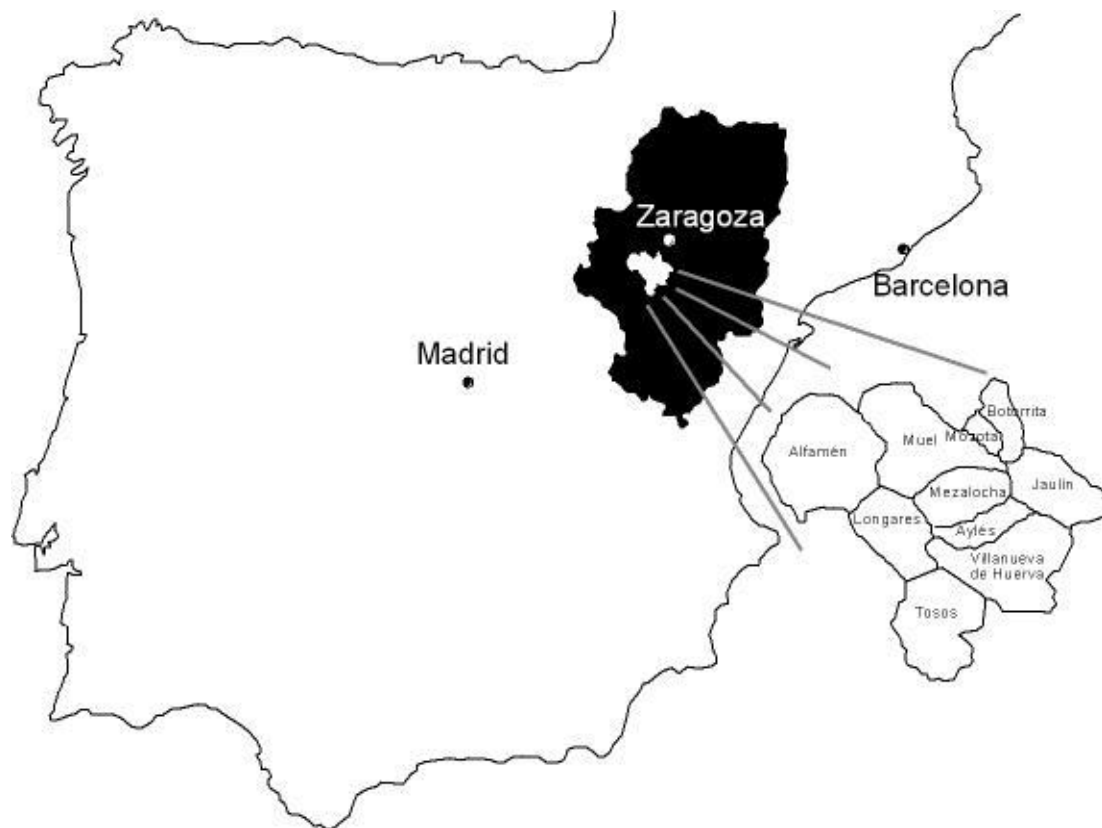
AREA AND DATA

The data are for a rural area -around 500 km²- in Valle del Ebro (Aragón), a region in northeast of Spain (see Figure 1). The distance from this area to the capital of the region, Zaragoza, is between 19 and 40 kilometres. There are data from ten parishes included in the present study –Alfamén, Aylés, Botorrita, Jaulín, Longares, Mezalocha, Mozota, Muel, Tosos and Villanueva de Huerva- which had 5,237 inhabitants in 1801, increasing to 5,686 in 1900, and descending to 5,380 in 2001. Growth was lower than the Spanish average (Nicolau, 2005) due to emigration to other rural areas and urban centers.

The database was built following the Family Reconstitution Method. It was carried out using parish records on births, marriages and deaths for the period from mid-sixteenth century to mid-twentieth century. From mid-twentieth century to the year 2012 there is a sample based on family surveys with the same demographic information (dates, occupation and education). The database (both records and surveys) contains all those who were either born in or migrated into the parishes. But we don't have information about out-migration, thus, they were censored at the time of out-migration. The study area is located on Ebro Valley near the foot of the Sierra de Algairén. Plains are combined with small mountain sceneries.

It is Alfamén the village at lower height above sea level (373 meters) and Villanueva de Huerva the tallest (790 meters). During the period of the study, this area was characterized by the production of grain (especially wheat), wine and sheep grazing. Additionally, Muel's pottery has been recognized from the Middle Ages until now, and the villages of Alfamén and Jaulín concentrated part of the glass production in Aragon during the 19th century. To discover the head of family's occupation we use population censuses (1857 and 1860), electoral censuses (1890, 1894, 1900, 1910, 1920, 1930, 1934, 1945, 1951 and 1955), population list (1824, only for the biggest village: Longares) and information about occupation and education from surveys. The information about occupation was linked with demographic registers.

Figure 1.



For this Project, we employ HISCLASS to classify occupations and to distribute the social structure. However, most individuals are concentrated in HISCLASS 10 and 12. Thus, we have regrouped in five HISCLASS categories. The first group, HISCLASS 12, consist of agricultural day-labourers and smallholders –landless and semilandless- who did not have enough land at their disposal for the entire family to live on as a sole source of subsistence. The second group, HISCLASS 10, is farmers with enough land to support family needs. The individuals appear in

this category only if they were always registered in the censuses within the farmer category while they are older than 21 years old (never they appeared with other occupation). We have not differentiated by land amounts due to the scarcity of quality sources for some periods. The third group, HISCLASS 9, is composed principally of shepherds and goatherds (owners or non-owners¹). They are landless or semilandless. They rented the communal lands for feeding animals; therefore, they were affected by drought and water problems. The fourth group, HISCLASS 6-8, consists of landless or semilandless artisans –like potters, bakers, blacksmiths, tailors, glassmakers, etc. -, which means that a majority of the families were net consumers of wheat. The fifth category, HISCLASS 1-5, include principally individual with prestigious occupations in rural areas –such as doctors, teachers, veterinarians, notaries, bankers, nurses, town clerks and train station chief.- All of these occupations required a higher educational level. Finally, the sixth category, unknown HISCLASS, include people who do not know their occupation or we have not classified into the above–such as civil servants, military personnel, etc.-.

On the other hand, we use the price of wheat in Zaragoza, because an important part of the wheat harvest from our area has been sold in the Zaragoza's markets. The wheat price series that we have chosen to use is for the period between 1649 and 1919 (Peiró, 1987), although we only employ between 1801 and 1899. It is composed of annual data due to the fact that monthly series from the nineteenth century is unavailable entirely for the city of Zaragoza. The wheat harvest season in this area is the second half of June and July, for this reason, we consider that the annual wheat price series starts in July and finishes in the following June. We only have annual data. We have considered that the best solution is to average the statistics between one year and the next. For example, the harvest of July 1860 affected the price series between July 1860 and June 1861. For this reason, we use an average between the prices of 1860 and 1861. Although, we are capturing the medium of 50%, our data is affected by the first and last quartile of the two years period. That is to say, that, in a two year sample, the period from January to June of the first year (25% of the sample) and the period from July to December of the second year (25% of the sample) affect the "medium". For example, if the medium price in 1860 (January-December) was 24 and the medium price in 1861 was 30, we consider that the medium price of wheat cycle 1860-1861 was 27 ($24+30/2=27$). However, it could be that the medium price during the wheat cycle 1860-1861 was 26 (one less than in our assumption) because our assumption is influenced also by the previous and the following cycle -25% each-. In any case, we have compared our data series with the monthly series from

¹ Our sources sometimes did not allow us to differentiate if they are the owners.

Sánchez Albornoz and Carnero (1975) about wheat price in Zaragoza between 1858 and 1891, and the monthly series from Barquín (1999) about wheat price in Zaragoza between 1815 and 1860 -it is not complete- and the variation in the prices were similar. Following this methodology between 1801 and 1899, there were wheat-price crisis in 1801-1803, 1810-1811, 1836-1837, 1841, 1846, 1855-1856, 1867, 1881, 1891 and 1896-1897.

The wheat price is a good indicator to measure short-term variations in the rural living standards during the nineteenth century in Western Countries. So, this has been suggested by various aforementioned studies. However, it could not be a good indicator in the early twentieth century due to the economic changes produced in rural Spain, the diversification of diets (Cussó, 2002) and the integration of different wheat markets in Spain -avoiding excessively high prices- (Pinilla, 1995). For this reason, we have looked for another indicator that can help us to identify crises affecting families during twentieth century. We have thought that a good indicator could be the GDP per capita, being an increasingly integrated economy. Therefore, we have used an approach to GDP per capita in the province of Zaragoza (Pinilla, forthcoming). As a criterion to identify crises between 1900 and 1975, we have selected years when there was a drop of 1% or more of GDP per capita because there were many very small crises during the first part of the twentieth century. Just as with wheat prices, we have made the average of two years to continue using agricultural cycles from July to June. Following this methodology, there were GDA per capita crises in 1902, 1905, 1910, 1926, 1928, 1931, 1933, 1936-1938, 1945, 1949, 1953, 1959, 2008-2009 and 2011-2012.

BACKGROUND: REDUCING THE FECUNDITY DUE TO SHORT-ECONOMIC STRESS

Since the days of Princeton University's European Fertility Project in 1960s and 1970s most of the historians had considered that fertility in pretransitional Europe was natural, in other words, it was not deliberately controlled before the onset of the Fertility Transition (Coale, 1973). So women had many children from their wedding to their climacteric. However, some authors have shown -from microdata- that there were exceptions, for example when they had several children alive around their ideal children's quantity (Reher and Sanz-Gimeno, 2007).

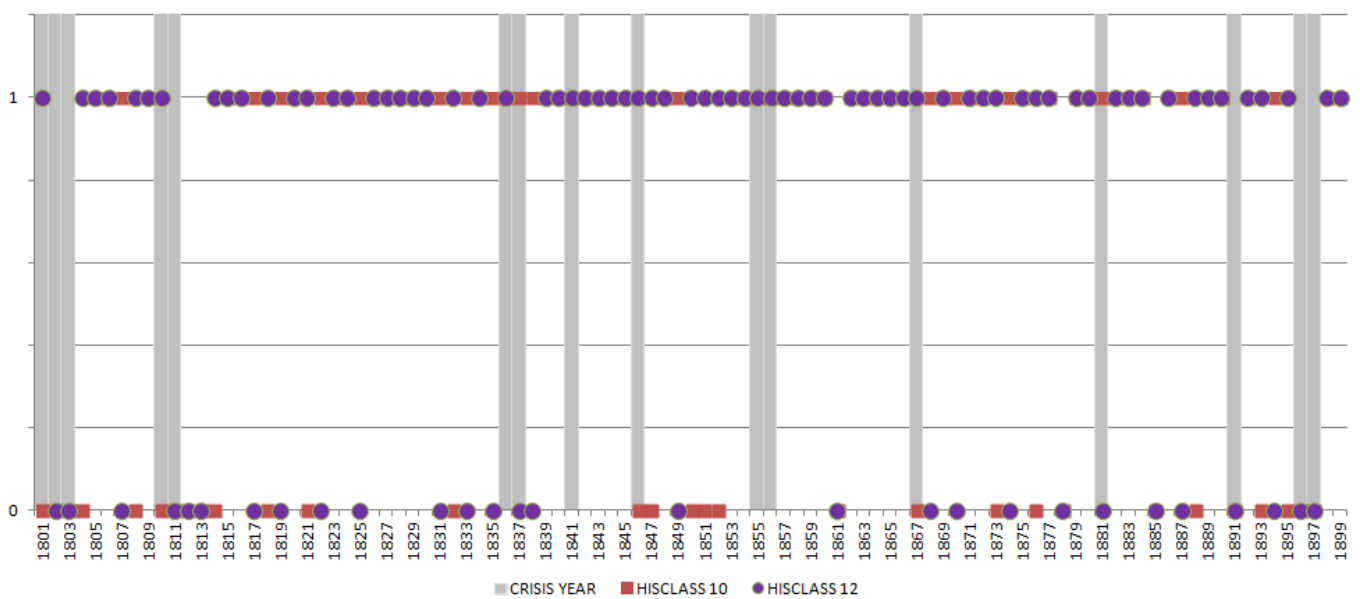
In any case, the exceptions tend to affect a segment of the population - especially people from high socioeconomic levels- or a heterogeneous minority in the long-term. For example, Louis

Henry showed that the patrician families in Geneva during the seventeenth century controlled their fertility (Henry, 1956). Nevertheless, some studies from microdata have also shown a temporary fertility control that affects most of the population even in a short period of time. These studies are based on the analysis of the effects of the food price crises. They have shown that there was fertility control in rural society close to these crises, especially among agrarian population with particular intensity in the landless workers. There are studies about this for different parts of Europe and Asia as for example: Sweden (Bengtsson and Dribe, 2006), Germany (Dribe and Scalone, 2010), Netherlands (Van Bavel and Kok, 2010) or China and Japan (Bengtsson et al., 2010). Closer to our area of study, in Friuli –a region of North-eastern Italy– has been demonstrated a relationship between short-term economic stress and demographic responses during the eighteenth and nineteenth centuries (Breschi et al., 2014). They indicated that short-term economic stress affects first to marriage and fertility in the mountain. The Eurasia Project has also analysed two Italian places with positive results about fertility control related with grain price crises (Bengtsson et al., 2010).

All papers cited above studied the nineteenth century or earlier because they wanted to prove that there was fertility control before the Demographic Transition. The Demographic Transition started in Western countries before the early twentieth century, for this reason there is a shortage of articles about fertility control due to economic stress in the twentieth century or twentieth-one century. During the Demographic Transition fertility control turned to a common behaviour among all socioeconomic groups. In the Aragonese case, it is a common idea that the Demographic Transition started around women born in 1880's decade and this control was during the last part of their fertility lifes. Therefore, our first period between 1801 and 1899 was a natural fertility period. As expected, the family fertility not only depended on the economic stress but also looked conditioned by other factors such as mortality crisis. For this reason, not every year of short-term economic stress fertility react on agricultural and low-skills workers. In the Figure 2 we can see, for our study area in the period 1801-1899, if individuals HISCLASS 10 and 12 controlled their fertility before a short-term economic stress avoiding conceptions. We considered that they are at Level 1 when the ratio of pregnancies in the reference year is equal or greater than 90% of the average of the century. Ratios of pregnancies per woman are in the average, higher or slightly lower of the average. It is considered that they are at Level 0 when the ratio of pregnancies per woman in a reference year is below 90% of the average of the nineteenth century. In 1855 there were 201 marriages HISCLASS 12 (45.58%), 171 marriages HISCLASS 10 (38.78%) and 69 other categories HISCLASS (15.64%). For individuals included in HISCLASS 10, the results show that 62.5% of the

years of short-term economic stress correspond to a year of low fertility. While only 24% of the years without economic shocks have an unusually low fecundity. For individuals included in HISCLASS 12 the results are similar. 50% of the years of short-term economic stress correspond to a year of unusually low fertility. While only 24% of the years without economic stress have low fertility. Exist exceptional years when there is high infant mortality due to an epidemiological crisis while, at the same time, there is an economic shock. For example, the biennium 1855-1856 with the cholera epidemic crisis. Individuals in this biennium are replacing deceased children and they have less incentive to control their fertility. In any case, these results seem to demonstrate that in the Spanish countryside the economic stress could also promote fertility control during the nineteenth century.

Figure 2. Evolution of fertility. HISCLASS 10 or 12 (1801-1899). Level 1 for a fertility close to the averages of the nineteenth century. Level 0 for unusually low fertility levels.

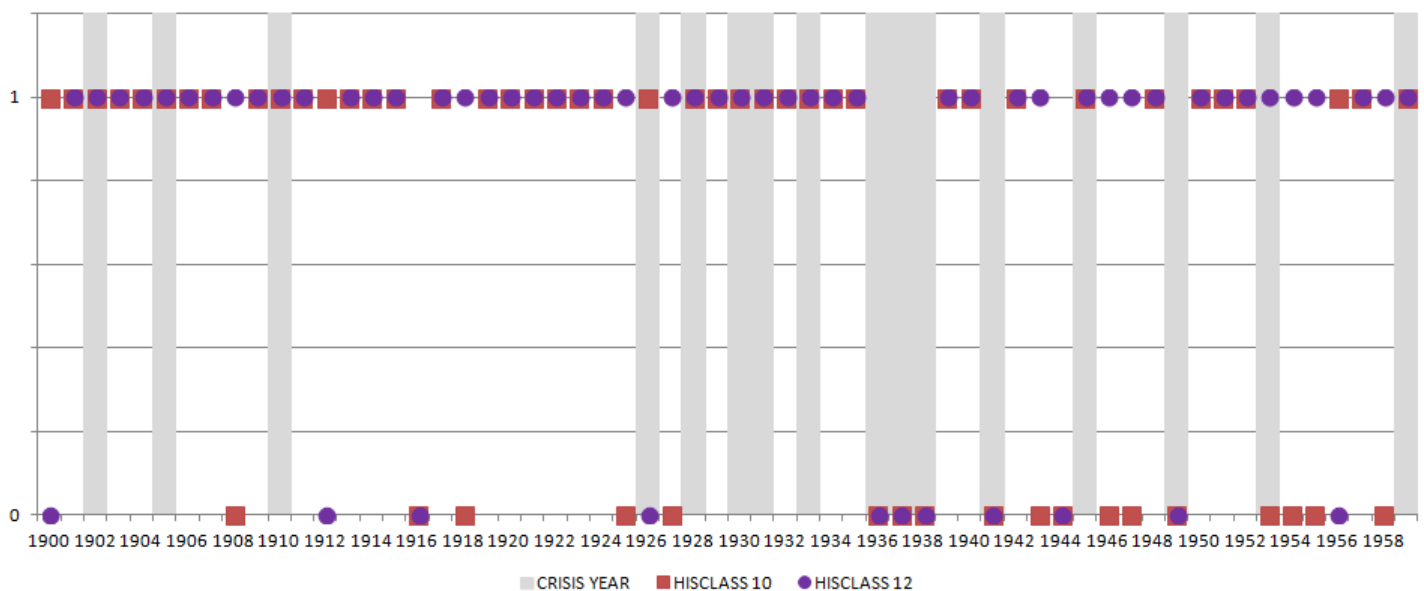


Source: Alfamén and Middle Huerva Database (AMHDB).

On the other hand, Demographic Transition was through our second period between 1900 and 1975. During the Demographic Transition women controlled their fertility; moreover, it is not a surprise that they were controlling their fertility. However, we are interested in who controlled more their fertility –by socioeconomic group- due to short-term economic stress and whether they were the same in both periods. In the Figure 3 we can see, as in the previous case, the relationship between fertility and economic shocks. Because the period is inside the Fertility Transition, demand of children is shrinking. So we set a group of HISCLASS is at Level 1 when

their fertility is equal or greater than 90% of the average of the same group in the previous and subsequent 2 years (5-year moving average). They are at Level 0, with an unusually low fecundity, when fertility is less than 90% to the average of the previous and subsequent 2 years (5-year moving average). During the twentieth century we found economic crises in Spain until 1959, according to the criteria established. Therefore, the Figure 3 only reflects the period 1900-1959. In 1925, 305 couples are HISCLASS 12 (46.56%), 254 are HISCLASS 10 (38.78%) and only 96 couples are in the other categories (14.66%). We find for the group HISCLASS 12 that the years of short-term economic stress (reduction of at least 1% of GDP per capita) correspond to years of low fertility in 37.5% of the cases. While in the years without crisis, there is low fertility in 11.36% of cases. In the group HISCLASS 10 we find that the years of short-term economic stress and low fertility matched in 37.5% of cases. While in the years without crisis, there is low fertility in 25% of cases. The relationship between economic stress and low fertility year seems less close than in the nineteenth century. In addition, the Spanish Civil War (1936-1939) coincides with years of short-term economic stress and low fertility but may be because the war causes both phenomena.

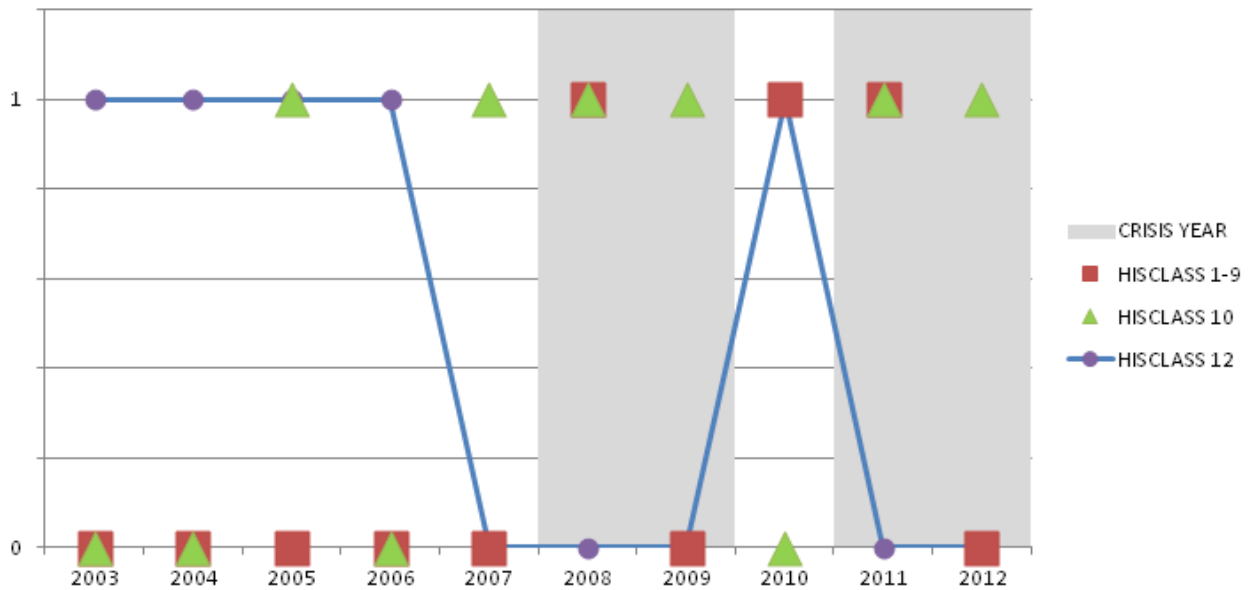
Figure 3. Evolution of fertility. HISCLASS 10 or 12 (1900-1959). Level 1 for a fertility close to the average (5-year moving average). Level 0 for unusually low fertility levels.



Source: Alfamén and Middle Huerva Database (AMHDB).

From the seventies of the 20th century began what some authors have called "Second Demographic Transition", a period characterized by low parity, even below replacement level (2.1 children). The GDP per capita of the province of Zaragoza in 2007 had increased more than 10 times the GDP per capita in 1900. Therefore, perhaps we could consider that low-skills employees will not be so dependent on the economic situation. In 2004 there were 72 couples in the category HISCLASS 12 (38.92%), 71 marriages in HISCLASS 10 (38.38%) and 42 marriages in HISCLASS 1-9 (22.7%). In the Figure 4 we can see the evolution of fecundity by HISCLASS (2003-2012). We considered that they are at Level 1 when the ratio of pregnancies in the reference year is equal or greater than 90% of the average of the century. Ratios of pregnancies per woman are in the average, higher or slightly lower of the average. It is considered that they are at Level 0 when the ratio of pregnancies per woman in a reference year is below 90% of the average of the twenty-first century. The families included in HISCLASS 12 reacted quickly to economic shocks and every year of economic crisis had a low fertility. 2007 is an exceptional year because, although it was not a year of crisis in the province of Zaragoza due to the investment in the organization of Expo Zaragoza 2008, it was a year of crisis throughout the country. This could affect the perception of the workers included in HISCLASS 12 preferred to react controlling their fertility. In the case of group HISCLASS 10, unlike previous centuries, it does not seem to have an active reaction to the economic shocks. In fact, two of the three years that have relatively high fertility were years of short-term economic stress. Other professionals (HISCLASS 1-9), mainly professional people with lower unemployment rates, did not react to the economic shocks. Most women in the study area have separate jobs; however we used as a reference male employment by encouraging, as far as possible, the comparison.

Figure 4. Evolution of fertility. HISCLASS 10, 12 and others (2003-2012). Level 1 for a fertility close to the averages of the twenty-first century. Level 0 for unusually low fertility levels.



Source: Alfamén and Middle Huerva Database (AMHDB).

Descriptive statistics show a clear stage in our study area. Economic crises caused by variations in the price of grain during the 19th century (main food and production in the area) or economic crises caused by variations in provincial per capita GDP in the twentieth and twenty-first centuries seem to be causing a reaction in the reproductive behaviour of low-skills individuals. This scenario was foreseeable to the nineteenth century, as evidenced by the literature cited above. Most of these articles include individuals HISCLASS 10 and 12 among those affected by the short-term economic stress. In our rural of study, these effects are maintained during most of the twentieth century. All this despite the economic growth experienced in the nineteenth century and, especially, during the twentieth century. In the early years of 21st century we note that low-skills workers continue to control their fertility due to the short term economic stress. However, farmers owners could not affected their fertility in the same period. So, maybe we could be facing a new scenario where, thanks to economic growth and welfare state, a part of rural society has no need to control their fertility to prevent the economic shocks. In rural areas of a developed country economic in the 21st century, short-term economic stress could be conditioning the fertility of its low-prepared inhabitants. In the following sections we will analyze the effect of the economic crises controlling for several variables.

METHODOLOGY

In order to capture the effect of short-term economic stress among socio-economic groups, we have focused on women who had children. We only consider married women as exposed women. Although there are single mothers their fertility does not depend on the economic situation because pregnancy was not a desired. Moreover, our analysis studies the second and higher order births because it has been displayed that in Europe the first birth is many times closely-knit to the wedding date (Bengtsson and al., 2010). Therefore, we only consider women with more than one child in different dates. Although there were immigrant women who had one or more children before come to our analysis area, with our date we cannot be sure about which position a child occupies in the birth sequence, for that reason we do not consider the first conception in the exposure period. In all cases, we start to considerer the exposition time as beginning when each woman had her first child and as finishing when she had 50 years if she is still married and we know when she died (or she is alive). In other cases we considerer finished the exposure time when she died before 50 year old, when the husband died or, if we do not know those dates, when the last conception happened. If a widow remarries she goes back into the exposure time, but she remained out between the death of her first husband and the birth of the first child of the second husband.

We are interested in knowing what changes occurred in fertility control when the local population were faced with a short-term economic stress, and in particular whether the population avoided having new children or not. To better approach our answer we will work with dates of conception rather than birth dates. To do so, given our lack of information about pre-term birth, we assume that all pregnancies were 38 weeks long. Additionally, we are unable to confirm whether there was an increase in the number of abortions. To identify the crisis years of wheat prices, we introduce the aforementioned price series (Peiró 1987) based logarithm, and then we identified which years had an increase equal to o greater than 10% between 1801 and 1899, by employing Bengtsson and Dribe's methodology (2006).

If there are several years of food-price crisis, we have deleted the second and higher year because it could be consequence of involuntary fertility responses - such as spontaneous abortion, temporary sterility, or libido loss- due to the mother's malnutrition. However, we use the birth rate information in these years studied in order to comprehend the number of children alive and the temporary distance between them. As we mentioned, this study includes two periods. The first begins in 1801 and continues until 1899. This is a "natural" fertility period in which we assume that most of the women included in our study should have

continued having children whether it was a year of short-term economic stress. However, we know that from studies carried out in other countries that this is not always the case (Bengtsson et al., 2010). However, as we want to study the case of rural Aragón, Spain. Moreover, we are especially interested in knowing if landless agrarian workers suffered more than other groups when there was short-term economic stress and, therefore, they were controlled more than other groups.

The second period from 1900 to 1975 developed during the Demographic Transition. Due to this, we assume that most people were controlling their fertility and we do not refer to whether they were controlling their fertility during periods of short-term economic stress. What interests us about this situation is whether landless agrarian workers were more vulnerable and, therefore, whether they tended to take further measures to control births. Therefore, we are working with the possibility or not to conceive a new child among women exposed to “natural” fertility in the first period and among women exposed but controlling their fertility during the second period. With a view to identifying whether the most vulnerable groups are always who control de fertility against any crisis. From 1900 for the analysis of the twentieth century, how we commented above, we take into account changes in GDP per capita for the province above 1%. We estimate that a variation of 1% is large enough to affect the most vulnerable individuals within an increasingly integrated market (Pinilla, 1995). In this case, we are not deleted second and higher year of crisis because we understand that the severe malnutrition problems are gradually reduced during this period until it disappears. However, in Spain there are some periods with special economic stress –as Spanish Civil War– where they could still play a role (Culebras, 2014). We will compare demographic behaviour in this short-term economic stress years with the rest to identify any differences and, if so, who controlled their fertility. We will do a statistical regression. We will use a Cox proportional hazards model with shared frailty (Therneau and Grambsch, 2000). In the statistical regression we will introduce different control variables:

- 1) Family’s socioeconomic status has been taken into account from the head of family’s occupation. As we have commented, they are classified in six groups (landless and semilandless, farmers, shepherds, artisans, high class and others).
- 2) Age of the woman has been classified in six groups: 15-24 years old, 25-29, 30-34, 35-39, 40-44 and 45-50.
- 3) Quantity of children alive.
- 4) Temporal distance (in days) between the last birth of a child and the starting of the cycle -1st July of that year-.

- 5) Place of birth of spouses depending on if they live in the same village where they born (both live in the same village, only one born in the same village where they live, nobody born there).
- 6) Place of marriage. They were marriage in the parish of residence or not.
- 7) Age difference between spouses. Three groups: wife is older, they are the same age or husband is older but less than six year, or husband is older six year or more.
- 8) Looking to know how the short-term economic stress affects fertility. We focus especially in the effect of a bad year on socioeconomic status.

Finally, we will analyse the effect of short-term economic stress during the 21st century (2003-2012) in the same area. We take also into account changes in GDP per capita for the province above 1%. We don't analyse the period between 1976 and 2002 because there weren't strong economic crises in Spain during that period. The agrarian Spanish society changed its demographic behaviour during the second part of the twenty century (lower fertility, greater age to access to the first marriage, etc.) Due to these reasons, we have considered that it was not worth extending the Cox Model analysis. There are two different realities. We prefer to develop for this decade a logistic regression with the same variable. With an exception, we are not interested in the number of children alive before, because the ratio of child mortality in this period is very close to zero. Besides, almost all couples have 2 children, so the regression omitted couples with more children. Therefore, we have a Cox Model regression for the period between 1801 and 1975 and a logistic regression for the period between 2003 and 2012. The results will be consistent with what descriptive statistics has predicted in the last section.

RESULTS

We will analyze the results in two periods. Because there is a temporary jump between them. In the first period (1801-1975), premodern times and Demographic Transition, we will use a Cox Model regression. We want to know if also in Spain agricultural workers are forced to control their fertility when they face a short-term economic stress. This period is divided into two subperiods, 19th century and 20th century. Besides, we will see the results separately. Then we will give a temporary jump until the 21st century. We will use the logistic regression discussed above. We will analyze the results according to socioeconomic status for the years 2003-2012. The analysis of this brief period will allow us to know if the economic crises continue to affect disadvantaged groups, the low-skill workers.

1801-1975

We start by estimating the basic relationships among prices, social status and fertility, while controlling for a number of other important determinants of marital fertility (see Table 1). The level of marital fertility differs significantly between social groups when we control for all other determinants in the model, including crises. The interaction between short-term economic stress and economic stress is only significant for HISCLASS 10 and HISCLASS 12 (principally agrarian workers). The landless (HISCLASS 12) showing the lowest levels of fecundity during the economic shocks. However, it is impossible at this stage to know the extent to which these differences resulted from behavioural or biological factors.

Table 1.
Cox Proportional Hazards Estimates of Fertility in Ten Aragonese Parishes (Spain), 1801-1975, for All Women, Second and Higher-Order Births

Variable	Mean	Relative Risk	%	<i>p</i>
Socioeconomic Status				
Hisclass 12	43,93	1,03		0,302
Hisclass 10	38,30	0,70		0,483
Hisclass 9 (ref.)	6,16			
Hisclass 6-8	6,49	0,21		0,833
Hisclass 1-5	1,81	0,13		0,897
Unknown Hisclass	3,31	-0,29		0,770
Parish				
Alfamén (ref.)	11,94			
Aylés	0,30	0,90		0,367
Botorrita	5,38	-2,08		0,037
Jaulín	6,15	-1,37		0,169
Longares	18,93	-3,39		0,001
Mezalocha	8,85	-2,68		0,007
Mozota	4,31	-0,29		0,772
Muel	20,01	-1,95		0,052
Tosos	10,45	-2,61		0,009
Villanueva de Huerva	13,67	-3,26		0,001
Place of Birth of Spouses				
Both in parish of residence (ref.)	41,00			
One in parish of residence	47,56	0,58		0,562
None in parish of residence	11,44	-1,01		0,314
Place of Marriage				
Parish of residence	63,38	0,58		0,562
Other parish (ref.)	36,62			
Age				
15-25 (ref.)	25,02			
25-29	30,77	4,18		0.000

30-34	20,71	3,98	0,000
35-39	13,24	2,29	0,022
40-44	10,05	0,60	0,547
45-49	0,20	-0,75	0,455
Age Difference Between Spouses			
Wife is older (ref.)	34,81		
Husband is older by <6 years	64,23	-1,07	0,286
Husband is older by >6 years	0,97	-1,13	0,258
Quantity of children alive			
Zero	20,35	19,94	0,000
One	22,40	19,66	0,000
Two	19,51	19,64	0,000
Three	13,93	19,39	0,000
Four	9,80	18,99	0,000
Five	6,06	16,35	0,000
Six	3,63	17,97	0,000
Seven	2,15	(omitted)	
Eight (ref.)	1,15		
Nine	0,51	14,29	0,000
Time (in days) from the last birth			
<2 years (ref.)	31,89		
Between 2 and 5 years	52,90	7,51	0,000
>5 years	15,20	1,38	0,169
Effect of Crises -10% Change in Wheat Price (between 1801 and 1899) or 1% fall in GDP per capita (between 1900 and 1975).			
Hisclass 12		-1,73	0,083
Hisclass 10		-1,65	0,099
Hisclass 9 (ref.)			
Hisclass 6-8		-0,73	0,468
Hisclass 1-5		-0,34	0,732
Unknown Hisclass		-1,48	0,138

Note: Relative risks from Cox proportional hazard estimates, p refers to Wald p-value, r.c. denotes the references category.

Source: Alfamén and Middle Huerva Database (AMHDB).

According with the data in Table 1, a 10% increase in food prices or 1% decrease in GDP per capita lowered fertility by 1.73% for the landless or semilandless (HISCLASS 12), and 1.65% for the farmers (HISCLASS 10). Agrarian workers could be using information about local conditions in agriculture to predict their economic situation in the following year and, therefore, making the decision whether to have a new child. When, in the same regression, we include a variable called: "Period" (separating 1801-1899 and 1900-1975) it is absolutely insignificant ($p=1.000$), so we can deduce that in both studied periods the effects are in the same direction. When we

perform the analysis separately for each period (see Table 2), we observe similar results with small percentage changes. Although the percentage drop is higher for the second period it could be due to excessive weight of the Spanish Civil War and its fertility consequences.

Table 2.
Two Cox Proportional Hazards Estimates of Fertility in Ten Aragonese Parishes (Spain), the first for 1801-1899 period and the second for 1900-1959 period, for All Women, Second and Higher-Order Births

Effect of Crises -10% Change in Wheat Price (between 1801 and 1899) or 1% fall in GDP per capita (between 1900 and 1959)	1801-1899		1900-1959		
	Category	%	<i>P</i>	%	<i>P</i>
	Hisclass 12	-1,49	0,020	-1,98	0,040
	Hisclass 10	-1,03	0,098	-1,62	0,075
	Hisclass 9 (ref.)				
	Hisclass 6-8	0,09	0,921	-2,10	0,228
	Hisclass 1-5	-0,81	0,443	-0,99	0,310
	Unknown Hisclass	-0,32	0,678	-0,68	0,445

Source: Alfamén and Middle Huerva Database (AMHDB).

In both periods (1801-1899 and 1900-1975) the economic shocks affected all agrarian workers. The short-term economic stress had stronger effects on landless or semi-landless. Therefore, the effects of economic shocks affected to the rural pre-transitional Spain and also to the rural transitional Spain (at least, previously to the economic modernization). But this situation generates a new question: Also the current agrarian workers in Spain (developed and modern) are affected by economic shocks?

2003-2012

In the second half of the 20th and early 21st century, the average age at first marriage rose to above 30 years for men and below, but close, in the case of women (Meil, 1999). This increase in the average age at first marriage, around 5 years between 1959 and 2012, has caused that the fertile period of marriage, prior to the female menopause, it has been shortened. The possibility of postponing births is rivalling with shorter fertile periods. The number of children has been decreased in Spain, below two children per woman. For the first time since 1959, GDP per capita fell more than 1% in the province of Zaragoza in 2008, 2009, 2011 and 2012 (Pinilla, forthcoming). The unemployment rate increased to over 20% in the same years. Table

3 includes logistic regression for the period 2003-2012 discussed above. The dependent variable is having the second child, or other higher order, in a year of crisis, with 1 being to have a child and 0 not having a child in a crisis year. The result is only significant for HISCLASS 12, composed by low-skill workers. In this case, the chances of having children facing an economic shock are reduced in the case of HISCLASS 12. In contradiction to the before periods (1801-1899 and 1900-1975) is not significant for HISCLASS 10 (Principally, agrarian owners). In the regression is also worth noting that wider interpregnancy intervals are significant. This could indicate that there is an ideal time interval between one child and the next. This interval is selected by each couple. This variable could counteract other effects such as the economic stress.

Table 3.
Logistic regression of Fertility in Ten Aragonese Parishes (Spain), 2003-2012, for All Women, Second and Higher-Order Births.

Logistic regression		Number of observations = 238		
		LR chi2(22) = 78.26		
		Prob > chi2 = 0,0000		
Log. Likelihood = -124.82127		Pseudo R2 = 0.2387		
Conceiving a child during a crisis year	Coef.	Std. Err.	z	p
Socioeconomic Status				
Hisclass 12	-1.383299	.6389855	-2.16	0.030
Hisclass 10	-.019483	.753484	-0.03	0.979
Hisclass 9 (ref.)				
Hisclass 1-8	-.9435535	.6431834	-1.47	0.142
Parish				
Jaulín (ref.)				
Alfamén	1.499661	.8850918	1.69	0.090
Longares	1.173646	.9224756	1.27	0.203
Muel	2.987701	.9159077	3.26	0.001
Small villages	1.971324	1.02685	1.92	0.055
Place of Birth of Spouses				
Both in parish of residence (ref.)				
One in parish of residence	-.3309083	.3998869	-0.83	0.408
None in parish of residence	(empty)			
Place of Marriage				
Parish of residence	.7112945	.3672448	1.94	0.053
Other parish (ref.)				

Age				
20-25	(empty)			
25-29 (ref.)				
30-34	.7024837	.3842024	1.83	0.067
35-39	.6014474	.5208448	1.15	0.248
40-44	.0037718	.954683	0.00	0.997
45-49	(empty)			
Age Difference Between Spouses				
Wife is older (ref.)				
Husband is older by <6 years	-.5219231	.459439	-1.14	0.256
Husband is older by >6 years	(empty)			
Time (in days) from the last birth				
<2 years (ref.)				
Between 2 and 5 years	-1.229538	.3980484	-3.09	0.002
>5 years	-2.783751	.5994887	-4.64	0.000

Source: Alfamén and Middle Huerva Database (AMHDB).

The results, for the period 2003-2012, show that in the 21st century the weakest social groups (low socioeconomic status) continue modifying their reproductive behaviour due to economic shocks in the Spanish countryside. In spite of the improvement in GDP per capita and the development of the welfare state.

CONCLUSION

The results from this analysis suggest that the short-economic stress has had an impact on fertility behaviour during all analysed periods (1801-1899, 1900-1975 and 2003-2012). Responses to food price increases and GDP per capita crises were negative and quick. The response was different between net agrarian producers and net agrarian consumers. This reproductive behaviour is according with analysis from other places in Europe during the pretransitional period. However, many authors had questioned if these responses were deliberate in pretransitional period. A delayed negative response is consistent with the nutrition hypothesis, which argues that acute malnutrition caused spontaneous abortion, temporary sterility, libido loss and other health problems. At the same time, it could be also consistent with the hypothesis that temporary labour migration separated spouses. It is not easy distinguishing between a deliberate decision to control the fertility and a malnutrition or physiological response. The discussion is located: How could we be sure if it is a decision or a physiological response? There is no absolute answer to this question. Malnutrition is likely to

have influenced the fecundity among the lower classes in these communities. Families in preindustrial societies could be vulnerable to economic food price shocks. As already we mentioned, numerous studies from Europe and Asia have shown that a variation in the price produced an increase in the risk of adult death possibly related to nutritional problems (Campbell et al., 2004). Malnutrition could also affect mothers inhibiting the possibility to have a new child. At the same time, there are examples that contradict the hypothesis of sharp declines in fertility due to malnutrition. For example: 1855 and 1856 were years of price-food crisis. However, contrary as we would expect, during 1856 the number of children born was increased around 5.8% respect 1855, and the following year had an increase around 8.2%. Despite of a decline in the number of mother exposed in 1856. This is because 1855 was a year of strong mortality due to a cholera crisis. Many parents and children died, including sibling group. In this case, and despite of economic stress during two years, there was an increase in the birth rate. So, a majority of women from all social groups did not suffer severe malnutrition or severe physiological response during this period. But nevertheless, it could be an exception due to the decreased competition for food within the family.

To sum up, we can conclude that agricultural workers reduced temporarily their fertility during the years of short-term economic stress in the first and the second periods (1801-1899 and 1900-1975). The reduction was especially strong among low-skills manual workers (HISCLASS 12). Despite the economic growth per capita experienced in the study's area, low-skills manual workers continued being the most vulnerable to the economic crises. When we studied the effects of economic shocks in the 21st century the results have not changed much. However, we did find some variations. During the twenty-first century low skills workers continue adapting their fertility to economic shocks, postponing births or not completing their ideal family size. Therefore, individuals categorized as HISCLASS 12 remain the most vulnerable to short-term economic stress. However, individuals included in HISCLASS 10, mainly farmers owners, do not seem affected their fertility due to economic shocks. Perhaps, these individuals are not so dependent on economic variations or their professional activity is increasingly independent of GDP.

In any case, the results obtained in this research show that economic stress is a powerful mechanism affecting the low-skills classes of preindustrial societies, as other studies around the world have already indicated. But it still maintains its ability to affect workers into the twenty-first century in rural Spain. Despite the economic growth experienced in recent centuries short-term economic stress continue to influence the fertility of the most popular

and less prepared socioeconomic groups (HISCLASS 12). In the Aragonese countryside this relationship resembles a neverending story.

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