

How was the fertility transition carried out? Analysis of fertility control strategies and their evolution in rural Aragon, Spain (1880-1955)

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KEYWORDS: fertility control, demographic transition, spacing, stopping.

JEL CODES: J12, J13, N33, N34.

The aim of this article is to analyse the fertility control strategies employed by families during the fertility transition and to understand their evolution over time. To achieve that goal, this study identified the use and popularization of stopping and spacing. This analysis employed data on the inhabitants of 10 rural villages in the Huerva River valley in north-eastern Spain. The results revealed that in the first stages of the fertility transition, the same fertility control strategies used in the pre-transitional period were employed. However, stopping quickly became the most common strategy. Although women exercised some type of control over fertility at some point in their lives from the beginning of the fertility transition, it was not until the late 1920s that women who were controlling outnumbered those who were not (on 1 July of each year).

¿Cómo se llevó a cabo la transición de la fecundidad? Análisis de las estrategias para controlar la fecundidad y su evolución en el medio rural aragonés (1880-1955)

PALABRAS CLAVE: control de la fecundidad, transición demográfica, espaciado, detención de la fecundidad.

CÓDIGOS JEL: J12, J13, N33, N34.

***E**l objetivo de este artículo es analizar las estrategias de control de fecundidad empleadas por las familias durante la transición de la fecundidad y conocer su evolución temporal. Para ello, identificamos el uso y popularización de la interrupción definitiva de la fecundidad y del espaciado de los intervalos intergenésicos. Para este análisis, se han empleados datos de individuos procedentes de 10 localidades rurales del valle del río Huerva, en el noreste de España. Los resultados revelan que, en las primeras etapas de la transición de la fecundidad, las estrategias de control de la fecundidad siguieron siendo las mismas que se habían utilizado en el periodo pre-transicional. Sin embargo, rápidamente la interrupción definitiva se convirtió en la estrategia más común. Aunque desde el comienzo de la transición de la fecundidad la mayoría de las mujeres ejercieron algún tipo de control de la fecundidad en algún momento de sus vidas, no fue hasta el final de los años veinte del siglo pasado cuando las mujeres que estaban controlando superaron cuantitativamente (a uno de julio de cada año) a las que no lo estaban haciendo.*

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1. INTRODUCTION

During the twentieth century, the average number of births per woman in Spain decreased rapidly. However, the age at marriage did not undergo changes significant enough to explain this trend. There is also no evidence that this reduction was a result of the fecundity of these individuals. Existing research has explained the decline in the number of children as the consequence of voluntary fertility control. These changes in patterns of reproduction are known as the *fertility transition*. Ever since the theory of demographic transition (which includes the fertility transition) was proposed in the first half of the twentieth century, thousands of articles worldwide have studied the causes, characteristics, and consequences of this phenomenon, finding divergences between countries and even between regions within the same country (e.g., Hirschman, 2001; Reher, 2004; Gil Alonso, 2011). The present consensus is that the term *demographic transition* refers to the shift from high natality and mortality to low natality and mortality (Van de Walle, 1992). This transition is extremely important, as it constitutes a break from the past. Societies changed their mentality with regard to sexuality, life, and death (Aries, 1980). The fertility transition produced a transformation in the family economy, allowing women to participate in the labour market for a longer period of time¹.

It is very difficult, perhaps impossible, to understand the evolution of any society in recent centuries without taking into account the fertility transition. However, it is even more challenging to understand the evolution of rural society without considering these demographic changes. Studying the evolution of rural societies requires a thorough analysis of the changes in population structure, the causes and procedures through which these societies transformed, and their differences from urban contexts. The fertility transition in the rural environment was characterised by stronger resistance to these changes, with slower transformations (Galloway, Lee & Hammel, 1998). This article focuses on the changes that occurred in a clearly rural society (the Aragonese agrarian context) that has remained at the margin of the debates generated through studying the fertility transition on the basis of microdata.

The fertility transition in Spain had several unique characteristics as a result of the political, economic, and social context. Contraception was legally prohibited in Spain for the majority of the period studied and was ultimately decriminalized in 1978. These regulations complicated access to synthetic contraceptive methods for Spanish women, especially in rural areas, and even created hurdles with respect to accessing information

1. For more about Spanish women in the farm labour market, see SARASÚA and GÁLVEZ (2003), BORDERÍAS (2007), ORTEGA (2015).

about their existence and use (Lucas, Beltrán & Martínez García, 1987; Ruiz Salguero, 2002). Furthermore, artificial contraception methods, which had existed since the mid-nineteenth century (McLaren, 1992), were very expensive. For this reason, the methods employed to control fertility were primarily free *natural* ones (Santow, 1995), which were openly accessible and could not be controlled by the government. Examples include coitus interruptus and abstinence, and to a lesser degree, vaginal washes, pessaries, and sponges (McLaren, 1992; Ruiz Salguero, 2002).

This article analyses the evolution of the fertility control strategies employed by families to make that control effective. It defines a *control strategy* as the decisions made within the family by one or both spouses, either unilaterally or in agreement (Fisher, 2000), that were put into practice within the marriage with the intention of reducing or preventing births. To study these strategies, this paper employs as a reference the temporal distance between births. We assumed that we were examining a fertility control strategy when anomalous birth intervals, much longer than the average for the reference pre-transitional period (1800-1860), were present or when the couple stopped having children at an unusually early age. This research therefore fits into the existing debate about the use of birth spacing and stopping during the demographic transition. Analyses of not only Spain (*e.g.*, Sanz Gimeno & González Quiñones, 2001; Reher & Sanz Gimeno, 2007; Reher & Sandström, 2015), but also other Western countries (*e.g.*, McDonald, 1984; Knodel, 1987; Secombe, 1992; Van de Walle, 1992; Yamaguchi & Ferguson, 1995; Hionidou, 1998; Van Bavel, 2004b; Van Poppel *et al.*, 2012) have concurred in identifying stopping as the control strategy clearly associated with the demographic transition. That is not to discount the role played by spacing in most cases (Knodel & Van de Walle, 1967; Knodel, 1987; Van de Walle, 1992; Yamaguchi & Ferguson, 1995; Van Bavel, 2003a, 2004a, 2004b; Van Bavel & Kok, 2004, 2010; Reher & Sanz Gimeno, 2007; Reher & Sandström, 2015), although that strategy had a more residual function. This article approximates the evolution over time of these fertility control strategies and simultaneously sheds light on the dissemination and implementation of knowledge about fertility control in a rural context with a low educational level. In the period of interest, Spain underwent a civil war that entailed the passage from a republican regime to a self-proclaimed *National-Catholic* pro-birth dictatorship.

This article is divided into seven subsections. The first has included an introduction to the subject of study. The second analyses the fertility transition as a demographic phenomenon. In the third, we introduce the study area and the data comprising the database. In the fourth, we discuss the methodology used to select the data. The fifth part applies the proposed methodology to the study area to determine, based on descriptive statistics, if the results are consistent with the intended objective. In the sixth section, we perform an analysis from three perspectives: Firstly, we adopt an annual perspective; that is, we

consider which fertility control strategy was being used by women of reproductive age on 1 July of each year between 1870 and 1955. Secondly, we approach the analysis from a cohort perspective (with a single control strategy or combination of control strategies assigned to each individual). That technique permitted an evaluation of how rapidly contraceptive techniques diffused among women of similar ages. To conclude that section, we examine the profile of the women who exercised the different fertility control strategies as a function of their literacy and their husbands' occupations. Finally, the seventh section draws several conclusions.

2. CONTEXT: THE FERTILITY TRANSITION

The terms *fertility transition* and *demographic transition* are sometimes used interchangeably, although differences between them do exist. The fertility transition focuses on explaining the changes that were produced in fertility and that reduced the number of children per woman. The demographic transition includes, in addition to these factors, other related demographic phenomena, such as variations in mortality, with the goal of explaining the decrease in fertility within a more complex causal context. This article focuses on the fertility transition, which it defines as the shift from a static situation marked by a high number of children per mother who completes her reproductive stage –approximately what Louis Henry has called *natural fertility*² (Henry, 1956)– to a new context featuring a much lower number of children per mother as a result of the voluntary control of fertility –what is known as *controlled fertility*. Ansley Coale (1973) has stated that for the voluntary control of fertility to be present, three requirements must be met: control strategies must be employed consciously, the individuals in question must have knowledge regarding some contraceptive method, and they must clearly understand the advantages of using it.

This article is also part of the debate over whether differences existed between rural and urban areas during the fertility transition. Some authors (*e.g.*, Sharlin, 1986; Galloway, Lee & Hammel, 1998; Dribe, Klüsener & Scalone, 2016) have indicated that population size has an inverse relationship with fertility; the smaller the town, the greater the fertility. A pattern that has been frequently observed in various Western countries is that urban and high socioeconomic status families begin to control their fertility first, and farmer

2. The term *natural fertility* is conflictive given that Western pre-transitional societies did not reach the maximum level of fertility. For this reason, there is a broad debate about how the high fertility that characterised pre-transitional societies should be defined and whether the term *natural fertility* should continue to be used.

families join later (Dribe, Oris & Pozzi, 2014). However, other authors, such as Leasure (1963), have suggested a similar acceptance of fertility control by rural and urban environments and have claimed that only the large cities were pioneers. In any case, perhaps the problem lies in trying to explain the fertility transition as a unified theory at the global level without taking into account regional differences and peculiarities. However, that is not to deny that the fertility transition is a global process that has affected all countries to a greater or lesser degree (Reher, 2004). Hirschman (2001) has warned that there is no theory of demographic transition that is universal and unilineal; rather, models tend to be too simplistic. The forces that spurred the fertility transition have multiple and contradictory effects. Gil Alonso (2011) has noted that several successive transitions took place that could have occurred simultaneously, which is why women could be found in society exercising different degrees of control over their fertility. Literacy also had an impact on the development of the fertility transition. In most of Europe, literate women were the most likely to control their fertility (Coale & Watkins, 1986). However, some authors have identified atypical behaviour in countries in southwestern Europe, namely, Spain, Portugal, and Italy (Livi-Bacci, 1968, 1971, 1977). In those regions, literate women were actually the least likely to control their fertility. David Reher and Pedro Luis Iriso (1989) have proposed that this peculiarity could be due to the fact that their education was imparted by the Catholic Church, which had a proclivity for high fertility.

The demographic transition is the cornerstone of demographic studies, since it is the main turning point in demographic behaviour. For this reason, the literature on the demographic transition, which comprises almost a century of academic research, is immense and challenging to navigate³. The 1990s and the first decade of the twentieth-first century were especially opportune as regards studying the fertility transition based on individual life courses from vital records. In most Western countries, large databases have been developed from census data, parish archives, and civil registry data. In this sense, in peninsular Spain we can highlight work on two southern towns (Iznájar in Córdoba and Loja in Granada: Ramírez Gámiz, 2001), three northern villages (Vera de Bidasoa, Yesa, and Sangüesa in Navarra: Sánchez Barricarte, 2001), three localities of the northeast (Sant Pere de Riudebitlles: Torrens, 1993; Sant Just Desvern: Masdeu, 2015; and Sedó: Nicolau, 1983), and one particularly productive town in central Spain (Aranjuez in the Community of Madrid: Reher & Sanz Gimeno, 2007). These works had stated that the main impetus prompting the fertility transition in Spain occurred in the first decades of the twentieth century, with women born at the end of the nineteenth century being especially inclined to control their fertility.

3. As regards the demographic transition in Spain, many books and articles are of great interest (*i.e.*, SÁEZ, 1979; ARANGO, 1980; REVENGA, 1980; GIL ALONSO, 2000; MUÑOZ PRADAS, 2001).

Van Bavel (2003a, 2003b, 2004a, 2004b) has explained that there are two ways in which couples could control their fertility: increasing the birth interval (spacing) and completely interrupting or stopping fertility (stopping). In the same vein, he has suggested that as long as methods were relatively ineffective at controlling fertility and knowledge was lacking on the subject, spacing became the most common strategy. This approach was not necessarily employed because it was the fertility control strategy that parents demanded. Rather, given the ineffectiveness of the methods available, there were limits on the degree to which parents could control their fertility. He has also demonstrated that before the fertility transition, there were already families in certain places, such as Leuven, that were controlling their fertility through spacing. The fertility transition brought about a change in control strategies, predictably because of a greater diffusion of contraceptive techniques. Stopping overtook spacing as the most popular technique (McDonald, 1984; Knodel, 1987). Spacing and stopping are complementary methods in the case of a sufficiently long fertile cycle, which is why there is an extensive debate in historical demography over to the degree to which stopping was used and the extent to which it was combined with spacing (Knodel, 1987; Van de Walle, 1992; Yamaguchi & Ferguson, 1995; Van Bavel, 2004a, 2004b; Van Bavel & Kok, 2004; Reher & Sanz Gimeno, 2007; Reher & Sandström, 2015). Furthermore, spacing the last birth intervals could be evidence of a failure to effectively implement a stopping strategy.

3. AREA AND DATA

The study area included 10 Aragonese villages⁴ in the northeast of Spain (Figure 1) and located around the middle valley of the Huerva River, whose municipal boundaries occupy an area larger than 500 square kilometres. The distance to the regional capital, Zaragoza, varies from 19 to 40 kilometres. The study area had a population of 6,434 people in 1877; 7,765 in 1910; and 8,086 in 1950. This region is located next to the Ebro Valley at the foot of the Algairén Mountains, and it combines the plains with low mountain landscapes.

The Alfamén and Middle Huerva Database (AMHDB), which includes a total of 95,817 individuals, was built following the family reconstitution method devised by Michel Fleury and Louis Henry (1956). To construct this database, data were extracted from parochial records on baptisms, marriages, and deaths for the period between the last quarter of the fifteenth century and 1950. From 1950, and until the beginning

4. These villages were the following: Alfamén, Aylés, Botorrita, Jaulín, Longares, Mezalocha, Mozota, Muel, Tosos, and Villanueva de Huerva.

of 2012, interviews were conducted with which the database was completed with the same information and that information was inputted into the database⁵. The database contains all individuals who were born and baptized in the reference parishes or who migrated to them and were registered there in connection with one of the previously described events. Individuals who left the parish, and for whom the date of death was therefore unknown, were not taken into account by this analysis. The profession of the head of the family, as well as data on literacy, was extracted from population censuses (1857 and 1860), electoral censuses (1890, 1894, 1900, 1910, 1920, 1930, 1934, 1945, 1951, and 1955), and a population list (1824, only for the village with the largest population, Longares). Information on professions and literacy was linked to population records for each individual.

FIGURE 1
Study area location



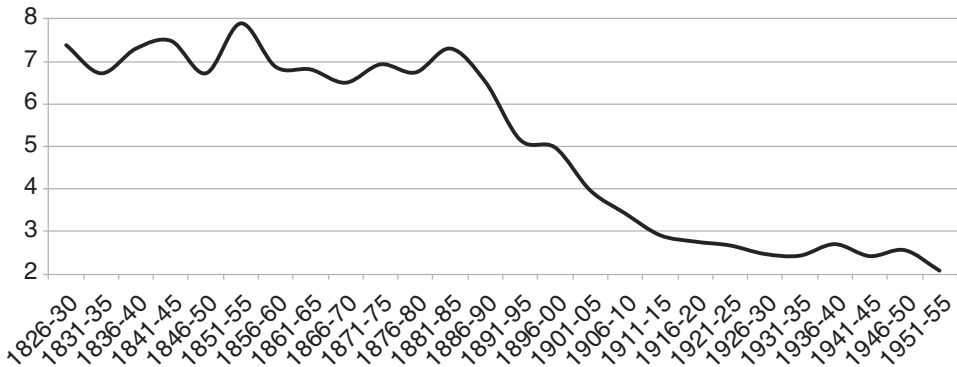
Source: own rendering.

As Figure 2 illustrates, in the pre-transition period, marriages in which both spouses lived past age 49 had an average of 7 children born alive. The last women whose average number of children surpassed seven children were those born between 1881 and 1885, with

5. Information regarding dates of demographic events, occupation, and education.

7.29 children. From that moment onwards, a decline in fertility began that led to those born only 25 years later (between 1906 and 1910) to reproduce at much lower levels, 3.43 children. Average number of children continued to decline in the area of study, reaching levels below replacement among those born in the five-year period from 1951 to 1955 (2.09 children).

FIGURE 2
Average marital fertility (children born alive) by maternal cohorts.
Couples in which both spouses had reached 49 years of age



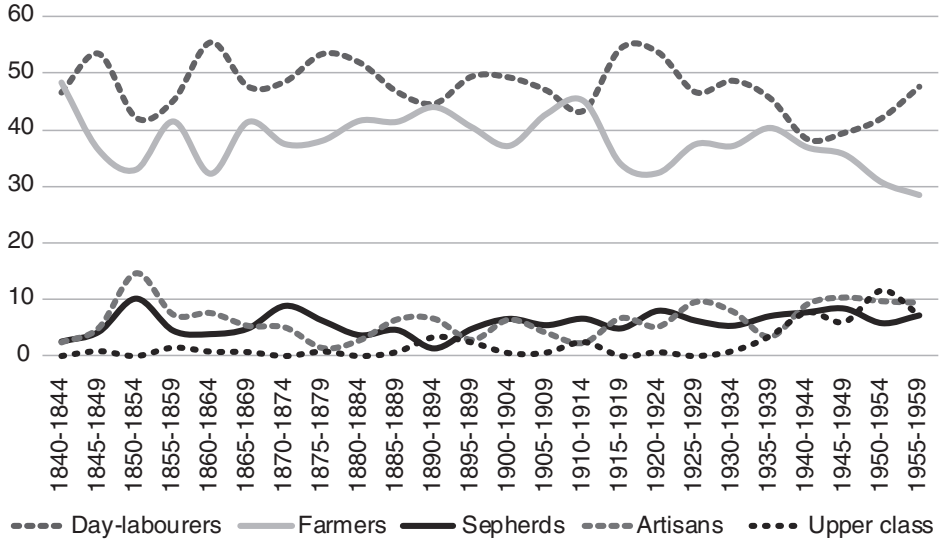
Note: three-year moving averages.

Source: AMHDB.

The inhabitants of the study area were mainly engaged in agriculture, primarily in exploiting their own or others' cereal fields and vineyards, and to a lesser extent, in tending small herds of sheep. Only the vicinity of the Huerva River allowed for fruit and vegetable production. Throughout the study period, and especially since the beginning of the twentieth century, agricultural land increased, as a significant share of grazing land was acquired for agricultural purposes. The increase in the amount of land devoted to agriculture was typical of this period in the province of Zaragoza (Pinilla, 1995). This shift was facilitated by improvements in production and the introduction of fertilizers.

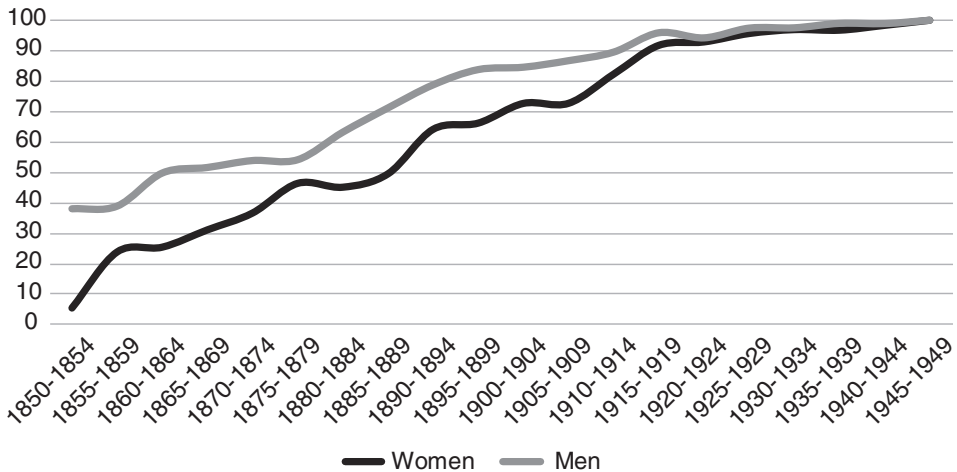
Figure 3 analyses the evolution of the employment of married men between 1840 and 1949 on the basis of occupational categories according to the year of the wife's birth. The figure clearly points to a predominance of day-labourers and farmers. Those included in these two groups together accounted for about 80% of the total. In a much lower ranking category, below 10%, were artisans and non-migrating shepherds. Finally, high-skilled workers (*e.g.*, doctors and teachers) were almost non-existent for most of the period.

FIGURE 3
Evolution of the profession of the husband,
according to the date of the wife's birth, 1840-1959



Source: AMHDB.

FIGURE 4
Evolution of literacy, according to date of birth, 1840-1949



Source: AMHDB.

In Figure 4, we analyse the evolution of literacy in the study area for both males and females according to their date of birth. We can observe that until the implementation of

the Moyano Act of 1857, which forced local councils to educate girls, the female literacy rate was close to zero. At the period before the Moyano Act, the male literacy rate was over 40%. There was both an increase in literacy for both sexes and a slow convergence between them, with an uneven effort and generally few economic resources (Ballarín, 1989). Individuals born in the second third of the twentieth century were the first to achieve full literacy.

4. METHODOLOGY FOR THE ANALYSIS OF FERTILITY CONTROL STRATEGIES

In this article, the analysis only considers marriages in which both spouses reached the age of 49 years⁶. We considered the beginning of the reproductive cycle to be the date of marriage; if that date was unknown, we used the date of birth of the couple's first child. We defined the end of the reproductive cycle to be marked by the woman reaching the age of 39, since the mean age at the birth of the last child in the pre-transitional period (1800-1860) in our study area was 39.1 years. With this restriction, we hoped to ensure that the majority of women in the sample had remained fertile until the end of the analysis period and had not yet begun menopause. Some studies have concluded that up to one-third of women lose their fecundity before the age of 40 (*i.e.*, Berger, 1983). Thus, despite these restrictions, it was inevitable that a portion of the women in the control groups had actually lost their fecundity. To establish which strategy, if any, was used to control fertility, we considered all children live at birth, including those born after age 39. To be included in the sample, women in the database needed to have given birth to at least one infant. We did not include any restriction with regard to the age at marriage, despite the fact that this factor could have affected the decision to start controlling fertility (Van Bavel, 2003b).

Determining when families are voluntarily controlling their fertility and when this control was the consequence of an involuntary situation is an almost impossible task. However, there are approximation methods that although imperfect, generate coherent results (*i.e.*, Sanz Gimeno & González Quiñones, 2001; Van Bavel, 2004a, 2004b). In this study, the goal was to understand the temporal evolution of the use of each fertility control strategy, and so we attempted to classify women according to the strategy that they used. Below, we establish the criteria that led us to sort each mother into groups. Furthermore, those women who did not control their fertility formed a separate group. On

6. In some cases, there may have been temporary migrations that we could not detect, which could have affected fertility.

the other hand, for those who controlled their fertility at some point, we differentiated among four fertility control strategies. These strategies were classified according to whether they were a permanent or temporary control mechanism and whether they were used at the beginning of fertile married life, at the end, or throughout the couple's marriage. Following these criteria, we established the following four strategies:

- 1) Stopping or definitively interrupting fertility⁷: This was the most common strategy during the fertility transition in Western countries (Knodel, 1987; Secombe, 1992; Van de Walle, 1992; Yamaguchi & Ferguson, 1995; Sanz Gimeno & González Quiñones, 2001; Van Bavel, 2004b; Reher & Sanz Gimeno, 2007; Van Poppel *et al.*, 2012; Reher & Sandström, 2015; Reher *et al.*, 2017). It describes families that voluntarily stopped having children at an unusually early age. In Table 1, following the methods proposed by David Reher and Alberto Sanz Gimeno (2007), we can verify that during the fertility transition, this strategy was used in our study area. However, it cannot be denied that other strategies were also employed. In fact, a definitive stop is easier to identify than voluntary spacing (Van Bavel, 2004b). In constructing the group of families that relied on stopping, we included those in which the woman had her last child before the age of 36. Since we established the end of the woman's fertile cycle at 39 years of age, the women in this group were fertile for at least three years following the birth of their last child, but did not bear additional children. To establish this threshold for inclusion in the "stopping" group, we followed the criteria laid out by Alberto Sanz Gimeno and Fernando González Quiñones (2001), which allowed us to analyse the evolution of this group over time. Those researchers established that a woman can be considered to exhibit behaviour associated with fertility control if she ceased to have children at least three years before the mean age at the birth of the last child characteristic of pre-transitional periods⁸.
- 2) Spacing the last birth intervals: The term *spacing the last birth intervals* entails an increase in the duration of the final birth interval or intervals with the intention of reducing fertility and, thus, of reducing overall offspring. A significant range of studies have examined the role of spacing in fertility control in both the pre-transitional period and the fertility transition (Knodel, 1967, 1987;

7. When we refer to stopping or definitively interrupting fertility, we are not talking about abortion, but about the voluntary stopping of fertility through which families cease to conceive children.

8. In the case of Aranjuez, Sanz Gimeno and González Quiñones established the threshold at age 35, because the reference mean age was approximately 38 years.

TABLE 1
Probability of an additional birth,
based on parity and the number of surviving children, 1900-50

1900-50 SURVIVORS	PARITY			
	1 TO 2	2 TO 3	3 TO 4	4 TO 5
0	0.886	1.000		
1	0.780	0.806	0.941	
2		0.718	0.671	0.520
3			0.578	0.729
4				0.643

Source: AMHDB.

Van de Walle, 1992; Yamaguchi & Ferguson, 1995; Hionidou, 1998; Van Bavel, 2003a, 2004a, 2004b; Van Bavel & Kok, 2004, 2010; Reher & Sanz Gimeno, 2007; Reher & Sandström, 2015; Reher *et al.*, 2017). Following the methodology of Reher and Sanz Gimeno (2007), we found that fertility control prolonging the last intervals was also used in our study area during the fertility transition, as illustrated in Table 2. In contrast to the stopping category, the families that employed spacing were more difficult to identify (Anderton & Bean, 1985; Okun, 1995; Knodel, 1987; Ewbank, 1989). Our objective was to not only identify these families, but also understand their evolution over time. In Table 3, we can observe the mean birth intervals, measured in days, between 1800 and 1860 in our study area. The length of the birth interval shifted as parity increased. Larger families presented shorter birth intervals (Van Bavel, 2003a). The difference between the longest mean birth interval in the pre-transitional period (that between the third and fourth child) and the shortest interval (that between the ninth and tenth child) was 155 days. Thus, any threshold for identifying couples controlling the last intervals needed to be greater than 155 days. In this way, we could ensure that any family with intervals shorter than or equal to the longest mean birth interval (949 days) was not categorized as having no control strategy, given that our objective was to guarantee as far as possible that all those categorized as controlling their fertility by spacing the last intervals were, in fact, controlling their fertility. This margin of 155 days was not taken into account in the case of the first birth interval (between the wedding and first birth). As its length in days was much shorter than that of the other intervals, an excessively high threshold would have impaired our ability to identify the control of fertility in the first interval. The interval between the first and second child did not have the same characteristics as that between the ninth and tenth child, and so we had to be sufficiently flexible in our approxi-

mations. Similarly, we could not consider excessively high thresholds, because that approach would have excluded a portion of families that were, in fact, controlling their fertility in the last intervals by postponing the conception of children by a few months, rather than by a few years. We must not forget that coitus interruptus, vaginal washes, pessaries, and most contraceptive methods used in that period were minimally effective and thus allowed for the delay of conception, but were not always effective at preventing it entirely (David & Mroz, 1989; Szreter, 1996). The last intervals' control strategy could partially be a response to this ineffectiveness. For this reason, we also did not want any threshold used to detect the last intervals' control to lead us to require delays in conception greater than one year. From these requirements (a threshold sufficiently large to avoid false positives, but less than one year, and able to adjust to changes in parity), we developed a mechanism to establish thresholds that while imperfect, met the criteria and offered results that were coherent with the existing literature. For this purpose, we considered the couple to have controlled the last birth intervals if the duration (in days) of the last birth intervals was at least 25% longer than the mean of the same intervals in the pre-transitional reference period (1800-1860). Table 3 reveals the thresholds that were established after applying this rule. After the tenth birth interval, the data for interval 10 was used, because intervals 11 and up had fewer than 10 cases and, as such, were marked by excessive and incoherent variation from one interval to the next. Due to its characteristics, the first birth interval (between the wedding and the first child) did not meet the 155-day rule, as it expanded past 152 days when the 25% criterion was implemented.

TABLE 2
Average birth intervals (in days) according to parity and the number of surviving children, 1900-50

1900-50 SURVIVORS	PARITY			
	1 TO 2	2 TO 3	3 TO 4	4 TO 5
0	712	844		
1	1,091	947	1,090	
2		1,242	1,108	1,170
3			1,292	1,231
4				1,288

Source: AMHDB.

- 3) Spacing the initial birth intervals: Some authors have demonstrated that in Western countries, even during pre-transitional periods, there were couples that con-

trolled their fertility in the first years of marriage (Bean, Mineau & Anderton, 1990; Santow, 1995; Szreter, 1996; Hionidou, 1998; Friedlander, Okun & Segal, 1999; Fisher, 2000; Van Bavel & Kok, 2010), possibly with the intention of adjusting the family size to the small budget available in the first stages of married life. For example, Jan van Bavel and Jan Kok (2010) found that some families in two Dutch provinces tried to control their fertility during the first 10 years of marriage during the period from 1825 to 1855. Based on the same criteria established for the last intervals, we considered a family to exhibit controlling behaviour typical of initial interval spacing when its first birth intervals were at least 25% longer than the reference intervals. Later births featured intervals below the 25% threshold, however.

TABLE 3
Birth intervals (in days) for the period 1800-60

	Interval 1	Interval 2	Interval 3	Interval 4	Interval 5
1800-60	610	912	935	948	949
+25%	763	1,139	1,169	1,185	1,186
	Interval 6	Interval 7	Interval 8	Interval 9	Interval 10
1800-60	934	942	890	921	856
+25%	1,167	1,178	1,113	1,151	1,070

Note: Interval 1 corresponds to the interval between the couple's wedding and first child.

Source: AMHDB.

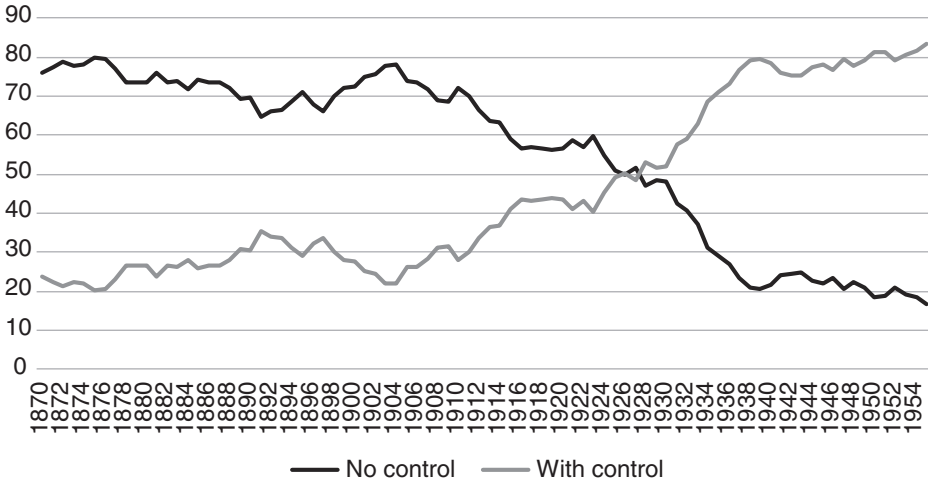
- 4) Total control of fertility (spacing of all birth intervals and stopping): This is the fertility control strategy associated with the second demographic transition and with synthetic contraceptives (Lesthaeghe & Van de Kaa, 1986; Van de Kaa, 1987; Lesthaeghe, 1995). We deemed couples to be exercising total control over their fertility if their birth intervals were at least 25% longer than the reference value for the period from 1800 to 1860 throughout their entire fertile cycle, given the motivations described above. Generally, this behaviour is associated with stopping before reaching age 36. This criterion presented problems, since it classified couples with severe fertility problems as exercising total fertility control. However, in the pre-transitional period, these couples represented less than 1% of cases, as we will see shortly.

All thresholds established to classify fertility control strategies, despite being based on objective criteria and the existing literature, had a clear margin of error, as is typical with the use of such boundary criteria.

5. THE FERTILITY TRANSITION IN THE RURAL WORLD

By applying the methodology described above, we found the percentage of women who, according to the established thresholds, were controlling their fertility on 1 July of each year. In Figure 5, we can see a clear and increasing trend of women who were controlling their fertility beginning in the first decade of the twentieth century. However, it was not until 1926 that the women who were controlling their fertility exceeded those who were not. There was a small change in the trend the following year, with the controllers then definitively prevailing from 1928 onwards. Since the Spanish Civil War (1936-1939), the percentage of women not controlling remained static at approximately 20%.

FIGURE 5
Percentage of women who were and were not controlling
on 1 July of each year, 1870-1955



Note: because we took as a reference the situation on 1 July of each year, the same woman may appear as a controlling and non-controlling person at different times of her fertile life.

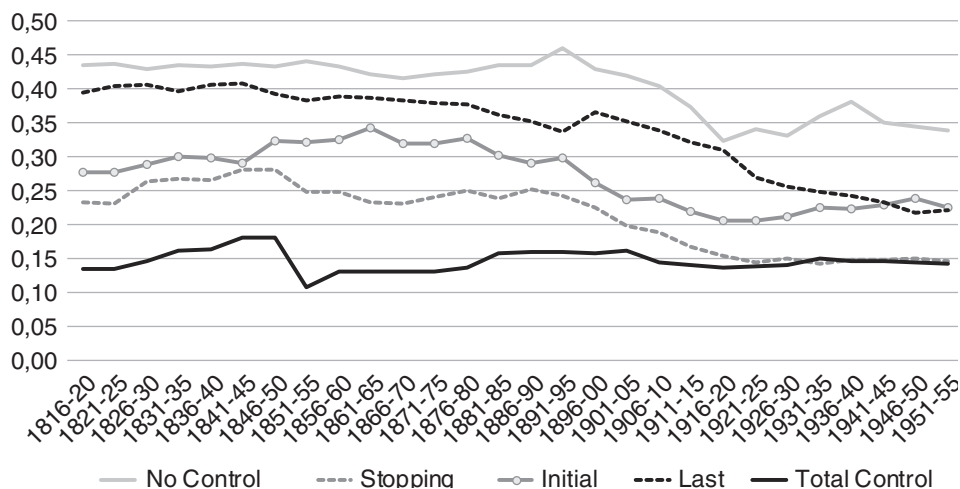
Source: AMHDB.

Similarly, we determined the rate of children born per year per mother according to the fertility control strategy used. We kept in mind that births were separated by a period longer than one year, meaning that this figure was always less than one child per year. Figure 6 demonstrates that the families that were not controlling their fertility were those who had children more quickly, and those families controlling the last intervals followed in that respect. Conversely, women who used stopping were among those who had children the slowest. The figure seems to indicate that stopping was a very effective strategy, since these couples' mean fertility per year was much lower than that of non-controllers (approx-

mately 50% of the non-controller mean). Total control, as the name suggests, was clearly effective, and these women's rate of children per year was always the lowest.

FIGURE 6

Children per married woman per year as a function of her fertility control strategy, cohorts of five years. 1816-1955



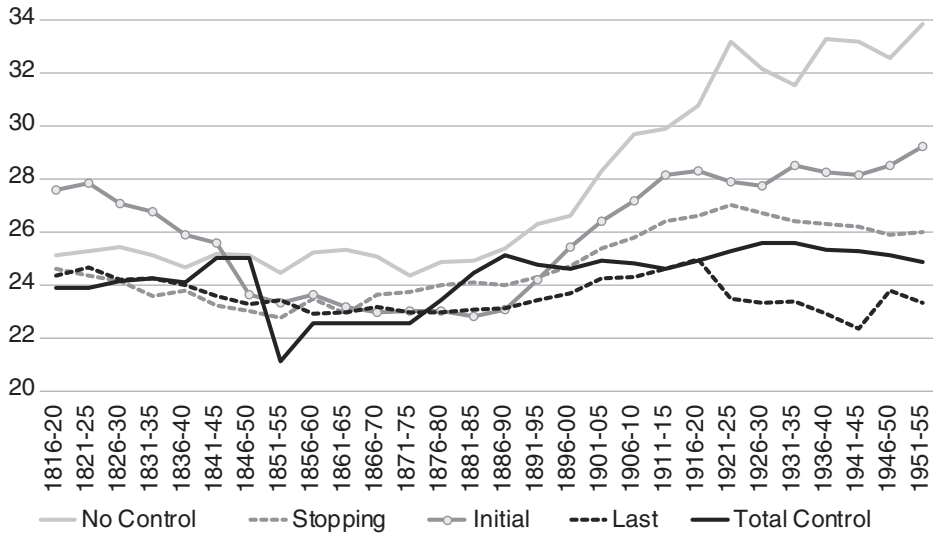
Source: AMHDB.

In almost all cases, Figure 6 demonstrates the trends that one would expect. Only the results for the non-controlling families presented complications that needed to be considered. One would predict that the non-controlling women would have maintained a relatively constant rate of children per year. However, the figure indicates that in the nineteenth century, the rate was roughly 0.43 children per year, while in the twentieth century, it decreased to approximately 0.35 children per year, a decline of nearly 20%. A number of factors can explain this drop. On the one hand, as Figure 7 reveals, the age at first marriage increased dramatically among non-controllers. Studies have demonstrated that as the age at marriage increases (and, as a consequence, the age at which the first child is sought does the same), the probability of conceiving children decline and the spacing of birth intervals increases slightly (*e.g.*, Van Bavel, 2003b), possibly because age affects individuals' physiological functions. This increase in the age at first child among non-controlling women seemed to indicate that a large portion of these women were categorized as belonging to this group because they did not reach the desired family size before completing their fertile cycle. On the other hand, the established thresholds contained a margin of error, as previously mentioned. For this reason, some families that were making a modest effort to control their fertility could have been classified as non-controllers because they did not exceed the established thresholds. In fact, Fisher (2000) has noted, based on

surveys in the United Kingdom, that a portion of couples could have occasionally used coitus interruptus because it was a socially accepted method, but without having a real desire to control their fertility.

FIGURE 7

Mean age of the mother at the birth of her first child as a function of her fertility control strategy, cohorts of five years, 1816-1955



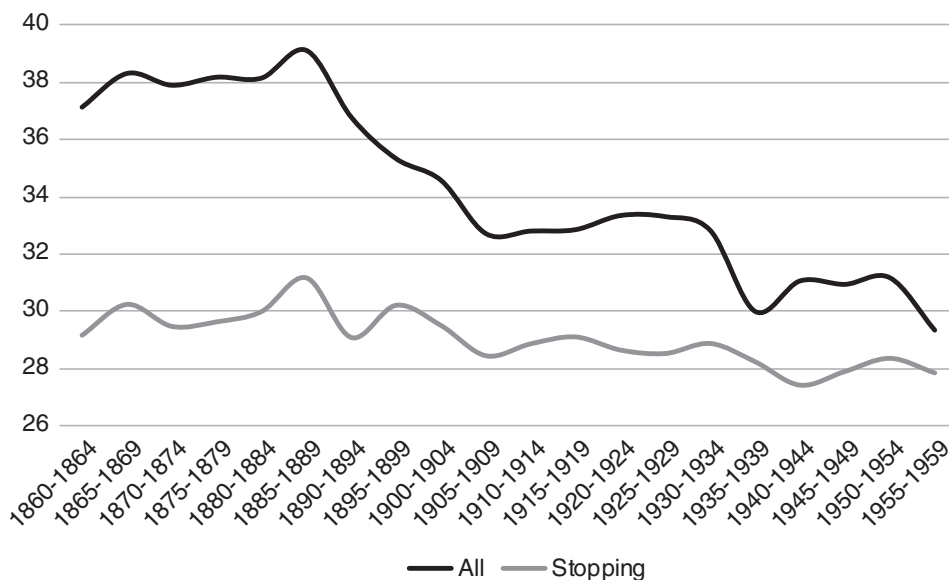
Source: AMHDB.

Next, we compared the families that exercised the previously described fertility control strategies, according to the criteria outlined above, with the population as a whole. The purpose of these comparisons was to analyse trends. Figure 8 illustrates the comparison regarding the age at the birth of the last child. The women belonging to the stopping category were between 28 and 30 years old upon the birth of their last child, although this figure slightly decreased over time. In contrast, the population as a whole followed a clear downward trend of greater intensity than that for the stopping women. This approximation effect could be due to the fact that a large share of the families adopted the stopping strategy.

Figure 9 compares the spacing, measured in days, of the last offspring, taking into account only the last birth interval. Control increased in intensity with the passage of the years. On the one hand, women who belonged to this group were more successful in applying spacing. On the other hand, the whole of the studied rural society converged with the women selected in this category of fertility control. This convergence tendency could have resulted from a larger number of families controlling for the end of their couple's

fertility life (or totally controlling their fecundity) or from a generalized control of fecundity (although some families did not surpass the established threshold and therefore they are not included in this fertility control strategy category).

FIGURE 8
Age at last child for women using stopping versus all women in the sample,
according to the mother's date of birth, 1860-1954



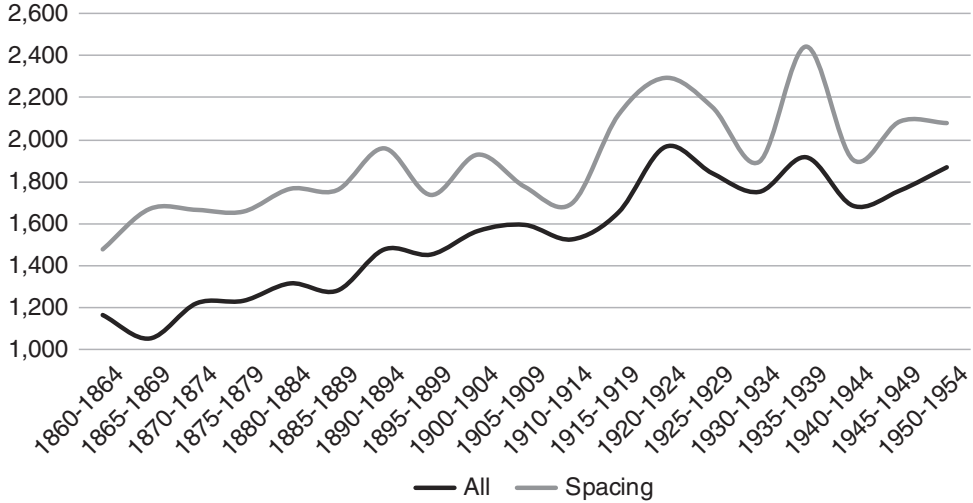
Source: AMHDB.

Figure 10 compares the evolution of the initial mean interval for families using the spacing control strategy (or total control) versus the full sample. In the sample, the mean initial interval was between 400 and 600 days, while women who controlled the initial intervals converged with the full sample following a downward trend. The convergence may be explained by the fact that as the period advanced, most of the selected women were using total fertility control. This group differed from society as a whole as the intervals were slightly longer for the women in this category. In the first five years, given the small size of the sample, a number of extreme cases (stemming from fertility problems, miscarriage, or spousal separation) may have conditioned the results.

The categorization of fertility strategies was, generally speaking, in agreement with the desired objectives. The results were coherent and indicated that stopping was not only a common strategy, but also a very effective one. In fact, from the beginning of the twentieth century, it was equal to the total control of fertility.

FIGURE 9

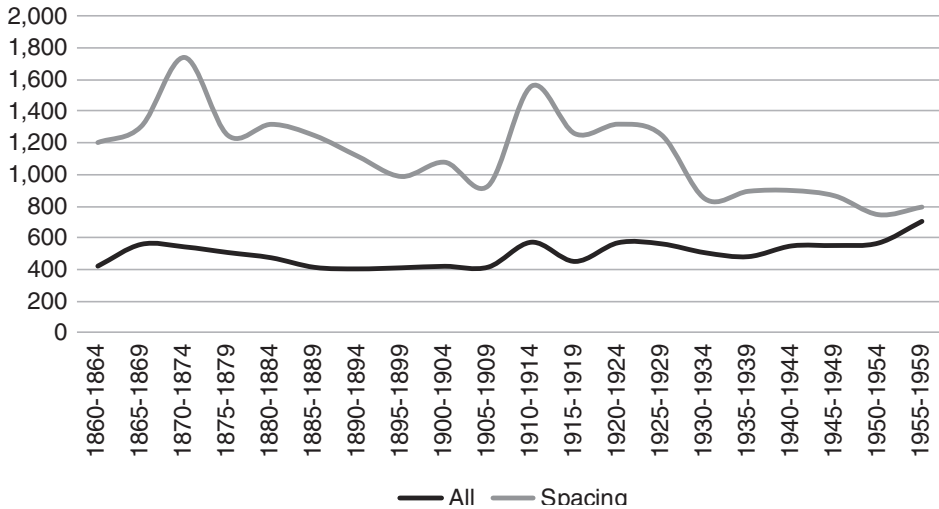
Average birth interval in days (y-axis) between the penultimate and the last child for women using spacing strategy versus the full sample, according to date of birth, 1860-1954



Source: AMHDB.

FIGURE 10

Average first birth interval in days (y-axis) between the wedding and the first child for women using spacing strategy or total control versus the full sample, according to date of birth, 1860-1954



Source: AMHDB.

6. EVOLUTION OF FERTILITY CONTROL STRATEGIES

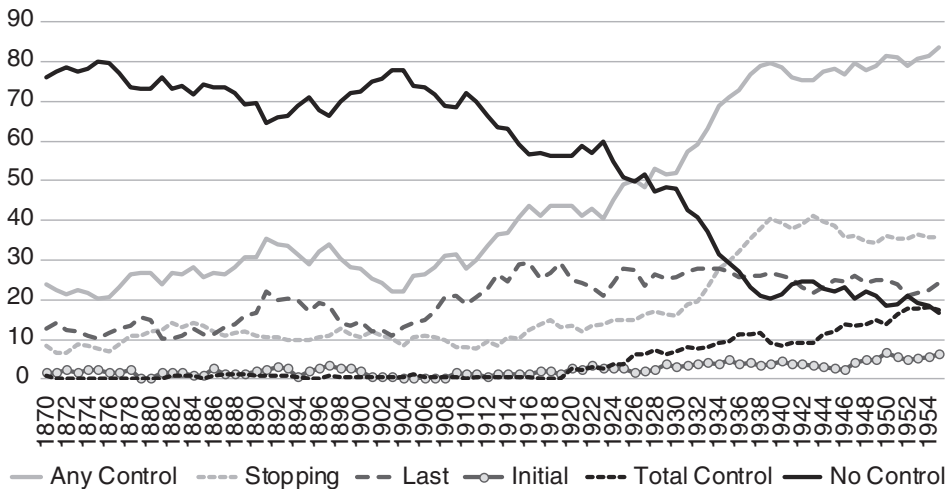
The fertility transition brought not only a greater control of fertility, but also gradual shifts in control strategies. Below, we analyse the results from different perspectives. Firstly, we consider the findings from an annual perspective, analysing how many families were controlling their fertility on 1 July of each year, and with which –if any– strategy. That evaluation followed the previously outlined methodology. This view permitted us to understand the evolution of the use of each fertility control strategy. Secondly, we changed perspectives and conducted a cohort analysis to determine which methods were most commonly employed by the women born in each five-year period. In this case, we analysed the increase in the desire to control fertility and the speed at which strategies diffused among women of the same cohort. Finally, we studied whether literacy and socioeconomic status were associated to different degrees with the various types of fertility control.

6.1. The fertility transition from an annual perspective

An annual view allowed us to discern the evolution of the use of each fertility control strategy in our study area, according to the established criteria. In this way, we identified when certain methods became popular or began to decline. To calculate the percentages, we employed 1 July of each year as a reference date. Therefore, we anticipated that most women would appear to use different strategies at different times in their fertile lives. From the beginning of the fertility transition, or at least from 1870, the most utilized method was control by spacing the last intervals; that is, delaying the birth of new children by spacing the birth intervals. The longer birth intervals in situations of stress, such as periods marked by high prices or a high number of surviving children, have been demonstrated in different countries during the pre-transitional period (Bengtsson & Dribe, 2006; Reher & Sanz Gimeno, 2007; Reher *et al.*, 2017). As Figure 11 points out, this method went from being used by 10% of women in 1870 to nearly 30% of women at the beginning of the fertility transition in 1916. From this moment, a slow decline began, leading to a static rate of just over 20% in the 1940s and 1950s. On the other hand, stopping was the second most used strategy and took longer to become popular, only exceeding 20% in 1933. However, from 1930, it grew rapidly, and by 1935, it had become the most popular option. From 1938 onwards, approximately 40% of women used this method. These results are compatible with existing proposals regarding how the fertility transition took place in Spain, which we have discussed in previous sections. Spacing the last intervals and stopping were not completely complementary. The popularization of stopping brought with it a relative reduction in spacing the last intervals. Initial interval control continued to be

unpopular, as in the last decades of the nineteenth century, and this approach only attracted a slightly larger share of women beginning in 1929. Finally, the slow but inexorable increase in the percentage of women exercising total control over their fertility is worth noting: This figure grew from 2.56% in 1920 to 17.23% in 1955. Figure 11 features a curve labelled *any control*, which includes all women who were controlling their fertility, regardless of the method. In other words, together, *no control* and *any control* always totalled 100%.

FIGURE 11
Evolution of the use of each contraceptive technique by married women
on 1 July of the reference year, 1870-1955



Note: the percentage of women using no type of control is also included.

Source: AMHDB.

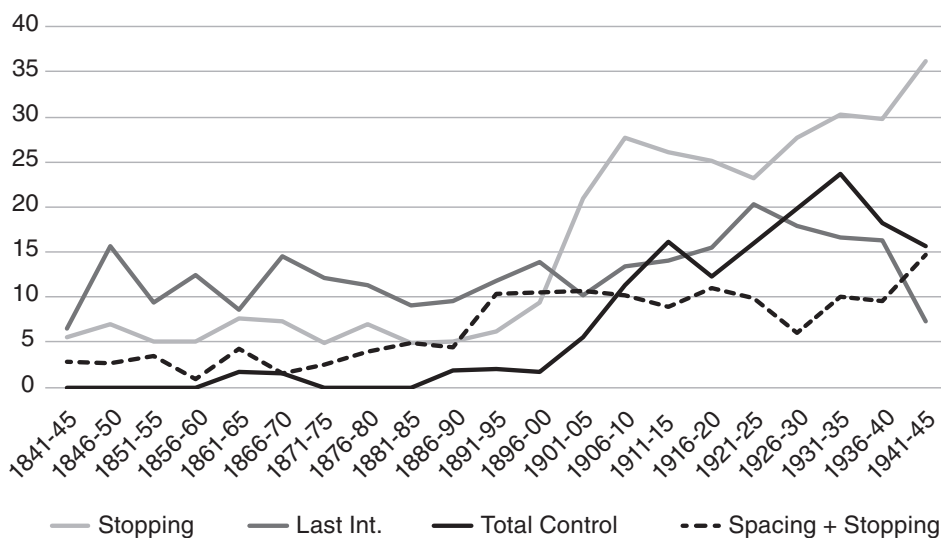
6.2. The fertility transition by cohort

An analysis according to five-year cohorts indicated whether there was a rapid diffusion and acceptance of contraceptive techniques among women of similar ages. In Figure 12, we can see the percentage of women using each fertility control strategy as a function of their birth year. Each woman was assigned only one strategy, regardless of how many years she exercised control. To facilitate interpretation, we reduced the number of strategies analysed, only considering stopping, spacing the last intervals, and total control. We also introduced a new category that included women who began spacing the last intervals and who stopped having children before age 36; this group represented a combination of spacing and stopping. The results reveal that on the cohort level, the fertility transition took

place in a short period of time. Women born in the 1890s were the ones who fostered fertility control by making use of different strategies. The popularization of stopping could have had a generational component, because among those born from 1896-1900, only 9.44% of women used this strategy, while in the next 5-year period, the figure was 20.94%. Clearly, stopping was the most popular strategy. Nonetheless, from a cohort perspective, spacing the last intervals continued to be a notable strategy, gaining importance until 1921-1925 and slowly losing prominence thereafter. The combination of spacing and stopping was also associated with the fertility transition, and especially with its first cohorts. Its relative weight doubled between 1886-1890 and 1891-1895. Finally, it reached a point of equilibrium of approximately 10%. Total control of fertility gained in importance over time, eventually exceeding 10%, beginning with those born in 1906-1910.

FIGURE 12

Evolution of the use of each fertility control strategy by cohort, 1870-1955



Note: each couple was assigned the strategy it used during its fertile life.

Source: AMHDB.

6.3. Comparison by occupation and literacy level

This subsection sheds light on how socioeconomic status and female literacy affected the use of each fertility control strategy. To achieve that goal, we performed a logistic regression, as outlined in Table 4, for each strategy. Logistic regression allowed us to analyse how different independent variables (*e.g.*, socioeconomic status) affected an individual's likelihood of adopting a concrete strategy for controlling fertility. Logistic regressions require

a dichotomous dependent variable. In this case, for each regression, the dependent variable took the value of 1 if the mother made use of the analysed strategy and the value of 0 if she did not use it and therefore employed another strategy, or none at all. As in the previous subsection, each woman was assigned a single fertility control strategy. To facilitate the analysis, in addition to socioeconomic status and literacy, we included as a control variable the decade. This factor took the form of a continuous variable, and so the model indicated whether certain strategies grew in popularity over time. Furthermore, we incorporated a continuous variable indicating the total number of children to confirm the relationship between each strategy and family size. None of the regressions explained more than 30% of the reasons a strategy was selected, but they all explained more than 10%.

TABLE 4
Logistic regressions based on the mothers in the study area
and examining the use of each fertility control strategy. 1880-1949

	No Control	Stopping	Last Intervals	Stopping+Last Int.	Initial Intervals	Total Control
Number of observations	970	970	970	970	970	970
Pseudo R ²	0.1736	0.1704	0.2253	0.1095	0.1542	0.1305
Socio-economic status	Shepherds (ref.)					
Day-labourers	1.32	-0.26	1.20	0.57	-2.34**	-0.85
Peasants	0.95	0.30	0.62	0.67	-2.19**	-1.26
Artisans	0.85	-0.52	1.56	0.47	-1.89*	-0.55
Medium- & high-skill workers	1.19	0.83	(empty)	0.21	0.23	(empty)
Female literacy	No (ref.)					
Yes	0.56	2.35**	-2.45**	0.8	0.29	-1.24
Period (decades)	-0.42	3.37***	-2.76***	-0.18	-0.07	1.76*
Number of children	7.34***	-9.84***	0.38	1.18	8.09***	-7.24***
Constant	-5.85***	3.83***	-4.50***	-4.17***	-4.72***	0.10

Note: ***, **, and * are indicating significance at the 1%, 5%, and 10% levels.

Source: AMHDB.

The results in Table 4 demonstrate that socioeconomic status was not significantly correlated with any fertility control strategy, with the sole exception of initial interval control. Agricultural workers and artisans were less likely to control their fertility with this strategy. More interesting was the effect of female literacy on fertility control, although this variable was only significant for the two most popular strategies. Literate women had a higher probability of using the stopping strategy, while illiterate women had a greater probability of spacing the last intervals. Perhaps this effect was related to the higher skill level of the literate women, who may have known how to successfully stop their fertility, while a portion of the illiterate women may have only been successful at spacing their birth

intervals but failed in trying to implement stopping. The passing of decades was related to the popularization of the stopping and total control strategies, but had the opposite effect on spacing the last intervals, as the previous analyses have already confirmed. Having a high number of children was less compatible with total control and stopping, and that outcome was clearly linked to women who did not control their fertility or who exclusively did so through initial interval spacing.

7. CONCLUSIONS

The period prior to the fertility transition, according to the established criteria for determining the fertility control strategies, was characterized by a non-controlling attitude towards fertility. Despite this factor, some families exhibited signs of controlling their fertility through spacing the birth intervals. The proposed methodology offered results consistent with the existing literature, which has already pointed out the existence of spacing during the pre-transitional period (*i.e.*, Bengtsson & Dribe, 2006; Reher & Sanz Gimeno, 2007; Van Bavel & Kok, 2010; Reher & Sandström, 2015). Families employing that strategy wanted to adapt the economic burden that new children would place on the family budget or had reached a family size that they did not wish to exceed (Knodel & Van de Walle, 1967; Anderton & Bean, 1985; Knodel, 1987; Yamaguchi & Ferguson, 1995; Van Bavel, 2003a, 2004a, 2004b; Van Bavel & Kok, 2004; Reher & Sanz Gimeno, 2007; Van Poppel *et al.*, 2012; Reher & Sandström, 2015; Reher *et al.*, 2017).

Beginning with women born in the five-year period from 1891-1895, the percentage of women who were exercising voluntary control over their fertility clearly increased in the analysed rural area. Initially, the control strategies used were the same as those found in the pre-transitional period: avoiding having too many children at the end of the reproductive cycle by spacing the last birth intervals through making use of imperfect techniques. However, in a short period of time, stopping became the most popular and effective strategy, and it was clearly linked to the success of the fertility transition in our study area. Stopping became the most popular strategy, despite the study region being a rural area comprised of small municipalities, was therefore likely to present greater problems with respect to accessing modern contraceptives than those encountered by inhabitants of cities and more populated areas. Therefore, this article has demonstrated the success of stopping in rural areas despite problems with accessing modern contraceptives. At the same time, this paper has found that the popularization of stopping brought about a transition of some significance, in which spacing the last intervals was the predominant fertility control strategy. The fact that despite stopping's success, spacing's popularity remained high seems to indicate that a percentage of the women failed with stopping and

had lagged births that possibly were not intentional. On the other hand, the total control of fertility throughout the fertile stage –that is, extending throughout all birth intervals beginning with the wedding– was a strategy that resulted in very few children and gained in popularity as the transition progressed.

Literate women were most prone to using stopping in the study area, while spacing was linked to illiterate women. The results of the logistic regressions have verified that the role of literacy in this area was consistent with that in most of Europe (Coale & Watkins, 1996). Thus, the exceptionality indicated by Livi-Bacci (1968, 1971, 1977) for some countries of southwestern Europe was not found in this analysis.

Other interesting results are related to the fertility transition temporal qualities in this area. If we analyse the transition from a cohort perspective (assigning a single fertility control strategy or combination of strategies to each individual), the women in the 1891-1895 cohort were the first to clearly control their fertility at some point in their lives. This could indicate that the rural area analysed was slightly behind the larger municipalities (Reher & Sanz Gimeno, 2007). These results could reflect differences between urban and rural environments, or at least regional dissimilarities between the central Spain and the northeast peninsular. If we observe the study period from an annual perspective, and following the classifications proposed in the methodology, it was not until the second half of the 1920s that there were more married women controlling their fertility than those who were not. From this moment, women tended not only to control their fertility at some point in their lives but also to do for long periods of time. This explains why women born from 1881 to 1885 had a mean of 7.29 live births, while those born just 25 years later, from 1906-1910, and who began having children in the 1920s, had less than half that number, 3.34 children per mother.

In short, this article has verified how the fertility transition came about in the Aragonese rural environment as women applied different fertility control strategies. We have observed that spacing the final intervals, whether intentionally or not, was the predominant method in the first stages of the transition, while stopping later took its place. Most of the existing literature has highlighted the importance of stopping in bringing about the demographic transition, but has not evaluated in depth the process of moving from spacing the final intervals to stopping. This process requires new analyses aimed at understanding its importance in different geographic and temporal term. On the other hand, we have verified that the rural environment, whether because of ideological reasons or the accessibility of contraceptives, featured certain differences as compared to the urban environment, which, due to its greater population, has tended to dominate in global analyses of the fertility transition.

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