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The impact of women's educational and economic resources on fertility. Spanish birth cohorts 1901-1950

Abstract

In this chapter we portray the effects of female education and professional achievement on fertility decline in Spain over the period 1920-1980 (birth cohorts of 1900-1950).

A longitudinal econometric approach is used to test the hypothesis that the effects of women's education in the revaluing of their time had a very significant influence on fertility decline. Although in the historical context presented here improvements in schooling were on a modest scale, they were continuous (with the interruption of the Civil War) and had a significant impact in shaping a model of low fertility in Spain. We also stress the relevance of this result in a context such as the Spanish for which liberal values were absent, fertility control practices were forbidden, and labour force participation of women was politically and socially constrained.

1. Introduction

In this chapter we wish to take a step forward in the deepening and broadening of our understanding of the Spanish demographic transition. We aim to provide information on the economic condition of mothers (both educationally and professionally) and the impact it had on fertility patterns. Since the economic and social condition of women has been the missing value in the analysis of the vital events relating to the demographic transition[1], in our case study we seek to give the necessary centrality to the transformation of women's lives coupled with the diffusion of fertility control[2]. Furthermore, we shall see that in fact the analysis of women's economic condition in motherhood deserves a central part in the analysis of the demographic transition.

Our case study is based on the female birth cohorts from 1901 to 1950 in Spain. The demographic transition in Spain was a long process that spread over the entire 20th century with the exception of some regions like Catalonia that witnessed fertility control already in the second half of the 19th century[3]. Out of the various aspects of the demographic transition we shall concentrate on fertility and human capital patterns. The cohorts under study place our analysis on population dynamics during the second stage of the demographic transition, between the years 1915 and 1980, for which the number of children (completed fertility) per woman was already low, between 3.3 in the birth cohorts born in 1901 and 2.2 for women born in 1950 (Fernández Cordón, 1986). Therefore, the broader question we shall answer is why women (and couples more generically) controlled their fertility in the specific historical context of Spain in the aforementioned years.

The time span from the years 1936-1939 until 1980 covers the whole of the Franco period, and historical events during these years did not foster low levels of fertility or intentional fertility control. With the advent of Francoism in 1939 all the

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[1] Because of a problem of under-registration in the sources. This is not particular to the Spanish case and can be found in most analyses of the demographic transition.
[2] See F. Gil, this volume, and Reher and Napal, 1989.
[3] See Cabré, 1999; Nicolau Nos, 1991.

religious values concerning the traditional gender roles of the family and the virtues of large numbers of children (including economic subsidies) were part of the regime's discourse and ideology. Other factors leading to fertility control elsewhere, like the diffusion of the pill[4] and other contraceptive methods, were forbidden in Spain. Moreover, during the 1940s and early 1950s Spain diverged more than ever from the European pattern of economic growth[5]. Other factors also fostering modern fertility patterns were temporarily absent. Living standards worsened in absolute terms, especially in the period 1940-55, while the urban network lost density and the country experienced a trend towards ruralization during the same years. Nonetheless, fertility levels remained low and according to our results they maintained a downward tendency: completed fertility was 3.1 for the 1901-10 cohort, 2.7 for the central cohorts of 1911-1940 and 2.5 for the 1941-50 cohort. Yet neither ideology nor the macroeconomic circumstances were prone to modern fertility patterns.

Given that the overall context was so adverse to the demographic transition, other factors must have had the opposite effect in order for levels of fertility to remain low. One factor leading to fertility decline we already know is the drop in infant mortality during the same period[6]. From levels of mortality of 185 per thousand in 1900 it diminished to 120 per thousand in 1940, 40 in 1960 and 15 in 1970[7]. Therefore, the probability of survival of newborns continuously improved over this period. The size of the surviving offspring could remain constant with a lower number of births, along with the normal delay this process of adjustment takes in most demographic transitions. Exogenous human capital health improvements causing a decrease in infant mortality[8] were therefore leading to a decline in the desired number of children by families.

However, in this chapter we shall focus our analysis on the role of women's social and economic position, rather than exogenous factors, in the fertility decline. We shall stress the role of education of women, their social family backgrounds and levels of participation of mothers in the paid labour force. In Section 2 we present the source and the methodology. In Section 3 we proceed to analyse the effects of female education on

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[4] See Goldin and Katz, 2002.
[5] See Carreras and Tafunell, 2003.
[6] See Nicolau, 1989.
[7] See Nicolau, 1989; Reher and Sanz-Gimeno, 2000.

fertility patterns. In Section 4 we see that female human capital investment had consequences on the occupational profiles of women and therefore also on their reproductive pattern. In Section 5 we conclude.

2. Data and techniques

Data source

Our analyses will be based on the Spanish Sociodemographic Survey (ES), conducted in the second half of 1991 by the National Institute of Statistics (INE, 1993a). This survey collected information on the life histories of the respondents, in particular on their education, social background, work, migration and family formation. The focus was on the timing of relatively objective events, and thus it provides no information on values, attitudes and religious beliefs. The sample comprises 158,264 individuals resident in private households in Spain, aged 10 years or over on the date of interview, and representative of the Spanish population at that time. For the present analysis we restrict ourselves to a sub-sample of 45,565 women born between 1901 and 1950, for whom complete fertility histories are available. The ES survey has been the basis of several studies that focus mostly on the postwar birth cohorts, while previous birth cohorts have been comparatively neglected. We have not made a detailed evaluation of this data source. However, the results obtained previously by several authors and the results presented here are generally consistent with those obtained by other data sources (see below). A detailed description of the survey, data editing, data checks, as well as some data quality evaluations are given by various publications of the National Institute of Statistics (INE, 1993a and 1993b).

Table 1. Number of individuals selected for the analyses. Spanish Sociodemographic Survey 1991

	1901-1910	1911-1920	1921-1930	1931-1940	1941-1950	Total
Men	2,075	5,876	10,488	9,151	8,998	36,588

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[8] As a consequence of medical innovations and improvements in health care.

Women	4,106	9,889	12,856	10,243	8,471	45,565
Total	6,181	15,765	23,344	19,394	17,469	82,153

The use of a retrospective survey immediately raises the issue of the selectivity of the interviewed population with respect to the variables studied (Auriat, 1996). It is clear that the combined effects of mortality and international migration will increasingly affect our sample the earlier the cohort was born. Their effects may bias the sample to the extent that they are selective with respect to the variables we study. However, with the existing evidence it is not possible to know in detail, and *a fortiori* to correct, the diversity of selection sources that have depleted the original members of each birth cohort. Therefore, the strategy followed in this chapter is to base the analyses on multivariate regressions in which the main known sources of selectivity are controlled as independent variables[9]. The focus is primarily on the effects of variables between each other across the life course, which should minimize that type of biases (Blossfeld, 1985; Courgeau and Lelièvre, 1992). We will also present several descriptive tables and graphics, essentially for illustrative purposes, and whenever possible compare the results with other sources of data[10]. Although studies on international migration and mortality in Spain covering the 20th century are not scarce, there is much less individual-level evidence on the impact of variables affecting them. It is clear, however, that there have been great differentials in mortality according to geographical location, education, and social class/occupation (e.g. Trifiró, 1991; Gómez Redondo, 1989 and 1990; Regidor Poyatos and González Enríquez, 1989; Ramiro Fariñas and Sanz Gimeno, 2000; Reher and Sanz-Gimeno, 2000). Unfortunately, we lack studies on a potentially important source of bias, namely social differentials in delivery-related mortality. Existing information concerning international migration mainly refer to geographical origin of emigrants[11].

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[9] Obviously, heterogeneity arising from variables not included in the survey cannot be taken into account.
[10] Of course, these other sources of data (census, labour force surveys, civil registration), are also affected to some extent by biases and quality problems. A thorough discussion of these issues is beyond the scope of this work.

Variables

Complete fertility histories can be obtained from the ES, including the age of the women at each birth. In Table 2 we present the distribution of women by parity and the average number of children per woman. Our results are remarkably similar to those obtained from civil registration and census data (Fernández Cordón, 1986).

Table 2. Completed fertility: distribution of women by parity. Spanish birth cohorts 1901-50

Parity	1901-10	1911-20	1921-30	1931-40	1941-50
0	15.9	18.1	15.2	10.4	9.5
1	11.8	13.9	12.9	10.9	10.1
2	18.5	22.2	25.9	30.2	37.3
3	15.3	16.7	19.1	22.9	25.2
4+	38.5	29.1	26.9	25.6	17.9
Average	3.1	2.7	2.7	2.7	2.5

Source: Sociodemographic Survey 1991. Weighted data. These data are slightly different from those published by INE, 1993b, p. 409.

Full educational trajectories were requested, including information on informal studies. For our present purposes, only studies taken in the official system of education were taken into account. Given the crucial role of education, we included a multivariate analysis in which the dependent variable is the women's highest educational attainment (Table 8). The purpose of this analysis was to measure the impact of several background variables on the accumulation of this form of human capital. The Kaplan-Maier estimate depicts age at end of educational enrolment, i.e. the age at which the individual left the educational system for the last time (although only periods of enrolment beginning before age 25 are included), irrespective of the possible discontinuities of enrolment (Figure 3). Changes in educational level over the life course are directly estimated from the data, since the year that the person obtained the corresponding diploma is available in the dataset. The time-varying covariate "educational level" reflects the progression in the level attained at each age. Note that the ES does not allow an exact measure of the

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[11] Immigration played a relatively minor role in the period studied. The existing studies relating to *internal* migration provide evidence of a strong selectivity of migration according to occupation, educational level,

number of illiterate individuals, as the question "can you read and write?" is only asked to those individuals that never went to school. Table 3 shows the highest educational level attained by individuals at the time of the survey[12].

Table 3. Distribution of women and men by highest educational level attained. Spanish birth cohorts 1901-50

	1901-10		1911-20		1921-30		1931-40		1941-50	
	Wom	Men	*Wom*	Men	*Wom*	Men	*Wom*	Men	*Wom*	Men
Illiterate (never went to school)	*25.0*	11.6	*18.3*	8.2	*12.3*	6.2	*9.3*	4.2	*3.1*	1.4
Literate (never went to school)	*10.6*	15.6	*9.1*	10.6	*8.0*	9.5	*8.2*	9.5	*4.1*	4.3
Primary school not completed	*27.0*	31.4	*27.9*	29.2	*29.5*	29.6	*26.4*	24.7	*21.2*	15.8
Primary school completed	*34.4*	33.2	*40.7*	41.6	*44.5*	43.6	*47.6*	45.3	*50.8*	47.6
Lower secondary	*1.1*	2.9	*2.0*	4.3	*2.8*	4.5	*3.6*	5.1	*7.7*	8.8
Upper secondary	*0.3*	0.8	*0.4*	1.5	*0.5*	1.5	*1.8*	4.2	*5.6*	10.5
Tertiary	*1.6*	4.5	*1.6*	4.5	*2.4*	5.1	*3.2*	7.0	*7.5*	11.5
	100.0	100.0	*100.0*	100.0	*100.0*	100.0	*100.0*	100.0	*100.0*	100.0

Source: Sociodemographic Survey 1991. Weighted data.

The information concerning labour market trajectories was not as complete as that of the educational career. It was nevertheless possible to compute the age at which the individual started her first "stable" employment (i.e. lasting more than six months). The Sociodemographic Survey provides information on periods of labour force participation that are interrupted for no more than twelve months, i.e. short interruptions of work or short spells of unemployment are not recorded. This should result in some over-estimation of participation, although its relevance for our purposes is not great. Furthermore, seasonal jobs (very widespread in the agricultural sector) as well as part

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and household and family situation (Baizán, 2002).

[12] These data confirm our suspicions that the ES over-represents highly educated groups (see Núñez, 2005).

time jobs (irrespective of the number of hours worked) are counted as participation in the labour market. The survey also asks for the type of job and the status of the individual that predominates (i.e. the longest) in each of these labour force spells. We have classified spells according to seven categories that take into account the profession[13] and power relationships[14]. Thus, the category "High" includes individuals that are employers (family employees are not counted) or employees in the most prestigious occupations (e.g. managers of large or medium enterprises, high and middle level technicians, lawyers, teachers, nurses). "Middle" occupations include employees in "non-manual" occupations (e.g. administrative employees, salespeople, waiters, cooks, hairdressers, postwomen). The category "self-employed" includes agricultural and non-agricultural heads of enterprises with no employees (excluding family employees); this category includes individuals working in a family enterprise, even if unpaid. The rest of employees are classified according to the sector in which they work, i.e. agricultural workers, domestic service and "other workers" (including factory workers and occupations in services such as washerwomen, cleaners). Finally, a residual category comprises individuals outside the labour force.

In some of the models we also include age at union formation. The date of the first union formation given in the survey refers to the year when actual coresidence between partners began, not necessarily to the date of legal marriage (if it had occurred)[15]. This is an ordinal variable, measuring the completed age at union formation. As we focus in this study on the fertility effects of the availability of own resources by women, we restrict the analysis to age at marriage, and we do not make any analysis including partner's characteristics. Furthermore, the timing and intensity of union formation and especially the characteristics of partners are likely to be a consequence of the factors we are interested in[16]. Union formation takes place relatively late in the life course of Spanish women born in the first half of the 20th century, when they had progressed a great deal in their transition to adulthood (Baizán, 1998 and 2001).

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[13] This is based on the National Classification of Occupations provided by the National Institute of Statistics (INE, 1993a).

[14] This classification is adapted from Erikson and Goldthorpe (1993).

[15] Unmarried cohabitation was very uncommon in Spain until the 1990s (Delgado and Castro Martín, 1998).

Finally, we include in the analysis several indicators of the individual's social background and an indicator of the cultural and economic regional context in which the person grew up. The parents' socioeconomic status and their educational level refer to the father's and mother's situation when the child was 16 years old. They are constructed in a similar way to the variables concerning the women studied (see above). The "region" of birth comprises four groups of "autonomous communities": "Centre" (Madrid, Castilla-León, Castilla-La Mancha, La Rioja), "North" (Galicia, Asturias, Cantabria, País Vasco, Navarra), "South" (Andalucía, Extremadura, Canarias, Murcia, Ceuta, Melilla), and "East" (Aragón, Cataluña, Valencia, Baleares). The grouping of these regions is based on the timing of the fertility transition, regional household composition and nuptiality patterns (Solsona and Treviño, 1990; Pujadas and Solsona, 1988). Furthermore, given the relatively low levels of inter-regional migration during childhood and adolescence for these birth cohorts (Baizán, 2002), this indicator can approximate the conditions experienced by the individual during those stages.

Techniques

In this chapter we apply two complementary techniques of analysis: event history analysis and ordered logit regression. The first type of technique focuses on the effects of several variables on the age of women at conception of their first child (Table 6)[17]. The dependent variable is age at birth of first child minus 9 months, i.e. conception time, in order to avoid reverse causation[18]. Event history models make it possible to include variables that change in time, facilitating the interpretation of their (causal) effects on the dependent variable. For example, in the model applied in Table 6, we include time-invariant variables, such as birth cohort and father's educational level, as well as time-changing variables, such as educational enrolment (enrolled versus not enrolled at a school), educational level, employment status, and historical period, thus measuring the

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[16] Marital homogamy in Spain has been studied by González (2003) using the Sociodemographic Survey 1991.

[17] We also calculated models for second and third birth, that we do not present here for reasons of space and because the effects of most variables are essentially similar to those provided by the logit regressions.

[18] Reverse causation would take place, for instance, in the case of a particular woman whose labour force status changes as a consequence of her pregnancy. In such a situation, if we measure her labour force status at the moment of birth, we would erroneously interpret that change as a cause of the birth. Measuring the dependent variable at conception time overcomes that error.

effect of changes over time in the categories of these variables for a given individual. The multivariate event history model applied here is the piecewise constant exponential, a particularly flexible model that does not need any *a priori* knowledge of time dependency of the risk (Blossfeld, 1995). In this model the time axis (baseline) is divided into a number of intervals; only within these intervals is the risk constant, while it changes between intervals.

In order to evaluate the consequences of several explanatory variables on educational attainment and on completed fertility, we have applied a maximum-likelihood ordered logit regression model. This is a cross-sectional technique, that measures at age 40, i.e. near the end of the childbearing cycle, the effects of a number of fixed variables, on the one hand, on the educational level attained by the women at that age (model 8), and on the other hand, on the total number of children she has had up to that age (models 9 and 10). The categories included in the models for completed fertility are: 0, 1, 2, 3, 4, and 5 and over. Here we have included women with no children, and we have grouped parities five and over, that is, parities five and over are considered as equivalent. Estimated parameters will then be interpreted in terms of log-odds of parity progression, that is, of having an additional child, for women with a given number of children (Billari and Rosina, 2004). In the model on educational attainment, the categories are: illiterate (never went to school), can read and write (never went to school), primary school not completed, primary school completed, lower secondary, upper secondary, higher education. Analogously, the results should be interpreted as the probability of attaining an immediately higher level of education for women with a given level. Additionally, we have presented the results of the analyses in terms of relative risks, in order to facilitate their interpretation.

3. Women's family background and the role of women's education

Before considering the educational results attained by the women in our sample it is important to stress that Spanish authors dealing with education regard the Civil War of 1936-39 as a major setback that clearly slowed the improvement of education levels

during the decades that followed it.[19] In fact we cannot know the educational supply during the years of the war, but we can infer that the completion of studies was hindered from the cohort of 1922 (aged 14 in 1936 and therefore finishing basic secondary school) to the cohort of 1939, with the end of the armed conflict. In the postwar years the Spanish economy and with it the supply of schooling had to recover from the destruction of the war and it can be estimated that until the 1950s schools had not reached normality[20]. Postwar economic strangulation affected all spheres of economic activity[21] including the supply of schooling for children.

As we said earlier in the methodological section the results we obtain on the basis of our source are merely representative of a sample of survivors and not necessarily of the whole population. The rates of illiteracy of the overall population according to the census returns are higher than those provided by our sample and presented in Table 3[22]. It is obvious that longevity is positively correlated with education, and therefore in a retrospective survey such as the ES educated people should be over-represented.

Table 3 and Figure 4 show that the supply of schooling was very poor at the beginning of the period (among the cohorts born before the war, during the years of Primo de Rivera's dictatorship and the Second Republic). With the advent of democracy during the Second Republic (1932-36) the state improved the public supply of education by increasing the shares of public expenditure financing education. Indeed, this was a pressing need. Notice in the table the very low levels of education of the first cohort under study, 1900-10, with 25% illiteracy in women and 11.6% in men[23]. Notice also in the same table how households reacted to the scarce and scanty investments in education by providing literacy at home (10.6% of women and 15.6% of men). These very basic levels of education are important because they show the adaptive family strategies to provide a scarce service in the Spanish context of the beginning of the century. From the table we can also see that despite the dramatic events that brought the democratic years to a close, the generous educational policy of the Republican governments helped to

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[19] See Núñez, 2005.

[20] See Núñez, 2005.

[21] See Catalán, 1995.

[22] The rates of female literacy according to the census returns are: 41% (1910), 51% (1920), 63% (1930), 76% (1940), 83% (1950), 87% (1960). These are cross-section results and not cohort as those presented in our analysis. See Núñez, 2005.

mitigate the negative effects of the war and postwar period. The levels of education of the cohorts under study continuously improved, albeit on a modest scale. Among the 1941-50 birth cohort illiteracy and the educational gender gap were nearly overcome. We know that the educational improvement of the overall Spanish population was in line with the trend observed in the table, despite the fact that literacy and education are somewhat over-estimated by our data, as mentioned in Section 2[24].

The general improvement in levels of education among women has been considered as an important factor fostering a fertility decline and also the human capital quality of their children. Education raises the price of women's time for performing domestic chores and also the opportunity cost of time devoted to child bearing and child rearing. Furthermore, educated women are usually more free to decide. And a third important factor is that women who had attended school and are competent in written and oral language are in a better position to educate their children and to make use of distant health services[25]. This is why couples with educated mothers usually have less quantity and more quality of children[26].

If we look at the social background of educated mothers we see in Table 6 that they belong to the wealthiest families in society, and that their parents were also highly educated. Both the father and the mother of educated women were also educated and belonging to the middle-high social strata of society (see Tables 6, 8). On the other hand, in Table 8 we can observe that the impact of the education of the mother of the woman interviewed is much more influential in her final educational achievements than the educational background of her father. This result is in line with the conclusions of the chapter by Jane Humphries in this volume[27]. According to this author while women constituted the emotional bases for the education and socialization of children (in our

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[23] These results are lower than those provided by the census returns. See footnote 22.

[24] See footnote 22.

[25] See Caldwell, J.C. (1982): Theory of Fertility Decline, New York; Cocharne, S.H. (1979): Education and Fertility: What Do We Really Know?, Baltimore; Inkeles, A., Holsinger, D.B. (eds.) (1974): Education and Individual Modernity in Developing Countries, Leiden; Galor, O., Weil, D.N. (1996): "The Gender Gap, Fertility and Growth", The American Economic Review, 86, 3-5; Hazan, M., Beredugo, B. (2004): "Child Labour, Fertility and Economic Growth", The Economic Journal, 112:482; Le Vine, R.A., Le Vine, S.E., Richman, A., Medrado, F., Correa, C.S. and Millar, P.M. (1991): "Women's Schooling and Child Care in the Demographic Transition: A Mexican Case Study", Population and Development Review, 17:3.

[26] See Mackinnon, this volume, and Becker, G.S. (1981): Treatise of the Family.

[27] See Humphries, in this volume.

case girls), men made the bridge towards the external economic world. An obvious outcome of this particular male breadwinning model of gender roles is that women were at their strongest in the transmission of education while men were providing the income foundations of the household. The conclusion of Table 8 is not that the role of men in the transmission of education was nil. But it was much less influential than the role of the mother's education. This result sheds some light on a mechanism of amplified transmission of education from mother to daughter which had as a final result increasing levels of education of women before conception.

In Table 9 (models 6 and 7) we can see the correlated effects that the increase in women's education levels had on the future reduction of fertility. The event history results in Table 6 are similar and make explicit that the education of the mother was one of the most significant variables shaping low levels of fertility. For instance, according to model 6 in Table 9 the probability of an illiterate mother bearing an additional child was double that of a woman with secondary schooling. Therefore, the gender roles embedded in the male breadwinner family have further consequences in fertility patterns, since the amplified mechanism of transmission of education from mother to daughter has further consequences in the reduction of the size of the completed offspring.

At least among the first cohorts (see Table 10) of the beginning of the century the main differences when explaining fertility patterns can be found in the gap between literate and illiterate mothers. At very modest levels like "can read and write" (not having attended school), education has a noticeable influence on the size of the offspring or the time at risk before the birth of the first child. As we have already mentioned, education at home may have been caused and amplified by the effects of economic backwardness in the decades of the beginning of the century and the Civil War after 1936. In this period the influence of the education of the parents of the woman studied was negligible, since from Figure 4 we can infer that educational attendance of the cohorts before 1900 reached very low levels. Therefore, here we are faced with another kind of education, mainly training in industrial activities offered by trade schools during the second industrial revolution in the areas of Spain where the adoption of these new technologies succeeded.

As a general result we can stress, both from the event history analysis model and the parity progression ratios model, that the education of the woman and also of her mother – having as an outcome the revaluing of the time of women – had a direct effect on the lower demand of children[28]. The revaluation of women's time implied by education, and also the need to educate children by literate and educated mothers, were factors leading to the decision to have fewer children who were more expensive to raise[29]. This process was led by women from the highest and most educated social backgrounds. Among wealthier family backgrounds it was easier to invest in the education of the daughters, particularly in the cohorts that experienced a wider educational gender gap. We can assume that this segment of more educated women were in a position to develop family agency further in the process of decision making on reproductive patterns.

We have also observed how literacy, at its very basic level, also transformed the reproductive patterns and family life of working class women of the first cohorts born at the beginning of the century, when the supply of schooling was not yet normalized and literacy was acquired in part at home. During the following decades and the early Franco years, the situation of poverty of the labouring classes and the reversal of welfare conditions in the years 1940-55 shifted downwards the budgets of many low-income families[30]. This budget constraint coupled with a demonstration effect to make effective the education of children by working class families together contrived to bring about low fertility patterns. The basic education of mothers willing to educate their children and the family budgetary restrictions to invest in human capital were the second set of endogenous variables fostering the observed low fertility model.

Although education in Francoist Spain was far from following the liberal model of social values based on individual freedom, from our analysis we can state that the impact of human capital investment on women had further consequences on family life. The education of mothers proves to be a powerful explanatory variable of the observed demographic behaviour.

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[28] A similar result is obtained by Brown, J.C. and Guinnane, T.W., 2002.
[29] See Becker, 1991.

4. The role of the levels of participation of mothers in paid production

One problem with the analysis of female activity patterns in historical societies is that historical and demographic sources very rarely give information relating to the economic activity of women. Only widows, as heads of households and owners of the household economic assets, receive the same statistical treatment as men. In broad terms, although we are certain that married women and mothers performed paid activity in the open labour market, they are systematically omitted from statistical sources or simply under-registered, depending on their different economic situations, and also depending on the rules the local officers executing the census followed concerning the information they had to collect. This is the reason why the quality of the information we can find at the local level is very diverse depending on the locality, region or jurisdiction, and the historical period.[31]

In Figure 2 we present the evolution of activity rates according to age of the cohorts under study. As a general remark we can stress that these results for female levels of participation in the workforce are significantly higher than those provided by the census returns[32]. The rates are exceptionally high between the ages of 18 and 25, corresponding approximately to first marriage and before the conception of the first child. These activity patterns are consistent with the savings families need before children's birth and are also in line with the working hypothesis that regards women's paid work as a supplement for the family economy.

INSERT FIGURE 1 ABOUT HERE

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[30] See the evolution of living standards in the long run in Reher and Ballesteros, 1993. The reversal of welfare conditions can also be observed by means of anthropometric analysis. Cohorts of births of the 1940s and 1950s were shorter. See Martínez Carrión, 2002.

[31] See on this topic Wrigley, 1973. See for under-registration of female labour force in historical Spanish sources Gálvez and Sarasua, 2004; Pérez-Fuentes, 2004. This fact is obviously not particular to the Spanish case and continues to be a problem in most primary sources in historical demography.

But apart from the aforementioned female pattern of activity we find a large proportion of women for whom participation in the labour force can be considered as central (and not a supplement) to the family economy. Activity rates among mothers after the age of 30 stand between 30 and 40%. These rates are high for the period under consideration and present us with a female activity pattern similar to that obtained in the developed countries of Europe during the Golden Age[33]. Notice particularly the modern shape of the activity rate function of the 1941-50 cohort, which is already similar to the stylized M model according to which fertility control allows women to leave the labour market when the first child is born and to return to it when the child conception time span has finished.

Among the first cohorts, women employed in industry also increased their share in employment particularly before the Civil War. During the first third of the 20th century some regions of Spain were experiencing the second technological revolution, which in traditional sectors like the Catalan textile or the Galician fish canning industries made intensive use of female work. Together with technological change and higher levels of women's human capital investment, during the 1920s and 1930s there was an increase in women's real wages having as an immediate outcome a decrease in fertility (see Figure 2 for the Catalan case). As far as domestic chores are concerned, it must be stressed that contemporaneously with the second industrial revolution technologies for housework also improved with the appearance of new durable goods (household appliances, etc.).

INSERT FIGURE 2 ABOUT HERE

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[32] See Nicolau, 1989.

Figure 2 compares the data on legitimate fertility constructed by Anna Cabré (1999) with the series of female real wages constructed by Montserrat Llonch (2005). In order to make the data comparable they have been converted to index numbers (1911-15 = 100). The combined effect of the indices clearly shows that while women's real wages increased fertility levels declined. During the following decades, after the setback of the war and the years of reconstruction, the Spanish economy increasingly moved towards the services sector, during the 1950s and 1960s. In this new period the educational demands of women also increased. In Table 10 we can see that women of the high social ranks employed in the services sector began to adopt fertility control measures as early as the cohorts of 1930-40 and 1940-50.

From the existing data provided by the literature it does not seem unreasonable to state that over the 20th century the income gender gap continuously decreased. In the first third of the century, during the second industrial revolution, we have seen that the advances of women's labour productivity and the systems of specific human capital investment in trade schools had as a consequence a sharp increase in women's real wages relative to that of men. During the Second Republic a trend towards the levelling of wages and also towards a more egalitarian distribution of income had as an outcome the narrowing of the gender gap. During the Franco period, coupled with educational demands to work in the services sector, the minimum administrative real wages of women were relatively high compared to those of men. Or to put it in other words, a plausible assumption would be that the wage gender gap was eroded throughout the period under consideration[34] for most Spanish occupations. This outcome is in line with the results of our multivariate regression models, which show the strong incidence of women's work in terms of length of service and participation in high and middle rank and industrial jobs on the lower probability of having children (see Tables 6, 9, 10). These results can also be read as an indirect outcome of previous investment in women's

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[33] See Ambrosius and Janssens. Nonetheless, our results may be over-estimated according to other sources. See Garrido, 1992.

[34] And together with this the opportunity cost of women's work increased. See the data on women's real wages in Llonch, 2004; Vilar, 2004.

education, which in turn made possible an increase in levels of participation of mothers in the workforce.

During the Franco period the shift towards budget constraint based on the real individual male wages for all salaried jobs should have impelled higher levels of participation of mothers. While individual incomes were artificially compressed expenditures on children's education of children constituted a major economic burden[35]. Together with the better educational backgrounds of women, higher levels of participation in the workforce by mothers enlarged the family income and were a means to adjust it to increasing expenditures to educate children. Moreover, among this segment of industrial wage earners, restricting fertility should have been another way to adjust expenditures to the family budget. But according to the model of parity progression ratios the incidence of this kind of employment on fertility control was lower than that of jobs with higher human capital investment requirements.

If we try to explain the trajectory of fertility patterns shown in Table 2 (completed fertility according to women's birth cohort), we can conclude that the forces leading to the decrease in the number of children per mother were diverse and dynamic according to the historical period under consideration. In the cohorts of 1901-1910 and 1911-20 fertility dropped from 3.1 to 2.7 despite the poor levels of education of mothers. We have nonetheless seen the adaptive family strategies to supply education at home at the literacy level. But the increase in the value of women's time in this period can also be explained by technological change in industry and the increasing use of female labour by the second industrial revolution. Notice for instance the steep increase in Catalan women's real wages during the first third of the century and the associated decrease in the size of the offspring in the region. Technological change during these decades actively fostered an increase in the levels of productivity of women's labour despite the modest achievements in education[36].

The aforementioned trend of diffusion of the second industrial revolution and the improvement of the educational supply by the Second Republic were hindered by the

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[35] Even if children attended a public school this represented a financial cost for the parents because of the income derived from children's work they ceased to receive. See Camps, 2003; Camps, 2004.
[36] Most human capital formation at the time was specific, and training was acquired in *Escoles d'Arts i Oficis*. See Llonch, 2004.

Civil War. In educational terms we have seen that the Civil War affected cohorts from 1922 to 1939. These cohorts did not change their average completed fertility levels, which remained low at 2.7 children per mother. Uncompleted educational attainment and the influence of adverse vital, economic and professional circumstances caused by the war were all factors leading to low fertility rates.

The most notable transformations of women's educational and professional lives are those observed for women born during peacetime, from the 1940-50 birth cohort. In Figure 3 the Kaplan-Meier educational survival functions show that this is the cohort that put off leaving primary or secondary school or tertiary educational institutions for longest. This is also the cohort that achieved the most modern activity rate function (see Figure 2), and together with a higher investment in their education this cohort notably increased its share of participation in high (8.8%) and middle (21.3%) rank jobs. Because of all the human capital arguments we have inferred up to now, better educational backgrounds and greater professional achievement resulted in the completed fertility of this 1940-50 birth cohort falling from 2.7 to 2.5. However, we must also make explicit the hypothesis that the sectors of society investing in the human capital formation of their daughters were on the side of the winners of the war, for whom the triumph implied a radical change in economic expectations.

INSERT FIGURE 3 ABOUT HERE

5. Conclusions

In the above pages we have seen the role of women's education in the adoption of a model of low fertility rates in the context of the Spanish female cohorts of 1901-50. Although the pattern of educational improvement was slow and modest it was the main driving force behind this model of low fertility levels. As a result of previous human

capital investment women's employment in the paid labour market also had an active role in fertility decline although its incidence was lower than that of education. The trend towards low fertility among the birth cohorts of the first half of the 20th century can be explained in terms of the moderate but increasing supply of education, the narrowing of the wage gender gap it implied and the increasing costs of raising educated children by educated mothers. All the aforementioned factors actively encouraged a decrease in the quantity and an increase in the quality of children.

From our data this last statement, the role of educated mothers in raising educated children, can be proved for the most part indirectly. When exploring the family backgrounds of women we have seen that one of the most noticeable variables determining their education levels and their fertility patterns is the education level of their respective mothers (much more significant than that of their fathers). This last intergenerational result is clear in showing the centrality of women's education in all the associated human capital and demographic transformations. In order to foster economic growth it is important for women to be educated since this leads to lower fertility but also to higher levels of education of their children.

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Table 6. Time to first birth (conception). Piecewise constant exponential model. Women. Spain.

Variable category	Relative risk Model 1	Significance level	Relative risk Model 2	Significance level

Birth cohort				
1901-10	1		1	
1911-20	0.9828		0.9627	
1921-30	1.0604	***	1.0216	
1931-40	1.2280	***	1.1964	***
1941-50	1.4384	***	1.5628	***
Region of birth				
South	1.0859	***	0.9969	
East	1		1	
Centre	1.0426	***	1.0053	
North	0.9982		0.9689	*
Place of birth				
Urban area	1		1	
Rural area	1.0268	**	0.9903	
Mother's educational level				
Illiterate	1		1	
Can read & write	0.9342	***	0.9375	***
Primary not compl.	0.8716	***	0.8849	***
Primary completed	0.8797	***	0.9273	***
Lower secondary compl.	0.8203	***	0.8856	***
Mother's labour force status at 15				
Out of labour force	1		1	
High or middle	0.8884	**	0.9422	
Self-employed	1.0792	***	1.1459	***
Agricultural worker	1.0186		1.0636	*
Other worker	1.0721	*	1.1902	***
Domestic service	1.0214		1.1266	***
Father's educational level				
Illiterate	1		1	
Can read & write	0.9468	***	0.9536	***
Primary not completed	0.9930		1.0248	
Primary completed	0.8762	***	0.9230	***
Lower secondary completed	0.7871	***	0.8666	***
Father's labour force status at 15				
High	1		1	
Middle	1.0035		1.0123	
Self-employed	1.1356	***	1.0834	***
Agricultural worker	1.2298	***	1.2053	***
Other worker	1.1688	***	1.1676	***
Enrolled in education			0.4266	***
Educational level				
Illiterate			1.0237	
Can read & write			0.9554	**
Primary not completed			1	
Primary completed			0.9036	***
Lower secondary compl.			0.7950	***
Higher secondary compl.			0.8065	***

Labour force status				
Out of labour force			1	
High			0.4952	***
Middle			0.5029	***
Self-employed			0.7488	***
Agricultural worker			0.7726	***
Other worker			0.6140	***
Domestic service			0.6212	***
Historical period				
Before war			1	
War 1936-38			0.7315	**
After war			1.0850	***

Note: Baseline not shown (three-year time periods from age 13 to 45).
Significance: *** 0.99; ** 0.95; * 0.90.

Table 7. Time to end of educational enrolment. Piecewise constant exponential model. Women. Spain.

Variable category	Relative risk Model 3	Significance level
Birth cohort		
1901-10	1	
1911-20	0.8803	***
1921-30	0.7901	***
1931-40	0.7287	***
1941-50	0.5456	***
Region of birth		
South	1.1670	***
East	1	
Centre	1.0037	
North	0.9131	***
Place of birth		
Urban area	1	
Rural area	1.1038	***
Mother's educational level		
Illiterate	1	
Can read & write	0.8294	***
Primary not compl.	0.7974	***
Primary completed	0.7082	***
Lower secondary compl.	0.6991	***
Mother's labour force status at 15		
Out of labour force	1	
High or middle	0.8009	***
Self-employed	0.7927	***
Agricultural worker	0.9656	
Other worker	1.0293	
Domestic service	1.1059	**
Father's educational level		
Illiterate	1	
Can read & write	0.9099	***
Primary not completed	0.8563	***
Primary completed	0.7188	***
Lower secondary completed	0.5295	***
Father's labour force status at 15		
High	1	
Middle	1.1975	***
Self-employed	1.3301	***
Agricultural worker	1.6210	***
Other worker	1.4265	***
Labour force status		
Out of labour force	1	
Participates	5.0820	***

Historical period		
Before war		
War 1936-38	1.3228	***
After war	0.9606	*

Note: Baseline not shown (10 time periods between age 8 and 25).
Significance: *** 0.99; ** 0.95; * 0.90.

Table 8. Educational attainment. Women. Spain.

Variable category	Relative risk Model 4	Significance level
Birth cohort		
1901-10	1	
1911-20	1.371	***
1921-30	1.802	***
1931-40	2.325	***
1941-50	5.140	***
Region of birth		
South	0.368	***
East	1	
Centre	0.818	***
North	0.897	***
Place of birth		
Urban area	1	
Rural area	0.773	***
Mother's educational level		
Illiterate	1	
Can read & write	2.232	***
Primary not compl.	3.453	***
Primary completed	6.851	***
Lower secondary compl.	8.141	***
Mother's labour force status at 15		
Out of labour force	1	
High or middle	2.181	***
Self-employed	0.881	***
Agricultural worker	0.614	***
Other worker	0.910	
Domestic service	0.770	***
Father's educational level		
Illiterate	1	
Can read & write	1.142	***
Primary not completed	1.276	***
Primary completed	1.369	***
Lower secondary completed	2.024	***
Father's labour force status at 15		
High	1	
Middle	0.496	***
Self-employed	0.282	***
Agricultural worker	0.149	***
Other worker	0.244	***

Note: Ordered logit with categories: 0 = illiterate (never went to school), 1 = can read & write (never went to school), 2 = primary school not completed, 3 = primary school completed, 4 = lower secondary, 5 = upper secondary, 6 = higher education.
Significance: *** 0.99; ** 0.95; * 0.90.

Table 9. Parity progression ratios: Impact of family background, education, labour force participation and age at marriage. Women. Spain.

Variable category	Rel. risk Model 5	Signif. level	Rel. risk Model 6	Signif. level	Rel. risk Model 7	Signif. level
Birth cohort						
1901-10	1		1		1	
1911-20	0.719	***	0.742	***	0.717	***
1921-30	0.663	***	0.689	***	0.628	***
1931-40	0.681	***	0.705	***	0.548	***
1941-50	0.612	***	0.677	***	0.421	***
Region of birth						
South	2.050	***	1.725	***	2.257	***
East	1		1		1	
Centre	1.580	***	1.437	***	1.799	***
North	1.153	***	1.108	***	1.372	***
Place of birth						
Urban area	1		1		1	
Rural area	1.085	***	1.039	**	1.060	***
Mother's educational level						
Illiterate	1		1		1	
Can read & write	0.909	***	0.950	**	1.032	
Primary not compl.	0.830	***	0.895	***	0.994	
Primary completed	0.825	***	0.946		1.094	**
Lower secondary	0.710	***	0.831	**	0.857	**
Mother's labour force status at 15						
Out of labour force	1		1		1	
High or middle	0.858	**	1.024		1.013	
Self-employed	1.039		1.175	***	1.020	
Agricultural worker	0.915		0.957		0.858	**
Other worker	1.005		1.189	***	1.012	
Domestic service	1.033		1.187	***	1.026	
Father's educational level						
Illiterate	1		1		1	
Can read & write	0.899	***	0.905	***	0.893	***
Primary not completed	0.925	***	0.947	*	0.905	***
Primary completed	0.857	***	0.877	***	0.856	***
Lower secondary	0.809	***	0.862	**	0.910	
Father's labour force status at 15						
High	1		1			
Middle	1.011		0.995		0.962	
Self-employed	1.262	***	1.111	***	1.010	
Agricultural worker	1.515	***	1.322	***	1.121	***
Other worker	1.220	***	1.125	***	0.953	

Educational level						
Illiterate			1.414	***	1.302	***
Can read & write			0.989		0.939	
Primary not completed			1		1	
Primary completed			0.842	***	0.917	***
Lower secondary			0.768	***	1.013	
Higher secondary			0.762	***	1.148	***
Years of labour force participation (up to 45)						
Never participated			2.282	***	1.542	***
Less than 8			2.487	***	1.317	***
8 to 20			1.818	***	1.273	***
More than 20			1		1	
Labour force status						
High			0.813	***	1.215	***
Middle			0.877	***	1.056	
Self-employed			1.430	***	1.243	***
Worker (agriculture)			1.684	***	1.426	***
Worker (other)			1		1	***
Domestic service			1.146	***	1.231	***
Age at union formation					0.869	***

Note: Ordered logit with categories: 0, 1, 2, 3, 4, 5 and over.
Significance: *** 0.99; ** 0.95; * 0.90.

Table 10. Parity progression ratios: Impact of family background, education, labour force participation and age at marriage. Birth-cohort specific models. Women. Spain.

Birth cohort	1901-10	1911-20	1921-30	1931-40	1941-50
Region of birth					
South	1.818***	1.803***	1.724***	1.687***	1.604***
East	1	1	1	1	1
Centre	1.819***	1.674***	1.424***	1.303***	1.116*
North	1.302***	1.264***	1.113**	1.059	0.881**
Place of birth					
Urban area	1	1	1	1	
Rural area	1.290***	1.162***	1.050	0.937*	0.890***
Mother's educational level					
Illiterate	1	1	1	1	1
Can read & write	1.073	1.041	0.852***	0.941	0.952
Primary not compl.	0.871	1.049	0.847***	0.840***	0.857**
Primary completed	1.083	1.006	0.956	0.959	0.796**
Lower secondary	0.767	0.940	0.746*	0.963	0.617***
Mother's labour force status at 15					
Out of labour force	1	1	1	1	1
High or middle	0.944	0.692**	1.324*	1.173	0.923
Self-employed	1.109	1.365***	1.166***	1.036	1.267***
Agricultural worker	0.903	1.096	0.989	0.802*	0.980
Other worker	1.238	1.174	1.236*	1.108	1.062
Domestic service	1.089	1.348**	1.112	1.010	1.428**
Father's educational level					
Illiterate	1	1	1	1	1
Can read & write	0.798**	0.901*	0.936	0.957	0.824**
Primary not completed	0.966	0.858**	0.984	1.049	0.897
Primary completed	0.676**	0.901	0.922	0.911	0.888
Lower secondary	0.634*	0.848	0.954	0.846	0.950
Father's labour force status at 15					
High	1	1	1	1	1
Middle	0.941	0.876	1.114	0.936	0.965
Self-employed	1.335**	1.128	1.218***	1.040	0.845**
Agricultural worker	1.608***	1.360***	1.386***	1.319***	1.002
Other worker	1.166	1.039	1.255***	1.138	0.916
Educational level					
Illiterate	1.523***	1.381***	1.254***	1.492***	0.997
Can read & write	0.925	0.999	0.957	1.085	0.943
Primary not completed	1	1	1	1	1
Primary completed	0.833**	0.911**	0.776***	0.891***	0.768***
Lower secondary	0.530**	0.762*	0.765**	0.892	0.604***
Higher secondary	0.457***	0.576***	0.637***	0.817*	0.629***

Years of labour force participation (up to 45)					
Never participated	1.991***	2.019***	2.347***	2.305***	2.562***
Less than 8	2.446***	2.488***	2.441***	2.407***	3.241***
8 to 20	1.837***	1.766***	1.889***	1.728***	2.070***
More than 20	1	1	1	1	1
Labour force status					
High	0.770	0.702**	0.548***	0.807*	0.842*
Middle	0.861	0.674***	0.697***	0.732****	0.938
Self-employed	1.129	1.208***	1.382***	1.330***	1.291***
Worker (agriculture)	1.394**	1.514***	1.605***	1.514***	1.772***
Worker (other)	1	1	1	1	1
Domestic service	0.856	0.863**	1.084	1.242***	1.221***

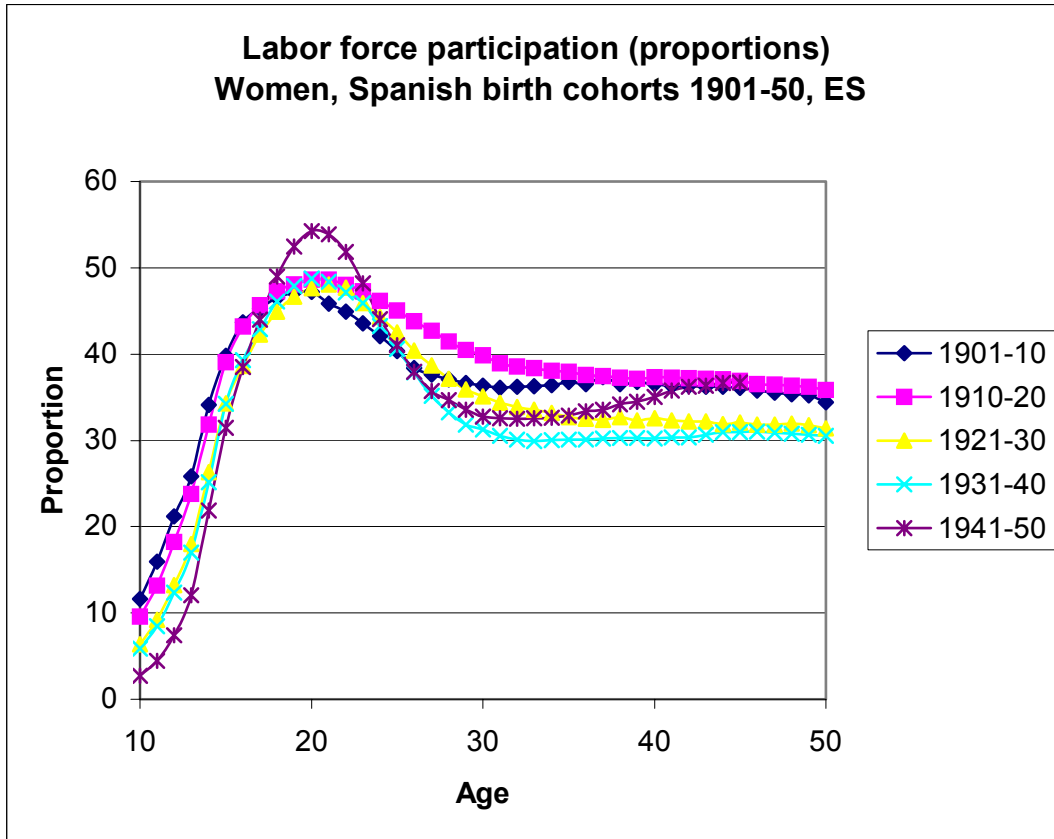Note: Ordered logit with categories: 0, 1, 2, 3, 4, 5 and over. Significance: *** 0.99; ** 0.95; * 0.90.

Labor force participation (proportions)
Women, Spanish birth cohorts 1901-50, ES

FIGURE 1. FEMALE ACTIVITY RATES ACCORDING TO BIRTH COHORT.

Source: ES.

FERTILITY AND WOMEN'S REAL WAGE. THE CATALAN MODEL
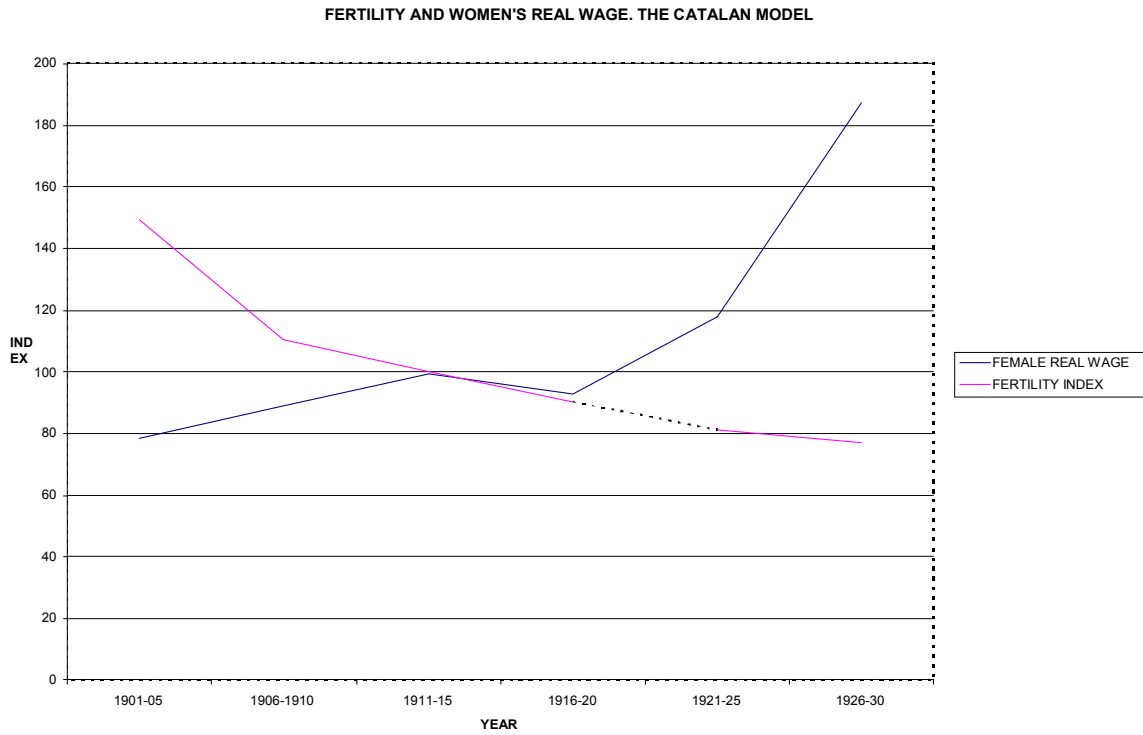
FIGURE 2. REAL WAGES AND FERTILITY INDICES IN CATALONIA.

Sources: Cabré (1999), Llonch (2005).

Kaplan-Meier estimates

END OF EDUCATIONAL ENROLMENT, BY BIRTH COHORT. Women, Spain
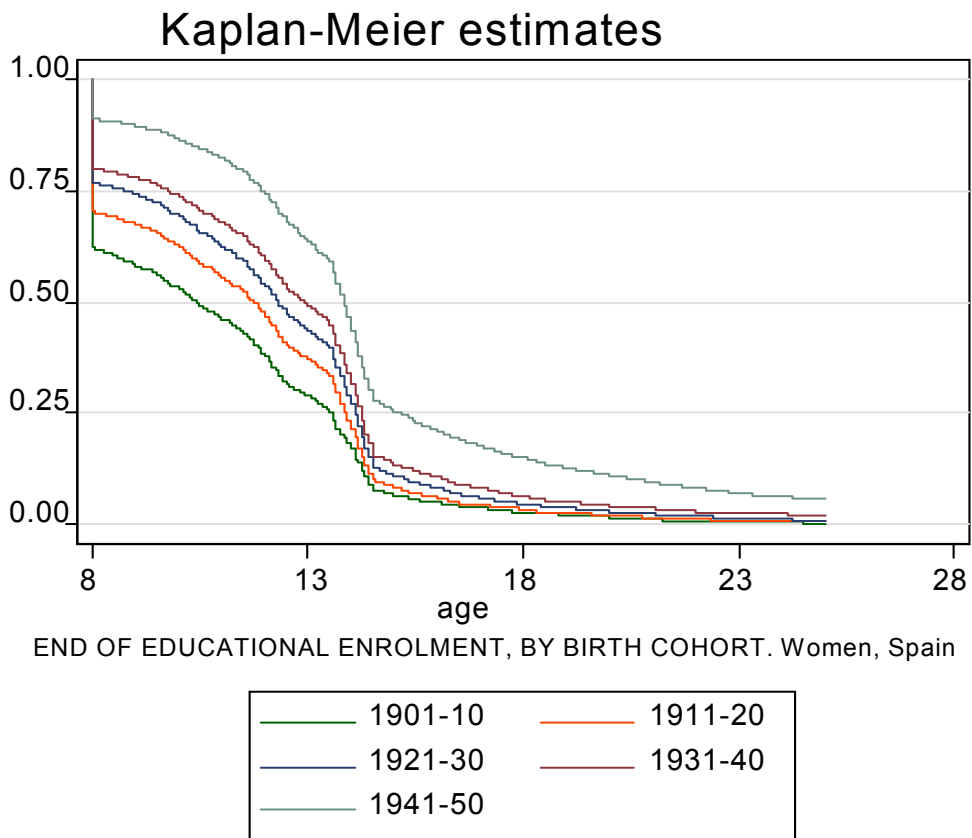
1901-10	1911-20
1921-30	1931-40
1941-50	

FIGURE 3. END OF EDUCATIONAL ENROLMENT.

Source: ES.