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Research Article

Fertility transition and social stratification in the town of Alghero, Sardinia (1866–1935)

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Abstract

BACKGROUND
Despite the large amount of research on European fertility transition, the mechanisms of this demographic process are still poorly understood. This is particularly true in the Italian demographic experience, especially for some regions.

OBJECTIVE
We wish to improve the knowledge of the determinants of fertility transition in Sardinia, a region situated in the heart of the Mediterranean but paradoxically one which is the least 'Mediterranean' region of the country. The analysis of SES differentials and their evolution over the transition process is the core purpose of this paper.

METHODS
We use a complex individual database deriving from the combination of civil and religious sources of Alghero, a large costal town in north-western Sardinia. Our analysis is focussed on the reproductive history of Alghero marriage cohorts (1866-1905), followed through the mid-1930s. A micro-level statistical analysis is performed on legitimate births of parity 2+.

RESULTS
We find that, in the period under examination, the process of fertility decline already underway in the northern and central regions, was almost absent in Alghero. However we did prove significant socio-economic differentials in marital fertility. The "elite" group shows the first clear signs of deliberate marital fertility control.

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CONCLUSIONS

The results testify to a new and more conscious attitude towards birth control adopted by the elite minority, while no significant change is detectable for the rest of the population until the 1930s. This is the first research carried out at the individual level related to an urban population in Southern Italy.[5]

1. The unusual path of Sardinian fertility transition

Findings from the Princeton Project (Coale and Watkins 1986) show that fertility decline in Italy, as in other European countries, followed its own specific path (Livi Bacci 1977). This project acknowledges the possibility of a multitude of transition paths, each determined by their specific historical and geographical context, and attempts to overcome the problems encountered with macro-analytical approaches or short-term temporal scales. More recent studies (Breschi, Pozzi and Rettaroli 1994; Del Panta et al. 1996; 2002; Dalla Zuanna, Rosina and Rossi 2004; Breschi, Fornasin and Gonano 2008; Santini 2008) confirm that the path and pace of transition in Italy differed quite dramatically from one region to another, and at times from one area to another within the same region.

At the aggregate level, the process of fertility transition in Sardinia stands out from national trends. This island region experienced the slowest and most gradual fertility transition in the whole of Italy (Livi Bacci 1977). Despite its initially low levels compared to other Southern regions, fertility levels in Sardinia went on to become the highest in Italy during the 1950s. While the national average was around 2.3 and that of the south was 3.2, the TFR of Sardinia was approaching 4 children per woman (Sorvillo and Terra Abrami 1993; Istat 1997). In stark contrast, Sardinia presently has the lowest fertility levels of all the Italian regions (Santini 2008).

Even in the pre-transitional period, Sardinia proves to be a demographical oddity. Although it is situated in the heart of the Mediterranean, it is paradoxically the least 'Mediterranean' of all Italian regions. Its system of family formation and reproductive behaviour does not fit any of the theories put forward in the literature. The Mediterranean model par excellence – joint patrilocal household, according to which a newly married couple resides with the husband's parents, with low female marriage age and high fertility – was far removed from the practices prevailing in Sardinia (Da Re 1990; Oppo 1990a; Meloni 1997; Perra and Cois 2012), which closely followed the 'north-western European' model, with "simple neolocal households and late marriage

[5] We have classified Sardinia as a Southern Italian region being aware that this classification, commonly used, is not completely satisfactory from the geographical as well socio-economic point of view.

for both sexes" (Viazzo 2003), a living arrangement pattern that obliged spouses ''to arrive at the wedding with the means necessary for creating a self-sufficient household'' (Oppo 1990b: 486).

The overall picture of Sardinia's reproductive behaviour is partially different if we take into account the evolution of marital fertility. The Ig index of Coale was relatively high immediately after national unification (1861) and the first signs of reduction were not detectable until the eve of the Second World War (Livi Bacci 1977). Between 1862 and 1962, the Ig index in Sardinia fell by a mere 15 percent, in stark contrast to the national figure of 50% and even more so to that of the northern and central regions (around 70%).

As Corridore observes (1902), the Sardinian population would have practiced Malthusian "preventive checks" on family size during the 19th century, but notably, these were also extensively used even in the first half of the 20th century (Breschi 2012), partially related to the lack of modern economic development of the island (Bottazzi 1999). In other words, a significant and sustained increase in the average age at marriage and in the level of celibacy for both sexes (De Santis and Rettaroli 2008) led to a moderate decrease in marital fertility but to a more pronounced decline in general fertility.

The complexity of the situation increases even more when we consider the few analyses conducted at the sub-regional level. Not only did the mean number of children per woman and the age-specific fertility pattern contribute to population growth in different ways before, during, and after transition, but variability in the marriage-fertility combination also appears closely related to the socioeconomic context (pastoral, mining, coastal, etc.) (Golini 1967; Lenti 1936; Zei, Lisa, and Astofi 1990; Breschi, Esposito, and Mazzoni 2013). Unfortunately, there is a lack of studies analysing fertility transition at the micro-level for Sardinia, as for the rest of the country[6]. This paper, in the aim of compensating for this deficit, relies on an individual-level dataset reconstructed for the municipality of Alghero, a coastal town of about 10,000 inhabitants, located in north-west Sardinia.

[6] However, to date few studies have been conducted at the individual level. As many as twenty nominative reconstructions based on Henry's family reconstitution method (Livi Bacci and Breschi 1990; Salvini 1990) have shed some light on certain aspects of the fertility pattern in the phase leading up to the decline, although these prevalently concern populations in Italy's north-central regions (Breschi et al. 2009). More recent studies that form part of Eurasian Project, focussing on three Italian communities at the micro-level, have also provided interesting insights (Breschi, Manfredini, and Rettaroli 2000; Manfredini and Breschi 2008; Breschi et al. 2010). In terms of individual data, our knowledge of the early stages of fertility decline is even more incomplete. In addition to the pioneering work of Schiaffino (1993), the most articulated study is that by Kertzer and Hogan (1989) regarding the rural community of Casalecchio di Reno, on the outskirts of Bologna. In the last years two other studies have been carried out at the individual level: an analysis focussed on an alpine village (Quaranta 2011) and another one relative to the area surrounding the city of Bologna (Rettaroli and Scalone 2012). The southern regions and the islands remained yet unexplored.

The choice of an urban community, characterised – as we shall see – by a large presence of agricultural workers and shepherds, provides the opportunity to investigate the unusual path of Sardinian fertility transition in a much more diversified social context than that prevalent in the island's rural areas. This path is to be analysed within the no less peculiar Sardinian modernization process, which took place, as was acutely observed, "jumping a phase" which meant that Sardinia "has become post -industrial without ever being fully industrial" (Bottazzi 1999: 29).

By focussing our attention on Alghero, we are allowed to detect the presence of social groups who more promptly adopted innovative reproductive behaviours which were becoming increasingly common in other Italian regions, but were seemingly still all but absent on the island.

The work that follows is divided in five sections. The first examines the theoretical background on the relationship between socioeconomic status (SES) and fertility transition, and is followed by three sections dedicated, respectively, to the presentation of the town of Alghero, the sources utilised, and a synthetic discussion of the main descriptive results. However, the main focus of this paper is the successive micro-analytical study aimed at measuring the impact of socioeconomic factors identified as potential determinants of the reproductive behaviour adopted by couples under examination.

2. Fertility transition and socioeconomic status: A theoretical background

Despite the large amount of research on European fertility transition, the precise causes and mechanisms of this demographic process are still poorly understood. As Cummins (2009) points out in his study of individual-level economic correlates of fertility decline in England and France, "the fertility transition in nineteenth century Europe is one of economic history's greatest puzzles. There is no consensus in the literature on the causes of this 'fertility revolution'"[7] as well as on the complex of motivations which triggered these revolutions. According to the conceptual framework of Carlsson (1966), fertility control takes places when the conditions for innovation and adaptation are realised. In the first case, one would refer to the emergence of new attitudes triggered

[7] Mason (1997: 446) also emphasises the difficulties in explaining this process: "Exceptions to all the major theories of fertility transition have indeed been found, and the field consequently suffers from a sense of malaise caused by our apparent inability to explain one of the most important demographic phenomena in human history". Her intention is to show that the crisis in our understanding of fertility transition is more apparent than real, and that our ability to comprehend is inhibited by erroneous thinking and overlooking the continuity between pre-transitional and transitional fertility.

by new knowledge while, in the second case, to an adjustment behaviour to new circumstances.

From a purely theoretical point of view, the adoption of new behaviours, according to Coale (1973), is a process that requires the presence of specific pre-requisites among the population. In particular, in reference to fertility decline, individuals should possess readiness, willingness, and ability to implement radical and substantial changes. Readiness refers to the fact that the new forms of behaviour must be advantageous to those who put them in place, especially in terms of cost-benefit. The term willingness implies considerations of ethical and religious legitimacy and moral acceptability of the new cultural model. Finally, the term ability involves the practical accessibility of these innovations.

This type of conceptualisation was later revived and developed by Lesthaeghe and Vanderhoeft (2001). In many cases, past populations, while having the means to limit their fertility, were not ready to do so for cultural reasons. Consider, for example, the difficulty in the diffusion of innovations now considered part of daily life, such as contraceptives (Cleland 2001). Other authors specify individuals as being more advanced and therefore more ready to take advantage of the possible innovations among the wealthy social classes (Rogers 1962, Cleland 2001).

Those differentials which are undeniably socioeconomic are assumed to have played a pivotal role in the dynamics of fertility decline in many European countries: a more pronounced dynamism is universally acknowledged to the upper classes. An attitude of greater prudence is usually attributed to those who belonged to the lower strata of society. More generally, "the negative association of fertility with economic and social development has therefore become one of the most solidly and established and generally accepted empirical regularities in the social sciences" (Myrskylä, Kohler, and Billari 2009: 741). This association is clear and well accepted in the course of fertility decline, however, doubts and uncertainties remain for the time prior to the transition and the first phase of the transition (Livi Bacci 1977; Cummins 2013).

Analysis of fertility SES differentials and their changing nature during the transition process remains essential for a better understanding of the demographic mechanisms at play, which forms the core purpose of this paper. Most authors (e.g., Livi Bacci 1986; Skirbekk 2008) agree that the relationship between socioeconomic status and fertility changed over the course of transition. Whereas individuals of higher social status were often found to have relatively high numbers of children prior to the onset of fertility decline (Livi Bacci 1977; Bardet 1983; Betzig 1986; Schneider and Schneider 1996), they went on to act as forerunners in the decline during transition (Livi Bacci 1986; Haines 1992).

Although some studies argue that the relationship between fertility and social status remains positive (Stys 1957; Wrong 1958; Hull and Hull 1977, Fieder et al.

2005), Italy has recently been put forward as "an example of a country where the status-fertility relation switched from positive to negative" (Skirbekk 2008: 146). Skirbekk refers to Livi Bacci's (1977) analysis of three Italian cities between the 15th and 18th centuries that revealed a higher number of surviving children in well-off families, and to more recent studies that indicate the emergence of a negative relationship between fertility and occupational rank/educational level in the 20th century (Jones 1982; FFS 2006).

In the absence of more precise information, Livi Bacci (1977) interprets the higher number of surviving children found in the richer families as a consequence of lower infant mortality and lower age at marriage. Bardet (1983) also found that the status-fertility relationship switched from positive to negative for the French town of Rouen over the period analysed (1670-1789). A more recent study by Cummins (2009), using two new data-sets reconstructed at the individual level, found a highly positive relationship between wealth and fertility prior to transition which then switched to a strongly negative one during its onset, in both England and France.

Even outside Europe, evidence of a negative relationship between fertility and affluence were found. Jones and Tertilt (2008), using data from the U.S. Census, point out that before the beginning of the demographic transition in the United States, approximately around the mid- nineteenth century, well-being and fertility were already negative. Westoff (1954) arrives at the same conclusion for the period 1900-1952.

In addition to the pioneering role assumed by the elites in terms of a voluntary reduction of fertility within marriage, an undoubtedly crucial role was also played by socio-economic differential mortality, as mentioned above. In the case of England, for example, child survival was found to be generally higher in the upper classes compared to the less well-off, and this condition may have played a decisive role in fertility differentials by socio-economic status (Boberg-Fazlic, Sharp, and Weisdorf 2011; Clark and Cummins 2009) even in the case where the fertility began to decrease well before the actual mortality decline, as in the singular French demographic path (Cummins 2013). Also Van Poppel and colleagues (2012) have recently ascertained in the Netherlands (1870- 1950) that SES differential in child survival influenced the chance of having another child as well as the length of birth interval.

Clearly, further evidence is required to support the idea of a possible reversal in the relationship between fertility and social status during the demographic transition process, and in the context of Italy, many aspects of the "fertility revolution" (Easterlin and Crimmins 1985) remain largely unexplored. The most comprehensive study on Italian fertility to date remains that by Livi Bacci (1977), which is essentially based on aggregate data. In recent decades, researchers in the field have become increasingly aware that a deeper understanding of the causal forces leading to fertility decline would best be derived from examination of that process at the individual level. Also for the

Italian case, as we have already pointed out[8], there are some investigations, especially on the pre-transitional period. This analysis is, however, the first study carried out with individual data about an urban population in the South of the country belonging to a region marked by a peculiar fertility transition, as we have already mentioned.

3. The study area

Alghero is a large costal town in north-western Sardinia that, before national unification (1861), formed part of the Kingdom of Sardinia, along with the regions of Piedmont and Liguria (Figure 1). The first Italian Census (1861) records Alghero as having 8,831 inhabitants, making it the fourth largest municipality on the island. In addition to the urban centre, the municipality included the "Nurra", a vast area which was marshy and barely inhabited until the 1920-30's, which guaranteed Alghero a certain degree of geographical isolation. The nearest large towns were Sassari, the capital of the province, about 35 km away, and Villanova Monteleone, located on the adjacent hills, at a distance of 25 km. While there were a number of smaller communities nearby, their population rarely exceeded a few hundred, such as Olmedo and Putifigari. Alghero's isolation was ensured not only by geographical distance and weak communications, but also by its high town walls, which remained intact until the start of demolition in 1886[9].

Being a coastal town with a port, there were a large number of fishermen, sailors, and coral fishers, as well as artisans and traders, who together accounted for 45% of the labour force. There was also a small but relevant group of "elite" (around 2%). However, Alghero's socioeconomic structure was dominated by farmers and shepherds, which could appear unusual considering its closeness to the sea, but this was a common trait of every town in Sardinia as well as in the South of the country (Sori 1973).

Another feature of the town was the concentration of the population in the historic centre, where the farmers and shepherds also lived. The standard of living of the population was very poor as were the sanitary and housing conditions. According to the indigent families lists kept in the local municipal historical archive, around 35-40% of families in Alghero were classed as "poor". Over three-quarters of the population were almost entirely illiterate, as was true throughout the rest of Sardinia. The town's hygienic conditions were far from satisfactory, as attested by national surveys and a variety of documents (petitions, requests, and protestations). The poor sewer system and the population density, especially in the dirty harbour side alleys, meant that water

[8] See footnote 1 about micro-analytical studies on Italian fertility.

[9] In the late 19th Century, the old town structure was radically modified following the demolition of the walls that had long protected it (Principe 1983; Sari 1988a; 1988b; 1999).

provision was insufficient and of bad quality. These problems were partially addressed at the end of the 19th century and further improved in the early 20th century.

The health status of Alghero's population was very poor, as seen by the extremely high incidence of (permanent and temporary) discharge of young men from military service, accounting for over 50% of the cohorts born between 1866 and 1900 at first enrolment (Breschi et al. 2011). Furthermore, conscripts from Alghero initially show a downward trend in physical stature up to 1870-1874, with mean height diminishing from 160.0 cm to 158.2 cm before stabilising at around 158 cm (Manfredini et al. 2013). Malaria was endemic, trachoma was also particularly widespread among children (Melis and Pozzi 2010), and tuberculosis was common (Tognotti 2012) – all clear signs of a continuous and enduring health "stress" afflicting the population.

Figure 1: Geographical location of Alghero

4. Data and sources

The demographic data used in this study are taken from civil records of birth, death, and marriage which were introduced in Sardinia in 1866, as decreed by the newly unified Kingdom of Italy. All the nominal data reported in the civil records (for the years 1866–1935) were digitised. Standard cross-check procedures were carried out to reconstruct individual biographies and family histories. Checks were made to verify the consistency between information reported in civil records and data from other sources, such as military enrolment records, Population Registers, and family sheets from the 1921 Alghero census. Lastly, demographic information obtained from the civil status registers and data from parish registers of baptisms, burials, and marriages were also combined. The crosschecking and combining of data from civil and religious sources was necessary to overcome the consequences of the long-standing state-church oppositions regarding marriage[10].

Adopting a cohort approach, our statistical analyses considered each couple's date of marriage from either church or municipal sources in the event of single registrations, or the earlier of the two dates in the case of double registration. Particular attention was given to fertility patterns of Alghero's female population, married between 1866 and 1905, given the opportunity to trace their reproductive histories up to 1935[11]. For the purposes of our analysis, we first screened for marriages celebrated in Alghero between spouses who both claimed residency there. From this group we selected couples whose reproductive history duration could be established or, in other words, where it was possible to ascertain the end of the marriage reproductive history and the stable presence in Alghero.[12] We selected a total number of 2,209 couples, which formed 79% of all marriages celebrated in Alghero between spouses with dual residency. The remaining 21% (about 542 cases) is presumed to consist of couples who migrated or were generally mobile[13].

[10] For a more detailed analysis of this topic and the measures adopted to overcome the consequences of new marriage-related legislative proceedings see: Breschi et al. 2009; Mazzoni et al. 2013.

[11] Note that for the most recent marriage cohorts (1901-05), we can trace the reproductive history of young married women (under 20 years) up to the age of 45.

[12] Our analysis therefore includes: a) marriages where the date of death of both spouses is known; b) marriages where the date of death of one or both spouses was/were unknown but it was possible to reconstruct the reproductive history up until the end of the fertile period (woman aged 50 and over). Despite the lack of continued and precise information on mobility, the couples selected were included in the analysis up to the date of the last event recorded for a component of the respective family. The detailed and wide-ranging set of data available allow for a fairly accurate identification of the entire reproductive history of resident couples. This data set is still being finalised, and we are currently engaged in the record linkage process using information from the 1961 Census family sheets. Notably, this census includes a marital fertility survey, the results of which, naturally referring only to the surviving women, are consistent with our reconstruction

[13] Our multivariate analysis took only 1,949 marriages into account because, as detailed below, we consider predominantly second or higher order births.

In order to analyse socio-professional differentials, particular attention was paid to the husband's occupation[14]. SES was stratified into occupational groups, coded according to the Historical International Standard Classification – HISCO – (Van Leeuwen, Mass, and Miles 2002), and each HISCO code was then converted into classes using HISCLASS (Van Leeuwen and Maas 2011). These classes were subsequently grouped into 6 categories, given in Table 1. Given Alghero's socioeconomic structure described above, all professions were divided into two main groups: manual and non-manual workers. The former includes: "unskilled", "low-skilled", "farmers" and "skilled"[15]. "Unskilled" or "low-skilled" manual workers included the large number of fishermen and sailors, whereas "farmers" were kept separate because of their numerical relevance and their close relationship with the land and the rural world, characterising them as a very special "urban" population. The amplitude of this group is an indirect symptom of the almost absence of industrial activities in Alghero. The only activities, which, perhaps, may be classified as such, had a short life and were almost all, moreover, related to the processing of agricultural products (Mattone and Sanna 1994).

Within the "non-manual" workers group, the "low and medium skilled" category includes individuals linked to local public administration and services. The "higher occupation" category amounts to a little over 1% of the total number of couples examined with a mere 20 couples, and includes only the most prestigious professions (doctors, pharmacists, lawyers, engineers, professors, army officers, bank managers, local nobility, and military).

Table 1: HISCLASS, categories adopted

	Socioeconomic status	HISCLASS	%
Manual workers	Unskilled	11-12	21.2
	Low skilled	9-10	13.7
	Farmer	8	50.3
	Skilled	7	10.0
Non-manual workers	Low/med. skilled	4-5	3.7
	Higher occupation	1-3	1.1

Note: Hisclass 6 is not in the dataset

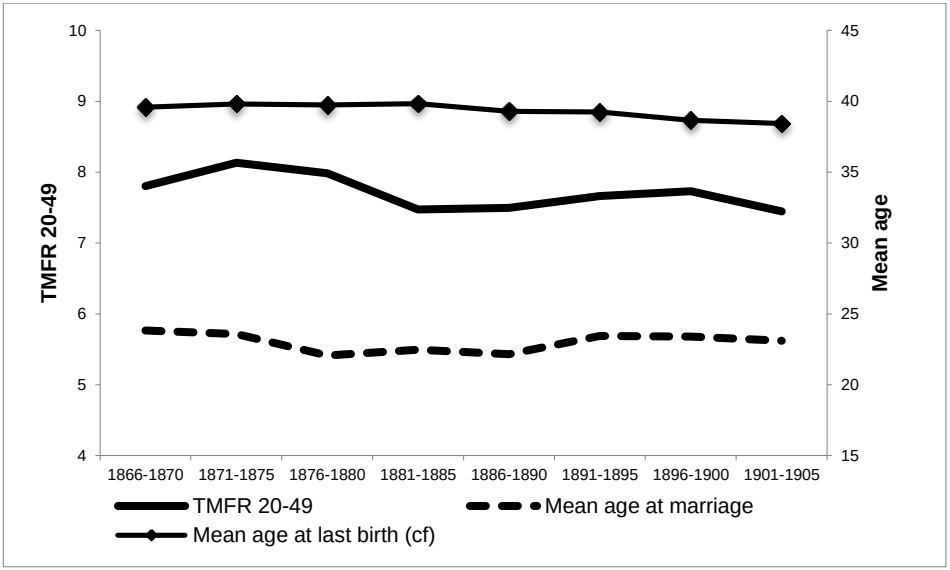
[14] Female occupational categories have no purpose in our analysis, as the overriding term used is "housekeeper" or the like.

[15] Craftsmen have been classed as "skilled" manual workers.

5. Trends and patterns of fertility in Alghero

To provide an initial historical overview, we examined Total Marital Fertility Rate (TMFR) using certain indicators (mean age at first marriage, mean age at last birth, and Coale-Trussell indices) (Figure 2 and Table 2). This analysis of five-year cohorts emphasizes an overall stability, especially in mean ages at first marriage and birth of last child, for couples with completed fertility. The TMFR shows a slight fall, from around 8 for the first cohorts to around 7.5 for the latter.

Figure 2: TMFR, mean age at marriage and mean age. Alghero 1866-1905 marriage cohorts



The picture that emerges at the aggregate level reveals a population still immersed in a pre-transitional stage, with an extremely small and gradual decline in fertility across the five-year marriage cohorts. Further confirmation of this is also provided by the values of the Coale-Trussell indices (*M* and *m*), the most commonly used measures for detecting parity-specific control (Table 2).

The *m's* for Alghero are in most cases close to 0.1, suggesting that the age-specific schedules closely resemble natural fertility schedules and therefore no parity-specific

control was practiced. It is only in the last cohort (1901–1905) that the *m*-value approaches but remains below 0.2, which is widely considered the minimum to indicate a population practicing parity-specific control. The *M* parameter values (0.85–0.95) also indicate somewhat high levels of marital fertility.

Although some fluctuation is visible, the overall picture is one of homogeneity and stability, revealing a population that has not yet begun the transition process. However, this homogeneity decreases when we focus our attention on socioeconomic differentials in female reproductive behaviour (Table 3). Considering the small number of marriages referring to the higher occupations group (about 20), we have grouped them in the larger "non-manual" class which includes also the lower-medium skilled.

Table 2: Coale-Trussell indices. Alghero 1866-1905 marriage cohorts

Cohorts	Marriages	Coale-Trussell	
		M	***m***
1866–1870	269	**0.91**	0.08
1871–1875	288	0.98	**0.15**
1876–1880	261	0.94	0.11
1881–1885	253	**0.91**	**0.16**
1886–1890	280	**0.86**	0.07
1891–1895	291	**0.91**	**0.12**
1896–1900	258	**0.91**	0.10
1901–1905	309	**0.91**	**0.18**
1866–1905	2209	**0.91**	**0.10**

Note: In bold coefficients (*M* and *m*) statistically significant ($p \leq 0.05$)

In this case, differences between non manual groups and others groups are clearly evident even regarding age at first marriage and age at last birth. Women's age at marriage is higher for the non-manual group, and the age at last birth is particularly low. The average birth interval does not show any significant variation. Corresponding indicators for the manual worker groups are more similar to the trend observed at the aggregate level.

Table 3: Mean age at first marriage, mean birth intervals, mean age at last birth, $TMFR_{20-49}$, and Coale and Trussell indices by social status. Alghero 1866-1905 marriage cohorts

Social status	N° marriages	Mean age at first marriage	Mean birth interval	Mean age at last birth	$TMFR_{20-49}$	*M*	*m*
Manual	2052	22.6	2.51	39.4	7.8	**0.9**	**0.10**
Unskilled	*458*	*21.2*	*2.47*	*39.7*	*7.8*	***0.8***	*0.04*
Low-skilled	*296*	*21.8*	*2.47*	*38.9*	*7.6*	***0.9***	***0.11***
Farmers	*1083*	*21.5*	*2.54*	*39.8*	*8.0*	***0.9***	***0.01***
Skilled	*215*	*22.0*	*2.55*	*38.0*	*7.4*	*0.9*	***0.25***
Non-manual	104	26.1	2.60	36.7	6.6	0.8	**0.33**
Total	2156	21.7	2.47	39.3	7.7	**0.9**	**0.12**

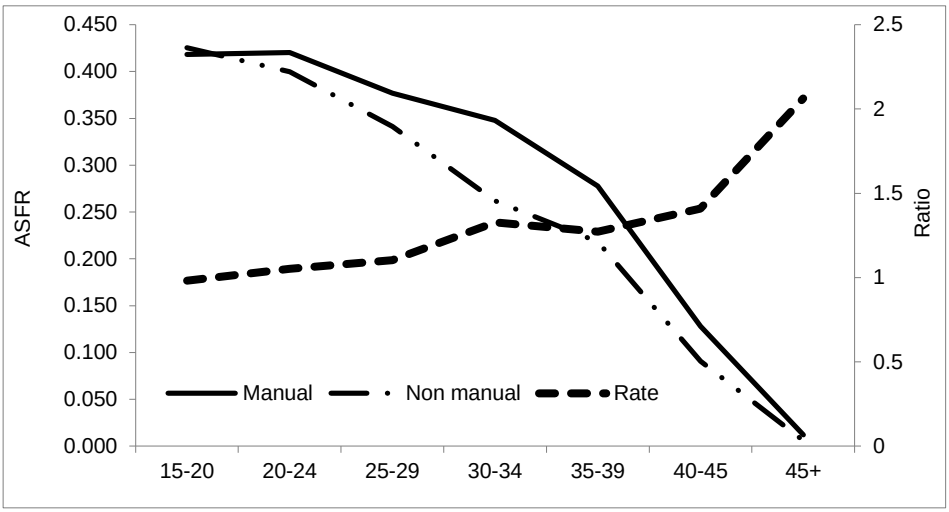
Note: In bold coefficients statistically significant ($p \leq 0.05$). Marriages with unknown SES are excluded; Mean birth interval and mean age at last birth for completed families.

The non-manual group show the lowest TMFR (20–49 years), with a value of 6.6, corresponding to just one child less than the average calculated on the total number of marriages. The average values are higher for the other socioeconomic categories, reaching 8 in the case of farmers. Differences between the upper classes and those less affluent are, once again, highlighted by the Coale-Trussell indices (last two columns in Table 3). The *m* index, intended to detect the presence of forms of birth control, is over 0.3 in the highest socioeconomic group and a value around 0.25 in the "skilled" category. Contrarily, *m* is significantly lower in the other groups ("unskilled", "low-skilled" and "farmers").

The "m" values are higher than the threshold value of 0.2 only in the case of the skilled and non-manual workers. These results actually suggest that for the more wealthy class the higher ranking components of the population had already adopted some form of fertility control, which appears to be entirely absent in the other socioeconomic groups.

In the following analysis we have compared the non-manual group with all the other groups (Figure 3). The ratio between the two indicators can be seen to substantially increase in the age group 30–34 years, level off for the following age group, and rise rapidly for the last two. The main differences between the two socioeconomic groups are therefore concentrated in the later stages of a women's reproductive history, which would appear to confirm the idea of the adoption of some form of fertility control within the higher social groups.

Figure 3: Age specific fertility rates in manual and non-manual social groups. Alghero 1866–1905 marriage cohorts



6. Reproduction from an individual perspective

The complex framework of fertility determinants makes it difficult to understand the role and impact each of these had individually, and thus interpret fertility patterns and reproductive behaviour. The reproductive framework put forward by the Eurasia Population and Family History Project (EAP), singles out three different and concentric levels of context, each of them overlaying groups of variables at the individual (couple), household, and community levels (Tsuya et al. 2010). A multivariate statistical analysis was conducted to disentangle the respective role and impact of each component, using event-history techniques and estimated risk of having another child.

A micro-level analysis was performed on legitimate births of parity 2+, as the birth of the first child frequently corresponds with marriage patterns, suggesting that intervals between marriage and first birth were strongly affected by courtship traditions and

prenuptial conceptions.[16] The population under study here is limited to currently married women, aged 15–49, who had already had one birth.[17]

Table 4 shows the models and full set of covariates used in our multivariate analyses, with the individual and couple level consisting of seven variables. The physiological and biological capability for woman to bear children obviously functions in relation to age, accounted for by a categorical variable consisting of seven age groups, with the reference category of age 25–29. The onset of reproductive life – and, indirectly, the marriage pattern – is caught by women's age at first birth, coded into three age groups (<20 years, 20–24, 25 and over). This variable was included to account for the well-known behaviour that late access to reproduction possibly implies accelerated subsequent childbearing.

Total children ever born, age difference between spouses, and order of marriage were also included to take account of other important characteristics of the couple and their reproductive history. The first is widely recognised as significant in the presence of some form of family size control; as family size increases, the propensity to have another child decreases.

Age difference between spouses is related to the quality of marital relationship which can affect fertility through "variables such as marital stability, marital satisfaction, family size preferences, and contraceptive use" (Casterline, Williams, and McDonald 1986: 354). Our models use three categories, namely wife older than husband, husband older by 0–3 years, and husband older by 4 years or more. They include a dichotomous variable indicating whether the union was the first or a remarriage. The reproductive patterns of remarried women may differ from those in first marriages in a variety of ways. They may form a select group with a higher probability of conception due to the second husband desiring more children, but they are just as likely to be discouraged from having more babies if they already have children from previous marriages.

The variables of survival status of previous birth and time since last birth (current birth interval) attempt to account for the effects of infant and child mortality on fertility (Van Poppel et al. 2012). The former captures the "child replacement" effect, that is to say the couple's deliberate choice to replace the lost child, while the latter accounts for the involuntary component of the relationship between infant mortality and fertility, which is the shortening of the postpartum amenorrhea period caused by the interruption

[16] Moreover, in the period analysed in Alghero as in the entire country, the question was also further complicated by the effects of the battle between Church and State on the validity of marriages celebrated only in front of the priest. Therefore, firstborn children are excluded from our analysis.

[17] The proportion of childless women is around 9%, a value within the range (5%–20%) considered as the normal proportion of childless ever-married women (Rowland 2007), and only slightly above the threshold (3%–5%) that many authors indicate as the expected proportion of couples affected by permanent sterility (Knodel and Wilson 1981; Toulemon 1996).

of breastfeeding and lactation (Tsuya et al. 2010: 45). In short, the above covariates aim at determining the role of bio-demographic factors of reproduction.

The last individual-level variable included is "migration" or rather a proxy of migration, given the lack of precise information on mobility. We considered whether the spouses were born in Alghero, given the possibility that non-natives would adopt a different reproductive behaviour (e.g. more inclined to control the number of offspring) or that the absence of social position or a structured support network of relationships within the adopted community could act as a deterrent to reproduction. Four categories were used: both spouses born in Alghero; both spouses non-native; only the husband non-native; and only the wife non-native.

Table 4: Cox regression. Estimated effect (relative risk) of the likelihood of having another child. Alghero 1866-1905 marriage cohorts

Covariates	Model 1		Model 2		Mean
	Haz. Ratio	P>z	Haz. Ratio	P>z	
Cohort of marriage (ref. 1866–1885)	1.000	-	1.000	-	47.0
1886–1905	**0.952**	0.022	1.038	0.390	53.0
Age of woman (ref. 25–29 yrs)	1.000	-	1.000	-	18.7
<20	0.950	0.592	0.958	0.652	1.9
20–24	1.014	0.729	1.018	0.659	12.6
30–34	1.002	0.951	0.998	0.952	19.1
35–39	**0.884**	0.022	**0.877**	0.015	17.9
40–44	**0.468**	0.000	**0.462**	0.000	16.0
45+	**0.060**	0.000	**0.059**	0.000	13.7
Age at first birth (ref. 20–24 yrs)	1.000	-	1.000	-	41.5
<20	**1.093**	0.001	**1.090**	0.002	30.3
25+	0.941	0.103	0.942	0.109	28.2
Children ever born (ref. 1)	1.000	-	1.000	-	13.8
2	**0.486**	0.000	**0.480**	0.000	13.7
3	**0.453**	0.000	**0.446**	0.000	12.7
4	**0.482**	0.000	**0.472**	0.000	11.3
5	**0.492**	0.000	**0.481**	0.000	11.0
6	**0.524**	0.000	**0.514**	0.000	9.8
7	**0.534**	0.000	**0.524**	0.000	8.7
8+	**0.665**	0.000	**0.650**	0.000	19.1
Marriage (ref. first marriage)	1.000	-	1.000	-	89.8
Remarriage	**0.911**	0.022	**0.911**	0.023	10.2
Age difference between spouses (ref. 0–3)	1.000	-	1.000	-	22.8
Woman older than man	1.035	0.457	1.041	0.391	8.5
Man older than woman by 4+ yrs	0.997	0.911	0.995	0.841	68.7
Life status of the previous child (ref. alive)	1.000	-	1.000	-	79.9
Dead <2 years since previous child	**1.903**	0.000	**1.907**	0.000	8.5
Dead ≥ 2 years since previous child	**2.221**	0.000	**2.224**	0.000	11.6

Table 4: (Continued)

Covariates	Model 1 Haz. Ratio	P>z	Model 2 Haz. Ratio	P>z	Mean
Birth place (ref. Alghero)	1.000	-	1.000	-	84.9
Other place husband	0.921	0.086	0.920	0.082	8.1
Other place wife	**0.907**	0.016	**0.905**	0.014	5.2
Other place both husband and wife	0.951	0.530	0.941	0.453	1.8
Socioeconomic status (ref. unskilled)	1.000	-	1.000	-	23.1
Low-skilled	1.011	0.760	1.066	0.230	12.8
Farmer	0.993	0.775	1.041	0.298	49.6
Skilled	**0.908**	0.014	0.992	0.878	10.1
Non-manual	**0.844**	0.005	1.102	0.258	4.4
Period (ref. no war / influenza)	1.000	-	1.000	-	92.5
War / influenza	**0.899**	0.039	**0.901**	0.042	7.5
Interactions					-
1886–1905*Low skilled			0.911	0.196	-
1886–1905*Farmer			0.920	0.108	-
1886–1905*Skilled			**0.841**	0.030	-
1886–1905*Non-manual			**0.619**	0.000	-
Log likelihood	-69262.093		-69253.042		
Person-Years			37481		
Marriages			1949		
Births			9607		

Household-level effects on fertility have been measured using household socioeconomic status. As outlined in section 2, it is possible that the association between SES and fertility in pre-transitional and transitional populations changed during the transition process. The slowness of the Sardinian transition gives the opportunity to capture the complex influence of socioeconomic status on reproductive behaviour.

In consideration of the wider context, we also included a dummy variable to account for the collapse of births that occurred between 1915 and 1918 as a result of World War I and the Spanish flu. Alghero, like the rest of the island, experienced a decrease of over 1/5 compared to the trend in that period. Lastly, the year of marriage was introduced to capture any tendency towards fertility decline as well as the process of modernisation of Alghero population.

Results from the first event history analyses (Model 1) share some features of general marital reproduction for the Italian population (Breschi et al. 2009). As Table 4 shows, the likelihood of marital birth decreases as the women's age increases. In relation to the reference category (wives age 25–29) the probability of giving birth falls by 12% only after the age of 35, decreases markedly (50%) after 40, and drops away after 45. This pattern confirms the decline of fecundity in the later years of a woman's

reproductive period. In Alghero, women whose reproductive history started early (first child under the age of 20) are more likely to have more children compared to the reference category. However, women who had their first child after the age of 25 have a reduced risk of having additional children, although this result is not statistically significant. This result is unexpected for a seemingly uncontrolled fertility regime, where women who married later in life had less time to reach the targeted family size and would be less inclined to postpone births.

The number of previous births has been included to detect the degree of deliberate marital fertility control given that the onset of natural sterility is accounted for by age. We used the propensity to move from the first to second child as a benchmark for higher order births. The absence of parity-specific control is further confirmed by the results shown in Table 4. Although the likelihood of another marital birth is lower for women who had two or more children ever born, the differences between women of higher parities are quite small. While marital fertility does decline to a certain degree at higher parities, the effect is not especially relevant and can probably be accounted for by the increasing likelihood of permanent sterility after child-birth due to infections or difficult deliveries (Knodel 1988; Wood 1994), or reduced coital frequency.

For higher order births (above sixth child), we can detect a slight recovery, which is indirect evidence that we are dealing with couples characterised by a strong tendency to have children. In short, parity analysis confirms extremely limited (if not absent) fertility control in Alghero's population, despite the fact that there is a statistically significant decline in the propensity to have children from the first marriage cohort (1866–1885) to the second.

Age difference between spouses proves to be of little importance. A slight fall (about 10%) in the risk is recorded for marriages of higher order, indicating that previous marriages and more likely the presence their offspring, discouraged further births.

In Alghero, the likelihood of marital birth results as lower for couples where both spouses are non-native, which is probably due to their having a less robust network of support within the community. Statistical significance indicates this difficulty was particularly pronounced for couples with non-native female and native male, which possibly reflects the problematic integration of women born outside the community.

In line with previous research, the relevance of the survival status of the previous child is evident. The likelihood of birth increases by over 80% when the previous child had died (independent of his/her age at death), compared to women with surviving children. This confirms the strong fertility-inhibiting effect of breastfeeding and that the interruption of breastfeeding after an infant death results in a significant short-term increase in the likelihood of an additional birth. In contrast to what has been observed for other Italian and European communities, the risk of having another child when the

previous child had died increases in relation to the child's age at death (Tsuya et al. 2010). This suggests a replacement effect that is stronger than the purely physiological effect due to early fecundity resumption caused by the premature interruption of breastfeeding. However, this result should be contextualised. In Alghero, as in the rest of the island, infant mortality, especially neonatal mortality, was among the lowest in the country (Breschi et al. 2012) and protracted breastfeeding was commonplace, in many cases lasting over one year (Coletti 1908; Matta 2010).

To take account for these characteristics, we ran an additional model, identical to that shown in Table 4 but with a different interval of time since last birth. The results, summarised in Table 5, reveal that with an increase of the time interval since previous birth (2 to 2.5 years and then 3 years), the effect of the previous death becomes stronger (and statistically significant). By lengthening the period of reference, it is possible to capture more cases of infant deaths that frequently occurred beyond the second birthday due to the time required for new conception and gestation on the one hand, and the Sardinian structural pattern of child mortality on the other (low infant mortality and particularly neonatal, and protracted lactation).

Table 5: Estimated effects of time since last birth/survival of previous child on the likelihood of having another child. Alghero 1866–1905 marriage cohorts

	Haz. Ratio	P>z	Mean
Ref. Preceding child is alive	1.000		79.9
< 2 years and child is dead	**1.903**	0.000	8.5
2 + years and child is dead	**2.221**	0.000	11.6
Ref. Preceding child is alive	1.000		79.9
<2.5 years and child is dead	**2.323**	0.000	10.2
≥2.5 years and child is dead	**1.433**	0.000	9.9
Ref. Preceding child is alive	1.000		79.9
<3 years and child is dead	**2.446**	0.000	11.4
≥ 3 years and child is dead	0.919	0.118	8.8

Notes: The model includes all the covariates indicated in the full model of Table 4.

The results presented in Table 4, which show the estimations of a multivariate event-history model controlling for factors including age at first birth, age differences between the spouses, and children ever born, demonstrate that summary measures largely conceal the variation of marital fertility between Alghero's social groups. In relation to the reference category (unskilled), the responsiveness of marital fertility to socioeconomic status remains "similar" among low-skilled workers and farmers and is reduced by 9% for skilled workers. But the most visible differentiation emerges for non-manual workers who had no less than a 16% lower chance of marital births. These results are statistically significant and consistent with observations made in the descriptive analysis.

Lastly, the relative risk of having another child was reduced (by about 10%) for the period corresponding with the First World War and Spanish flu. The results of the interaction with Model 2 (Table 4) show the SES differentials in the marriage cohorts. The non-manual workers experienced a notably significant reduction (40%) of the risk of having another child. These results are even more easily interpreted in the graph below (Figure 4).

Figure 4: Interactions between SES and Marriage Cohorts (1866–1905)

7. Conclusions

This paper examined the marital fertility patterns and possible determinants for the population of Alghero between 1866–1935, with a focus on social stratification and evidence of deliberate fertility control. The study is of importance for a number of reasons. First and foremost, this is the first research based on individual data relating to an urban population in southern Italy. We have seen that while the process of fertility decline was already underway in northern and central Italy, its impact in the south, and particularly Sardinia, was much weaker.

The island's decline in fertility was indeed slow and full transition was completed as late as the 1970s. Our analysis focussed on couples formed between 1866 and 1905, following their reproductive history until the mid-1930s – a time when awareness of the problems of birth decline was rising, but was, at the same time, thwarted by the fascist regime (Ipsen 1996).

The study focussed on marital fertility, since it is widely accepted that the majority of births occurred within marriage, particularly in Sardinia. In the pre-transitional era, fertility variations are chiefly attributable to cultural and biological factors, such as breastfeeding, reduced coital frequency due to the length of marriage or women's age, onset of permanent sterility, temporary sub-fecundity due to malnutrition, or spousal separation following temporary migration.

Marital fertility is assumed to be what Henry (1961) calls "natural", i.e., not deliberately controlled to achieve a certain family size. In fact, in Alghero, we did not find any clear indication of family limitation, i.e. parity-specific control at level of "general-total" population. None of the widely used measures of parity-specific control reveal that couples interrupted their childbearing after reaching a certain targeted family size. We saw that marital fertility was not exceptionally high ($TMFR_{20\text{-}49}$ is 7.7), mean age at last birth was quite late (over 39), and birth intervals were rather short (less than 2.5 years), which excludes the practice of deliberate spacing. The population of Alghero, like that of the entire island, controlled more marriage behaviours (late marriages and high levels of male and female celibacy) instead of reproductive behaviours to "limit" the total number of births and adapt it to the available resources (Corridore 1902; Breschi 2012).

However, we did find significant differences in marital fertility according to socioeconomic group. The small minority of non-manual workers show clear signs of deliberate marital fertility control, particularly in the case of the couples married after 1885. The micro-level analysis of legitimate births of parity 2+ shows that the differences observed between the social groups at the aggregate level were not exclusively determined by demographic factors (such as women's age or age at marriage, age differences between spouses, life status of previous birth, etc.).

A real gap existed between the manual and non-manual workers-couples, suggesting that this latter small minority group had begun to experience the difficulties, often economic, of having a high number of children.

This condition is also confirmed by the fact that in Alghero the children born to the upper classes experienced a mortality rate much lower than the poorer ones. Among the cohorts born between 1866 and 1930, for example, a child born to a non-manual worker run a relative risk of death in the first year of life up to 30% lower compared to an unskilled worker's child, and about 20% lower from the first to the fourth year of life (Mazzoni 2013; Breschi et al. 2014).

This appears to confirm the hypothesis put forward by Livi Bacci (1986), that the well-off acted as forerunners in fertility decline because they actually had the greatest need to relieve the household of the "burden" of an elevated number of children.[18] A new and more conscious attitude towards birth control was adopted by the well-off couples towards the end of the 19th century. Although no significant change is visible for the rest of the population, with the exception of the skilled workers group, until the mid-20th century, this does not imply that most couples did not have a conscious attitude towards reproductive behaviour.

While further study is needed, it appears that the conscious choice of young Sardinian men and women mainly acted on marriage access, and with the exception of the above mentioned minority, those who married did not control their reproductive behaviour to any great extent.

The low incidence of the elite families in Alghero, even more pronounced in the island's rural areas, might explain the substantial stability in fertility behaviours in the period examined. In fact, in the light of the small size of this social group until the Second World War, and the enduring prevalence of the island's socio-cultural model based on manual work and traditional Sardinian family formation system, the slow fertility decline in the island appears plausible.

[18] Alfred Perrenoud makes the same hypothesis regarding the bourgeoisie in Geneva (Perrenoud 1990).

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