

Fertility Regulation and Family Influence in Tunisia

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Abstract:

We revisit fertility analysis in Tunisia by examining family interference in birth control through the sequence of decisions: woman's marriage age, post-marriage delay in the first use of contraception, and past and current contraceptive use.

Using data from the 2001 PAP-FAM Tunisian survey, the significant effects of covariates in duration and probability models are found to arise and vanish as women progress in their lifecycle and along changes in the family planning policies. Family links and socio-cultural environment appear to greatly shape fertility regulation. This calls for family planning policies that address more the extended families, and suggests that traditionalist politico-religious movements may affect future fertility in Tunisia.

Keywords: Fertility regulation, Age at marriage, Birth control, Family Interference, Contraception, Tunisia.

JEL Codes : J12, J13, C25, C41.

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1. Introduction

In fertility studies some emphasis has been paid to investigating the factors explaining the number of children.² Somewhat less attention, despite a long tradition initiated by Bongaarts (1978), has been devoted to fertility regulation decisions.

In this paper, we show how some insight can be gained by considering successive regulation decisions made in Tunisia by women, or on their behalf by their husband or their families. We identify suggestive effects of correlates of regulation decisions, and focus particularly on family interference. Indeed, the likelihood of new births not only depends on the mother's biological characteristics, her preferences and her economic activity, but may also be affected by her family context, including within the extended families of the spouses. These family networks may influence various facets of young couples' lives, for example when choosing the spouse, financing the wedding, or determining the number and education of the offspring.

Family interference and family values are also associated with resurging conservative politico-religious movements that exert powerful influences to the youth. Radicalization and terrorism have been found alternatively to diminish fertility (Berrebi and Ostwald, 2015, across countries and over 1980-2007) or to increase it (Rotundi and Rocca, 2019, in Nigeria). These discordant results may conceal varied links of family networks with traditionalist ideologies. Therefore, it is useful to know better how these networks affect contraception choices to understand if they could offer a channel for radicalized ideologies to influence fertility.

Fertility regulation is often seen (e.g., in Easterlin 1978) as stemming from a woman having increased labor participation, and the disadvantages of unwanted children being greater than their economic and psychological benefits. However, this assumes that the regulation decision is made only by the woman; whereas, the husband or the extended families of the spouses may also be involved. In this paper, we track the encroachment of families in successive steps of birth control. To do this, we follow Bongaarts (1983) and Bongaarts and Potter (1983) who distinguish direct and indirect determinants of fertility. Direct determinants include exposure factors (such as being married), deliberate fertility control (e.g., contraception), and natural fertility factors. The indirect determinants refer to cultural, socio-economic and environmental factors. Among all these determinants, Bongaarts emphasizes four primary proximate factors that generate salient differences in fertility levels across societies. They are: marriage - notably the typical age at marriage -, contraceptive habits, lactation and induced abortion. We follow this approach while focusing on his first two factors.³ However, one major difference from Bongaarts is the systematic attention we devote to family interference in the correlates of these factors.

² See recently, Karsten and Kohler (2000), Klasen and Launov (2006), and Rindfuss et al. (2007).

³ Bongaarts' last two factors (abortion and lactational infecundability) are omitted because they are not measured in our data.

First, exposure to unwanted birth may be controlled by delaying marriage. Marriage has long been considered to be a proxy for exposure to the risk of fertility, on the grounds that premarital sexual intercourse is relatively uncommon among women.⁴ This is all the more relevant in Muslim countries, where marriage is the sole socially tolerated context for childbearing (Axinn and Yabiku 2001). In particular, in Tunisia, the primary reason for getting married is to have children, consistently with exceptional out-of-wedlock pregnancies. This is corroborated by access to birth control options, such as the pill, and abortion, reducing marriage incidence (Choo and Siow 2006). Besides, marriage timing may affect both the supply of and demand for children.⁵ Therefore, a woman who pursues personal projects, such as higher education and career achievement, has incentives to delay marriage.

A second regulation decision is the timing of the first contraceptive use after marriage. Contraceptive use may take place episodically along the reproductive span—for example, to allow for birth spacing that smoothes economic and time burdens across years. The first use may occur immediately after marriage if children are not immediately desired. The time gap between wedding and first birth control may entail both anticipated and unanticipated decisions, which reflect not only cost-benefit calculations but also subjective attitudes toward family planning. Nevertheless, this gap can easily be observed, as opposed to the detailed birth control process. This justifies investigating it in this paper.

A third, unobserved, stage of regulation is the full sequence of contraceptive uses by the spouses over the reproductive span. However, whether the woman is currently using contraception, or if she has used it in the past, can sometimes be observed. Obviously, these decisions cannot occur before the first use of contraceptive techniques.

All regulation decisions entail expectations, trials and errors. Moreover, the analysis of these decisions may be further complicated by changes in individual preferences, and shifting tradeoffs between regulation motives, along with each woman's lifecycle. Specifically, schooling prospects, labor force participation, family founding, and old age health concerns may, in a somewhat successive fashion, occupy the minds of women as they age. Faced with this complexity, it is clear that estimating a complete structural fertility model, at least in the Tunisian case, is far beyond what is possible with the available cross-sectional data. In these conditions, our approach is instead to focus on the observable birth control decisions and their suggestive relationships with observed covariates, notably with family variables. Furthermore, learning more about birth control in Tunisia may tell us something useful about what the other, less advanced, Muslim countries are aiming to.⁶

Section 2 presents the context and the data. Section 3 reports and discusses the results. Finally, Section 4 concludes.

⁴ See Hirschman and Rindfuss (1980) and Coale (1992).

⁵ See Rosero-Bixby (1996) and Bongaarts (2006).

⁶ For example, see Ahmed (1985), Hanks (2006) and Yursteven (2015).

2. The Context and Data

2.1. Fertility Regulation in Tunisia

Fertility has plummeted in Tunisia over the last half century. The fertility rate, which was close to eight children per woman in the early 1960s, was nearly below the renewal threshold (2.05 children per woman) in 1999. Although a slight rise has been recorded since 2010, the fertility rate remains low at 2.2 children per woman in 2018. These demographic changes have been fostered by laws and institutions that have enhanced the social and legal status of women, starting with the 1956 Code of Personal Status that promoted female emancipation. The Code regulated marriage and divorce, abolished polygamy, set a minimal legal age for marriage, and replaced repudiation with divorce. The minimal legal age for marriage was set to 15 years for women and 18 years for men in 1956, and later further revised in 1964 to 17 and 20 years, respectively. As a consequence, women and men in 2014 married on average at 28 and 34 years of age, respectively.⁷ These changes have had direct consequences on fertility because out-of-wedlock births only amount to 0.5 % of births over 2000–2012.⁸

Through public campaigns, the Tunisian government incentivized families to limit their fertility.. Advertising and sales of contraceptive items were legalized in 1961. In 1964, a new institution, the ONFP (National Board for Family and Population), was set up to assist in restricting and monitoring fertility. Abortion was fully legalized in 1973. Finally, modern contraceptive instruments, allowing couples to better control their progeny, have been provided for free.

These policies contributed to the rise in the contraceptive prevalence rate from 31 percent in 1978 to 63 percent in 2001, before it declined down to 51 percent in 2018. The 2001 ONFP survey report claims that 84 percent of respondents stated that they had been using contraceptives (62 percent stated currently being using them). No major differences occurred across regions (e.g., 75 percent for rural vs. 83 percent for urban areas), or across education levels (75.9 percent for illiterate, 81.6 percent for primary, 84.8 percent for secondary, and 83.4 percent for higher education). Moreover, the average delay before the first birth control steadily fell between 1978 and 2001, from 6.56 years to 1.37 years. As a consequence, the number of surviving children at the first birth control use collapsed. The younger observed women, aged 20–24 years, often started to regulate their fertility after giving birth to a single surviving child. On average, regulation takes place after about two (1.93) surviving children (1.61 in urban areas vs. 2.63 in rural areas). The most commonly used methods are IUD (intra-uterine device, 44.1 percent), the pill (17.4), tying tubes (16.7), and calendar (11.8).

⁷ All quoted statistics are from the Tunisian Annual Statistics of the National Institution of Statistics (INS) from 1957 to 2014.

⁸ Source: Tunisian Ministry of Women and Children: annual report on children 2000, 2012.

2.2. The Data

The data we use are taken from the 2001 PAP-FAM Tunisian survey. Beyond its focus on family relationships, social culture, and fertility behavior, this survey provides information on various household characteristics, including reproductive and sexual health, for 6702 households. After dropping a few non-responses and focusing on the population of interest, we obtain a sample of 3175 married women from 15 to 49 years old, a reasonable approximation of their fertile spell. The main population of interest when studying fertility regulation is that of married women. Data truncation occurs since not all women marry. However, the proportion of never-married women is small (only 3.9 percent in 2001, at the time of the survey, 1.6 in 1984 and 2.3 in 1994, ONFP, 2011), and we can neglect this source of bias, which we cannot correct anyway. Moreover, in 2001 (respectively, 1984), only 9.1 (1.6) percent of the 45-49 aged women were not married, and 6.8 (1.5) percent for the 50-54 aged women, respectively (Recensement Général de la Population et de l'Habitat 2014, 2016). Another issue, specific to the marriage's age equation, is that some women are not yet married, and therefore not surveyed in the PAP-FAM survey. We deal with this truncation issue below, which turns out to have little influence on the results in this case. Let us now discuss the variables used in the analysis.

Two dependent dummy variables depict a *woman's age at marriage* and her *marriage duration before first birth control*, both in years. Moreover, two dependent dummy variables inform about the prevalence of birth control. First, the respondents state whether they have used contraception in the past (*contraceptive ever used*); second, they say whether they are using contraception at the time of the interview (*contraceptive currently used*).

Our independent variables are inspired by the literature on the determinants of fertility, given the information available, and we complete them with original variables on family interactions. We avoid regressors that would obviously be endogenous. Finally, we maintain similar covariates for these successive decisions to facilitate comparison. Other socioeconomic motivations, influences and perceptions would be relevant for fertility analyses. It could also be useful to distinguish among sociological groups. Event though these features are unobserved, hints about who financed the weddings and family interference may partly reflect them.

Table 1 reports descriptive statistics. One important independent variable, common in the fertility literature, is the *number of desired children*.⁹ In our data, this is recorded through a retrospective question to the women ('If you think back in time before having your children, how many children would you have liked to have had?'). A woman's age is included as a covariate not only because it determines its fertility potential, but also because it is associated with diverse lifecycle factors. In this respect, the husband's age is also included. A dummy variable for urban areas is incorporated, as fertility

⁹ For example: Rosenzweig and Seiver (1982), and Rosenzweig and Schultz (1987, 1989).

often differs substantially between urban and rural areas. Moreover, prices are known to vary with urbanization, which affects the cost of raising children. The other covariates can be categorized into measures of educational and career attainment and characteristics of family and social interactions.

Fertility theory, starting with the seminal works by Becker (1960,1965,1974), has taken into consideration education and job variables that relate to the human capital and opportunity cost of women's time as determinants of fertility. However, we do not include attainment levels since their effects are not statistically significant, perhaps because these variables are not accurately measured. We only account for schooling through two dummy variables (*woman never educated* and *husband educated*). Furthermore, due missing information on women's professional status, we employ a binary variable (*woman employed before marriage*), which attenuates the potential endogeneity of female employment in fertility decisions by anchoring the answer in pre-marriage times. Labor market participation before marriage should have occurred before the fertility decisions were made, as having children is tolerated only among married couples. We consider a woman's belief in her ability of simultaneously coping with worker's and mother's tasks by including a dummy variable for *job and housekeeping compatibility*. The husband's professional status is described by two dummy variables for *husband unskilled worker* and *husband skilled worker*, which aggregate job-specific information.

Household incomes, along with the direct costs and financial benefits of children, are not observed. We capture some related information through two dummy variables indicating who paid for the wedding expenses. Because the cost of wedding in Tunisia is traditionally born by the husband, observing that the couple has fitted the bill jointly (*couple finances marriage*) suggests that the husband experienced financial difficulties. Likewise, observing that the woman paid for her own marriage (*woman finances marriage*) signals a relatively wealthy wife, or a relatively destitute husband.

The few authors who incorporated social and familial characteristics confine their attention to father's characteristics (education, profession, area), as in Wong (2005). We innovate by including covariates related to the family network: a dummy variable for the couples who first met at their family's home (*family meeting place partner*), and a dummy variable for the husband being a close relative of his wife (*intra-family marriage*). These variables depict couples with a traditional orientation characterized by closely knit families. In Tunisia, marrying within the family is widespread (42.3 percent), while 63.5 percent of the respondent women first met their future husband at the family's home. These strong family ties make family interference in the couple's regulation decisions more likely, and reinforces interactions among family members in general.

We examine the relationship between family involvement and regulation decisions. However, including a variable for the presence of parental childcare may generate a simultaneity bias, as childcare may be spurred by a new birth, which could itself follow some relaxation of birth control. Therefore, we instead use a proxy binary variable that reports whether either a woman's family or her family-in-law usually intervenes in the nuclear family decisions (*family interference*). That is, we presume that when the

family has the habit of interfering in a couple's life, this may imply availability of childcare support, and that the interference was already established before any birth. Mahfoudh-Draoui (2000, p. 139) reports that only 8 percent (respectively, 4.5) of households in rural (urban) areas employ external child carers for children under 6 years of age, whereas most childcare is performed by relatives. Likewise, we include the parents' financial support through a dummy variable (*descending financial transfers*) indicating whether the couple benefits from financial assistance from their parents: 30 (18) percent of the couples regularly receive financial assistance from the husband's (the wife's) father or mother. In addition, we construct a dummy variable (*discussion between wife and husband*) indicating whether the woman regularly speaks with her husband about his job, financial difficulties, housekeeping problems, or social issues. This variable proxies the degree of understanding between spouses. We also attempt to capture female autonomy by including a dummy variable for whether the woman must have a relative accompanying her when she visits a health center (*companion to health center*). This variable is a proxy for the woman's submission to traditions. Moreover, we include a dummy variable identifying women who state that children come from God (*God gives baby*), and may shun contraception owing to this belief. Finally, we include a dummy variable for the occurrence of lost pregnancies five years before the survey (*lost pregnancies*) as a proxy for women enjoying a poor reproductive health, a potential reason to limit sexual intercourse.

3. Results

The regressions for the age at marriage, and for the delay before the first birth control, are specified as Weibull duration models, which is a parsimonious functional form for this kind of model, and allows for increasing and decreasing hazard function. This conditioning is based upon the abovementioned covariates. Any obviously endogenous independent variable is omitted. However, since the estimates are based on a cross-section, and finding instruments for all possible regressors suspected to suffer from endogeneity is not feasible, the results should be interpreted as suggestive correlations rather than robust, undeniable causal effects.

For the marriage age equation, the population of interest should be the population of women over 16 years old (i.e., who can legally marry), as opposed to the other equations that make sense only for married women since they are the ones possibly using contraception, bar exceptions, in Tunisia.¹⁰ Since only married women are observed in the data, the sample for the marriage age equation is truncated. Indeed, some women were not surveyed because they were not married at the time of the survey, and may have been or will probably get married later. To explore this issue, OLS and truncated regressions of the marriage's age are also estimated, in levels and in logarithms, with a few variables that pertain to

¹⁰ All over the world, the contraceptive prevalence rate is measured for women 15-49 who are married or in union. Besides, the marriage event involves such a change in life context that it may generate truly structural changes in behavior. This is an additional reason to separate married and unmarried women in the analysis.

post-marriage information omitted. Moreover, the sample for the delay till the first birth control is right-censored due to the 18 percent of married women who were not observed to have made any birth control attempt at the time of the survey. However, this can be dealt with by specifying the right-censoring in the likelihood function of the Weibull model. All this clarifies the difference between the number of observations in the descriptive statistics and the estimation results. The sample size in these estimations is 3132 for the marriage age equation and 2901 observations for the other equations due to missing values. Finally, the regressions for currently using, or having ever used, contraception are specified as probit models.

3.1. Age at Marriage

We first show that the above-mentioned sample truncation that is associated with marriage age is innocuous for our purpose. For this, we estimate accelerated failure time (AFT) models that can be defined by the equation: $\log(t_i) = x_i' b + f_i$, where t_i is age at marriage, x_i are explanatory factors, b is a vector of parameter to estimate, and f_i is an error term, for observations $i=1, \dots, n$.¹¹ If there is no truncation, this equation can be estimated consistently by using OLS, for any reasonable distributions of errors, assuming that all factors are exogenous. To allow for the truncation, a truncated regression is estimated using the maximum likelihood method, by assuming that the f_i follows a normal distribution. If f_i is normal, then the AFT model is a lognormal model. By changing the functional form of the dependent variable, the restriction on the error distribution in the t_i model can be varied. For example, an equation with t_i in levels is also estimated, using both OLS and truncated regressions: $t_i = x_i' b + f_i$. Across all the tried estimation results (not all shown), there is a general correspondence in the signs and significance of the estimated coefficients, except for the age coefficient, for all estimation methods, including for the Weibull duration model that is related to the opposite of t_i . Indeed, increasing the hazard function of marriage corresponds to decreasing the age of marriage.

Therefore, a qualitative agreement is found for all estimation results for the marriage's age determinants, whether or not truncation is taken into account. Moreover, examining the precise estimation results in Table 2, for column (a) versus column (b), and column (c) versus column (d), shows that the effect of the truncation is likely to be insignificant in these data, for any included factor, except for age for which the estimated coefficient changes sign after correction for truncation. The latter is not surprising because most women yet-to-be-married are young, and the truncation is correlated with age. Therefore, in our comments we focus on the Weibull duration model estimates, in column (e), without truncation

¹¹ An AFT model provides an alternative to proportional hazard models that assume that a covariate changes multiplicatively the hazard by some constant. Instead, in an AFT model a covariate accelerates the life span by some constant. Because they can be estimated in linear regressions, AFT models are robust to exogenous omitted covariates, and do not depend asymptotically on the choice of the parametric distribution of errors. Finally, the Weibull model can be reformulated as an AFT model. However, since AFT models in general do not imply constant hazard ratio, a popular assumption in social sciences, they are viewed here rather as an investigation device rather than an alternative to proportional hazard models (See however Farouk 2018).

correction. However, when moving from AFT models to the Weibull model, the estimated coefficient of the variable ‘Woman never educated’ becomes insignificant, whereas the effect of ‘Job and housekeeping compatibility’ becomes very significant. This may uphold the use of the Weibull model instead of mere regressions.

On the whole, the conjecture that age at marriage is used as a birth control device is corroborated by these estimates that confirm the substantial influence of typical determinants of fertility demand. Examining distinct age classes would have been interesting, but our sample is too small to do this. Of course, the population’s ideas about marriage may have changed over time, which may imply that the link between age at marriage and birth control is less simple than it may appear. However, the estimated duration model provides us with a simple interpretation grid in which a few control variables, such as age and education, attenuate these concerns.

A woman’s age is a biological factor that affects her odds of having a child. We find that it affects age at marriage, even though the sign of its coefficient may be changed by the truncation. On the one hand, age affects biological processes and therefore lifecycle fertility. The older a woman is, the shorter her reproductive span, and as a consequence, the more limited an older woman’s prospects in the marriage market is. On the other hand, a woman’s desire to have children declines with age, as Cochrane and Guilkey (1995) already argued for Tunisia in the 1990s. However, owing to the lack of robustness of the estimated coefficient of age to the correction for truncation, we prefer not to interpret this effect, and rather consider the woman’s age variable as a mere control. Interestingly, the number of children desired is found to have a significant positive impact on the hazard of marriage, accelerating the contracting of marriage on average. Childbearing is a motivation for the marriage decision.

We find that the women who believe being able to fulfil both job and housekeeping tasks marry significantly later, by almost eight months. Diverse interpretations are possible. Overworked women may be less inclined to marry early, and, thereby to accumulate childcare burden. The results also show that, as in Wong (2005), (prior to marriage) employed women postpone marriage more than the unemployed women. This is consistent with raising children being a hindrance to career development and even to securing a job. In addition, because of the correlation of a woman’s labor force participation and the minimum husband’s quality that she would accept, her perceived opportunities of marriageable men may be less numerous, which may delay marriage.¹²

A woman having a higher income, proxied by the variable ‘woman finances marriage’, is associated with a higher estimated hazard of marrying. Contrary to findings by Palamuleni (2011) in Malawi, wealthier women who finance their own wedding in Tunisia marry approximately one year earlier, perhaps because they are more attractive financially to male suitors. As is usually found,¹³ urban women

¹² See also Loughran (2002) and Macunovich (1996).

¹³ For example, in Zahangir et al. (2008) in Bangladesh.

marry later, albeit only by seven months. This is consistent with women in urban areas being more educated, having more job opportunities, and being less traditional. In contrast to its effect on other decisions, which we discuss below, no significant effect of women's education on age at marriage is found. However, the few women with higher education in the sample tend to have married later.¹⁴ Finally, we find that strong family networks, in particular proxied by the variable 'family meeting place of partner', increase the hazard of the marriage event. Women belonging to a traditional family that arranges the marriage spend on average 15 months fewer on partner search. Since traditional Muslims often marry first cousins or other kin whom they already know, this saves on partners' time to learn to know each other. Furthermore, 'intra-family marriage' speeds up marriage occurrence by almost one and a half years. We now turn to the second-stage decision, which is the delay in the first birth control after marriage.

3.2. Marriage Duration till the First Birth Control

The estimates of the Weibull model for the delay till the first birth control, measured in years, are shown in Table 3(Col.f). The variable desired number of children is found not to significantly affect the hazard of the first control. A woman, and her partner, may not start using birth control immediately because they want at least one child, while their final number of children may not necessarily matter for the timing of the first use of contraception since conceptions may be spread over time. Moreover, the couple may decide about a definite number of children only after having had their first child and experienced parenthood. Finally, measures of ideal family size may provide inaccurate information on past motives for having children, as they reflect retrospective opinions that can change. For example, a woman may adjust her fertility target to changes in socioeconomic conditions that alter her perceived costs and benefits of children. In the case of undesired births, ex-post revision of family size preference may also occur through ex-post rationalization.

The older a woman, the greater the likelihood that she has used contraception early after marriage. We discuss below, along with contraception use, some interpretations of this result. Conversely, the husband's age is only weakly negatively correlated, at the 10 percent level, with the delay the first birth control.

Consistently with the previously obtained results for age at marriage, a woman who can accommodate both professional and housekeeping tasks is significantly less inclined to use birth control early, with an almost two-year delay. However, her career plans, as gauged by whether she was employed before marriage, do not significantly affect the hazard rate of her initial birth control, perhaps because it is a pre-marriage variable. Indeed, while 37.7 percent of respondents worked before marriage, only 14.4

¹⁴ We do not report this variable in the table for consistency with the sets of covariates in the other equations and to avoid drawing conclusions based on too small a subsample.

percent were still working at the time of the survey. Her husband's professional skill level and education do not significantly affect the delay in the first birth control. This reflects the smaller role that the husband plays in the fertility timing decision and in childcare. In contrast, women's education matters a great deal. Educated women first use contraceptives earlier after marriage, which contrasts with findings obtained by Bloom and Trussel (1984) in the US. Never-educated women delay birth control by as much as 34 months on average. For urban women, contraception occurs on average fifteen months earlier. Residing in an urban area is associated to lower demand for children and earlier contraception. Frequent discussions between spouses are significantly and positively associated with a reduction of the span without birth control—by more than five years on average. In couples that communicate a lot, the woman may not feel constrained to have children immediately after marriage to increase her likelihood of retaining her husband. This is the case for couples in which the spouses are enrolled in higher education and decide to complete their studies before having children.

Belonging to a traditional family in which the marriage is arranged by the parents, or with family interference, are found to delay the use of contraceptives by 13 and 16 months, respectively, presumably because conservative values favor a large family size. This is consistent with findings in the literature that family-arranged marriages are associated with higher fertility.¹⁵ Moreover, financial parental assistance is found to be correlated with a significant delay in the first birth control, by almost four years. Beyond direct family pressure, parental financial assistance may be correlated to low income that induces a negative income effect, which incite the couple to adjust their family size upward and delay birth control.

3.3. Contraceptive Use

The last regulation decision considered is captured by two dummy variables indicating whether a contraceptive is currently used (during the survey) or has ever been used.¹⁶ The estimated marginal effects from the respective probit models are shown in Table 3. We discuss them jointly because the significant effects are often similar.

The estimates again highlight familial influences as significant factors. When family members are tightly knit through intra-family marriage, encroachment on marital life, or intergenerational financial transfers, contraceptive devices are less often used, during the survey or before. As in Ghimire and Axinn (2013)'s findings in Nepal, the widespread erosion of family-arranged marriages may have weakened resistance to contraception in Tunisia.

Family interference, generally accompanied by opportunities for childcare by grandparents, often reduces the time that a woman has to devote to her children, hence reduces her opportunity cost of

¹⁵ As discussed in: Hong (2006), Ghimire and Axinn (2013) and Frini (2014).

¹⁶ 'Are you using any contraceptive method at the moment?' and 'Do you have any experience of contraceptive practice?', respectively.

having children, and, as a consequence, diminishes her use of contraceptives. Benefiting from family childcare facilitates the coordination of a woman's roles as worker and housewife, thereby allowing higher fertility.¹⁷ As in Ermisch (1989), Del Boca (2002) and Frini (2014), greater family childcare availability fosters fertility. Family interference is associated with a similar decline in contraception use, during the survey, or ever, by approximately 15 percent in both cases. Moreover, the availability of parental financial support diminishes the likelihood of having ever used contraception by 29 percent, and of using it during the survey by 35 percent. Finally, marriages arranged by families are associated with an 11 percent lower probability of using contraception during the survey.

A traditional sociocultural context appears to be unfavorable to birth control. Indeed, women who believe that having a child is a 'decision made by God' are half as likely to practice contraception. As for the delay in the first birth control, frequent communication between spouses affects birth control in the past (decreasing the probability of use by 40 percent), but not during the survey. Similar to findings in Link (2011) and Sharan and Valente (2002), better communication between the husband and wife increases contraception use, perhaps because they often pondered it jointly.

A woman's age positively affects her contraceptive use, during the survey and before. This rejoins the negative effect of women's age on the delay before the first control. There may be many reasons for these results. First, although many respondents are observed around the end of their reproductive period (49 percent are 37–49 years old), there may be sufficient variation in the age variable to reveal a decline in the need and capacity for children with age (between one and three percent per year), as women approach the end of their fertile period. This may explain why they do not use contraceptive currently, although not the effect of age on past contraception. Second, age is directly related to the exposure time to contraception. Therefore, the older the women the longer her opportunity period for having used contraception in the past. However, this may only marginally explain why older women delay more the first birth control.

A third interpretation of the finding that older women have employed more birth control is that the Tunisian demographic policy has evolved over time, shifting from a severe anti-birth orientation after the independence until the end of the 80s, to more emphasis on reproductive health care by the ONFP after the 1994 Cairo conference, and later on cancer prevention and sexual education of the youth. Accordingly, the contraceptive prevalence rate that was almost nil in the sixties, rose to above 30 percent in the seventies, to reach 59.7 in 1994 and 70.5 in 1999, then fell down to 63 in 2001, and 51 in 2018. Gastineau and Sandron (2000) present the Tunisian Family Planning policy over 1964–2000, which is completed in Gataa (2015). Initially, the policy was focused on a contraception intervening after the number of children has been obtained, quickly after marriage. From 1976, more subtle orientations were developed, with an attempt to enhance the pill, which nonetheless never reached the popularity of the

¹⁷ See Rindfuss et al. (2007), Compton and Pollak (2011) and Aassve et al. (2012).

DIU. In the early eighties, the Sixth Development Plan strengthened the family planning policy. Since the effects of delaying marriage had already been obtained at this time, all the efforts were devoted to the diffusion of contraception methods, including in the so far relatively neglected rural areas. From the mid-eighties, family health issues come to the ONFP policy forefront, thus diverting resources formerly devoted to contraception. Many different health issues are now dealt with through a global policy that puts less weight on contraception. Maffi and Affes (2017) confirm that, at this stage, birth control and diminishing fertility are no longer political priorities for the Tunisian state. They also note that from the late nineties, the ONFP contraception services have no longer been as efficient as in the past.

A fourth factor of the relative decline in interest of women for modern contraception is the progressive surge in abortion services that compete with them. This partly explains why observed young women have used modern contraception methods less, as compare to older women. Even if abortion was legalized in 1965, it was fully available only from 1973 without conditions to fulfill (husband' authorization and at least five children). Gastineau (2005) reviews the changes in birth control modes during the Tunisian demographic transition. She notes the increasing number of women using abortion, post 1973 legalization, even though they generally knew a modern contraception method. Abortion came to be the second most important birth control method after DIU. However, abortion is still a taboo subject among young women, which may explain why this information was not collected during the survey.

Fifth, conjuncture economic effects may contribute to reducing the use of contraception at some periods, if, as often believed, children's demand is stimulated by low incomes. Indeed, in that case, age effects for young fertile women may be confounded with year effects since these two variables are directly related in the survey. Economic growth was 8.8 percent on average in the sixties, and 72 in the seventies, then it went down to 3.8 during the 1983-96 crisis, to augment again, while only to 5.7 over 1987-2001. Finally, the recent resurgence of Islamist and traditionalist radicalized movements has perturbed the Tunisian society with calls to apply the Chariaa law and to restrict women's rights. This regression of mentalities, also noted by Maffi and Affes (2017), produced social and political pressure against the use of contraception. This political context also affected the functioning of medical centers that provided family planning and became targeted by the attacks of religious extremists.

A woman having more education is associated with a greater use of contraception, whether in the past (22 percent higher probability of use, relative to women with no education) or during the survey (15 percent higher). The literature has long shown that women's schooling favors more effective and intensive use of contraceptive methods.¹⁸ As before, male education does not influence contraception, in contrast to Cochrane and Guilkey's (1995) findings for Tunisia in 1988.

¹⁸ Rosenzweig and Schultz (1989); Chen et al. (1990); Schuler et al. (1997).

Compatibility between housewife's and worker's tasks negatively impacts past contraceptive use (by -15 percent), although it is insignificant for current use. This compatibility may matter mostly early in the lifecycle, when the woman attempted to establish her career. If this is the case, it would correspond mostly to past use of contraceptives and explain the results. However, this is not supported by the other variable on careers (woman employed before marriage), which has no significant impact on either contraceptive use. Moreover, the husband's skill levels, age and residency in urban areas are not associated with fertility control in this case.

The number of children desired is slightly negatively associated with the probability of current contraceptive use (-4 percent probability per additional child), as in Bollen et al. (1995) for 1988 Tunisia, and it does not significantly affect past use. The latter may be because fertility goals may change over time. Finally, lost pregnancies, which may be a sign of health problems, seem to induce women to avoid sexual relationships, and thereby reduce the probability of contraceptive uses by almost one-third, in the short and long run.

4. Conclusion

In this investigation, we consider several consecutive birth control decisions made by married women and their families in Tunisia: age at marriage, marriage duration at the first contraceptive use, and past and current contraceptive use. This sequential perspective elicits distinct lifecycle stages, given, for example, concerns about completing schooling or professional establishment early in life, then fertility plans, and finally health concerns.

Although perfect causal inference is not possible with the cross-sectional data that is used, the correlations obtained suggest explanations that call for additional collection efforts to better observe the lifecycle decisions of family members and the interactions with the extended family. Only the woman's age is found a significant correlate in all the estimated successive birth control decisions, and its effect may be confounded with stages of the family planning policy over Tunisia's history. The other independent variables differently affect the different decisions. Some factors are not influential at certain stages, such as the number of children desired, which has no significant effect on the first birth control timing, although it significantly affects the age at marriage; and the education of the woman, which has no effect on age at marriage, but significantly delays the first birth control.

Our main findings is the ubiquitous influence of the spouses' extended families on a woman's birth control. In particular, the availability of family childcare and parental financial assistance, and direct family pressure, are likely to make a couple less inclined to limit fertility.

Although we cannot assess - using these data - the direct effects of public contraception services, it is nevertheless valuable to draw tentative policy lessons. The hints about the successive motivations of

women suggest that family planning policies should be more a matter of fine tuning over the life cycle than a simple focus on the number of children as pursued by women and their families. In particular, the fertility decision—that is, having a child or not—and the number of children desired or the spacing of births have sufficiently distinct correlates that policy designs addressing these dimensions should be distinct.

Additionally, policy-makers should take greater consideration of the extended family when designing family planning programs. For example, surveys to monitor fertility could be directed not only toward women but also to husbands and to extended families. Moreover, media and advertising campaigns could also be targeted at men and families, not just women. Finally, future research should incorporate more dynamic analyses of women decisions in relation to family interactions within fertility processes. This broader perspective suggests that the resurgence of traditionalist politico-religious movements that foster the power of extended families, may affect future fertility regulation in Muslim countries. For example, family networks may be underlying the association of terrorism and fertility in MENA countries and elsewhere, as was found in the literature.

References

- Aassve, A., Arpino, B., & Goisis, A. (2012). Grandparenting and mothers' labour force participation: A comparative analysis using the generations and gender survey. *Demographic Research*, 27(3), 53–84.
- Ahmed, S. (1985). Factors affecting fertility in four Muslim populations: A multivariate analysis. *Journal of Biosocial Sciences*, 17(3), 305–316.
- Axinn, W. G., & Yabiku, S. T. (2001). Social change, the social organization of families, and fertility limitation. *American Journal of Sociology*, 106, 1219–1261.
- Becker, G. S. (1960). An economic analysis of fertility. In Universities-National Bureau *Demographic and economic changes in developed countries*. Princeton, NJ: Princeton University Press.
- Becker, G. S. (1965). A theory of the allocation of time. *The Economic Journal*, 125(299), 493–517.
- Becker, G. S. (1974). A theory of marriage: Part II. *Journal of Political Economy*, 82(6), S11–S26.
- Becker, G. S., & Lewis, H. G. (1973). On the interaction between the quantity and quality of children. *Journal of Political Economy*, 81(2), 279–299.
- Berrebi, C. and J. Ostwald (2015). Terrorism and Fertility: Evidence for a Causal Influence of Terrorism on Fertility. *Oxford Economic Papers*, Vol. 25, 63-82.
- Bloom, D. E., & Trussel, J. (1984). What are the determinants of delayed childbearing and permanent childlessness in the United States? *Demography*, 21, 591–611.
- Bollen, K. A., Guilkey, D. K., & Mroz, T. A. (1995). Binary outcomes and endogenous explanatory variables: Tests and solutions with an application to the demand for contraceptive use in Tunisia. *Demography*, 32(1), 111–131.
- Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review*, 4(1), 105–132.

- Bongaarts, J. (1983). The proximate determinants of natural fertility. *Population Development Review*, 2, 105.
- Bongaarts, J. (2006). The causes of stalling fertility transitions. *Studies in Family Planning*, 37(1), 1–16.
- Bongaarts, J., & Potter, R. G. (1983). *Fertility, biology, and behavior: An analysis of the proximate determinant*. New York, NY: Academic Press.
- Chen, J. A., Hicks, W. L., Johnson, S. R., & Rodriguez, R. C. (1990). Economic development, contraception and fertility decline in Mexico. *Journal of Development Studies*, 26(3), 408–424.
- Choo, E., & Siow, A. (2006). Who marries whom and why? *Journal of Political Economy*, 114, 176–201.
- Coale, A. J. (1992). Age of entry into marriage and the date of the initiation of voluntary birth control. *Demography*, 29(3), 333–341.
- Cochrane, S. H., & Guilkey, D. K. (1995). The effects of fertility intentions and access to services on contraception use in Tunisia. *Economic Development and Cultural Change*, 34, 791–804.
- Compton, J., & Pollak, R. A. (2011). *Family proximity, childcare, and women's labor force attachment*. Working Paper 17678, NBER. Retrieved from: <http://www.nber.org/papers/w17678>
- Del Boca, D. (2002). The effect of child care and part time opportunities on participation and fertility in Italian women. *Journal of Population Economics*, 14(3), 35–52.
- Easterlin, R. A. (1975). An economic framework for fertility analysis. *Studies in Family Planning*, 6, 54–63.
- Easterlin, R. A. (1978). The economics and sociology of fertility: A synthesis. In *Historical studies of changing fertility* (pp. 57–133). C.Tilly, L.K. Berkner (eds) Princeton, NJ: Princeton University Press.
- Ermisch, J. F. (1989). Purchased child care, optimal family size and mother's employment: Theory and econometric analysis. *Journal of Population Economics*, 2, 79–102.
- Faruk, A. (2018). The comparison of proportional hazards and accelerated failure time models in analyzing the first birth interval survival data. *Journal of Physics: Conference Series*, 974, 1-10.
- Frini, O. (2014). The familial network influence on fertility behaviour in Tunisia. *Journal of Economic and Social Research*, 16(1), 37–70.
- Gastineau, B. (2005). *Evolution des Modes de Contrôle de la Fécondité en Tunisie au Cours de la Transition Démographique*. Document de recherche n° 4, Laboratoire Population Environnement Développement, Janvier.
- Gastineau, B. and F. Sandron (2000). La Politique de Planification Familiale en Tunisie (1964-2000). *Les Dossiers du CEPED*, 61, Octobre, Paris.
- Gataa, R. (2015). Politique de population. Historique et Evolution, Conférence 'Le dividende démographique en Tunisie: réalités et projections', Tunis, 20 mai.
- Ghimire, D. J., & Axinn, W. G. (2013). Marital processes, arranged marriage, and contraception to limit fertility. *Demography*, 50, 1663–1686.
- Hanks, J. J. (2006). On the politics and practice of Muslim fertility: Comparative evidence from West Africa. *Medical Anthropology Quarterly*, 20(1), 12–30.
- Hirschman, C., & Rindfuss, R. R. (1980). Social, cultural, and econometric determinants of age at first birth in peninsular Malaysia. *Population Studies*, 84, 507–518.
- Hong, Y. (2006). Marital decision-making and the timing of first birth in rural China before the 1990s. *Population Studies*, 60, 329–341.
- INS (1957–2014). *Tunisian annual statistics*. Tunis: National Statistical Institute.
- Karsten, H., & Kohler, H-P. (2000). Gender preferences for children in Europe: Empirical results from 17 FFS countries. *Demographic Research*, 2(1), 255–267.
- Klasen, S., & Launov, A. (2006). Analysis of the determinants of fertility decline in the Czech Republic. *Journal Population Economics*, 19, 25–54.

- Link, C. F. (2011). Spousal communication and contraceptive use in rural Nepal: An event history analysis. *Studies in Family Planning*, 42, 83–92.
- Loughran, D. S. (2002). The effect of male wage inequality on female age at first marriage. *The Review of Economics and Statistics*, 84(2), 237–250.
- Macunovich, D. J. (1996). A review of recent development in the economics of fertility. In Paul Menchik (Ed.), *Household and family*. Boston, MA: Economics Kluwer Academic Publishers.
- Mafi, I. and M. Affes (2017). La santé sexuelle et reproductive en Tunisie. Institutions médicales, lois et itinéraires thérapeutiques des femmes après la révolution. *L'Année du Maghreb*, Paris.
- Mahfoudh-Draoui, D. (2000). *Etude de la socialisation de l'enfant dans la famille*. Dirasset, Tunisia: Ministère des Affaires de la Femme et de la Famille.
- Mason, K. O. (1986). The status of women: Conceptual and methodological debates in demographic studies. *Sociological Forum*, 1(2), 284–300. Retrieved from: <http://hdl.handle.net/2027.42/45651>.
- ONFP. (2001). Enquête tunisienne sur la santé de la famille. Tunis, Tunisia.
- Palamuleni, M. E. (2011). Socioeconomic determinants of age at marriage in Malawi. *International Journal of Sociology and Anthropology*, 3(7), 224–235.
- Recensement Général de la Population et de l'Habitat 2014 (2016). *Volume 3, Caractéristiques Démographiques et Fécondité*, Institut National des Statistiques, Tunis.
- Rindfuss, R. R., Guilkey, D., Morgan, P. S., Kravdal, Ø., & Guzzo, K. B. (2007). Child care availability and first-birth timing in Norway. *Demography*, 44(2), 345–373.
- Rosenzweig, M. R., & Schultz, T. P. (1987). Fertility and investment in human capital: Estimates of the consequences of imperfect control in Malaysia. *Journal of Econometrics*, 36, 163–184.
- Rosenzweig, M. R., & Schultz, T. P. (1989). Schooling information and non-market productivity: Contraceptive use and its effectiveness. *International Economic Review*, 30(2), 457–477.
- Rosenzweig, M. R., & Seiver, D. A. (1982). Education and contraceptive choice: A conditional demand framework. *International Economic Review*, 23(1), 171–189.
- Rosero-Bixby, L. (1996). Nuptiality trends and fertility transition in Latin America. In J. M. Guzman, S. Singh, G. Rodriguez, & E. A. Pantelides (Eds.), *The fertility Transition in Latin America* (pp.135–150). Oxford, England Clarendon Press.
- Rotundi, V. and M. Rocca (2019). Bombs and Babies: Terrorism Increases Fertility in Nigeria. SSRN Working Paper, June.
- Schultz, P. T. (1986). The value and allocation of time in high-income countries: Implications for fertility. *Population and Development Review*, 12, 87–108.
- Schuler, S. R., Hashemi, S. M., & Riley, A. P. (1997). The influence on women's changing roles and status in Bangladesh's changing fertility transition: Evidence from a study of credit programmes and contraceptive use. *World Development*, 25(4), 563–575.
- Sharan, M., & Valente, T. W. (2002). Spousal communication and family planning adoption: Effects of a radio drama serial in Nepal. *International Family Planning Perspective*, 28, 16–25.
- Wong, O. M. H. (2005). The socioeconomic determinants of the age at first marriage among women in Hong Kong. *Journal of Family and Economic Issues*, 26(4), 529–550.
- Yursteven, C. (2015). The socioeconomic determinants of fertility rates in Muslim countries: A dynamic panel data analysis. *Economics & Sociology*, 8(4), 165–178.
- Zahangir, M. S., Karim, M. A., Zaman, M. R., Hussain, M. I., & Hossain, M. S. (2008). Determinants of age at first marriage of rural women in Bangladesh: A cohort analysis. *Trends in Applied Sciences Research*, 3(4), 335–343.

Appendix

Table 1. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent variables					
Woman's age at marriage	3,175	21.61	4.20	10	45
Marriage duration before first birth control use (uncensored sample)	2,595	4.28	4.77	0	28
Contraceptive currently used	3,175	0.62	0.48	0	1
Contraceptive ever used	3,175	0.82	0.38	0	1
Independent variables					
Woman's age	3,175	35.85	7.45	16	49
Husband's age	3,175	42.95	9.44	22	99
Woman never educated	3,173	0.37	0.48	0	1
Husband educated	3,165	0.82	0.38	0	1
Job and housekeeping compatibility	3,137	0.59	0.49	0	1
Woman employed before marriage	3,175	0.32	0.46	0	1
Husband skilled worker	3,094	0.14	0.35	0	1
Husband unskilled worker	3,094	0.62	0.48	0	1
Urban	3,175	0.60	0.48	0	1
Woman finances marriage	3,175	0.00	0.01	0	1
Couple finances marriage	3,175	0.00	0.04	0	1
Family interference	3,029	0.52	0.49	0	1
Descending financial transfers	3,175	0.06	0.24	0	1
Intra-family marriage	3,172	0.45	0.49	0	1
Family meeting place partner	3,175	0.69	0.46	0	1

Discussion between wife and husband	3,175	0.97	0.15	0	1
Companion to health center	3,174	0.24	0.43	0	1
God gives baby	3,175	0.01	0.13	0	1
Lost pregnancies	3,175	0.09	0.28	0	1
Number of desired children	3,175	3.23	1.46	0	16

Table 2. Results for Marriage Age and Delay before Birth Control

Woman's Age at Marriage						Delay till the First Birth Control	
	OLS (a)	Truncated regression (b)	OLS in Logs (c)	Truncated regression in Logs (d)	Weibull duration model (e)	Weibull duration model (f)	
Woman's age (or Log)	.0572*** (.0100)	-.0324*** (.0123)	.0862*** (.0149)	-.0731*** (.0199)	-0.0388*** (0.00397)	Woman's age 0.0134*** (0.003)	
Woman never educated	-.357** (.166)	-.377** (.180)	-.0209*** (.00732)	-.0206*** (.00813)	0.0178 (0.0751)	Husband's age -0.00539* (0.002)	
Job and housekeeping compatibility	.225 (.146)	.249 (.159)	.00828 (.00642)	.00869 (.00721)	-0.166*** (0.0565)	Woman never educated -0.231*** (0.058)	
Woman employed before marriage	1.77*** (.160)	1.83*** (.178)	.0813*** (.00703)	.0870*** (.00809)	-0.415*** (0.0617)	Husband educated 0.0475 (0.072)	
Urban	.275* (.161)	.270 (.177)	.0126* (.00708)	.0142* (.00801)	-0.0701 (0.0686)	Job and housekeeping compatibility -0.14*** (0.054)	
Woman finances marriage	1.61 (3.99)	1.00 (4.41)	.0910 (.175)	.0676 (.203)	-0.0410 (0.0682)	Woman employed before marriage 0.0736 (0.060)	
Intra-family marriage	-.797*** (.149)	-.917*** (.163)	-.0454*** (.00678)	-.0407*** (.00737)	0.143** (0.0620)	Husband skilled worker 0.085 (0.093)	
Family meeting place partner	-1.01*** (.154)	-1.12*** (.170)	-.0348*** (.00655)	-.0519*** (.00771)	0.282*** (0.0635)	Husband unskilled worker -0.046 (0.063)	
Number of desired children	-.284*** (.0501)	-.289*** (.0537)	-.0121*** (.00220)	-.0123*** (.00241)	0.119*** (0.0167)	Urban 0.109** (0.054)	
Constant	20.8*** (.420)	24.5*** (.521)	2.80*** (.0529)	3.39*** (.0718)	-15.9*** (0.398)	Descending financial transfers -0.309*** (0.106)	
Weibull parameter log(p)					1.67 (0.0198)	Family interference -0.112** (0.052)	
						Family intermarriage -0.0925* (0.052)	
						Discussion wife and husband 0.422*** (0.148)	
						Number of desired children -0.0098 (0.016)	
						Constant -2.187*** (0.266)	
Observations	3,132	3,132	3,132	3,132	3,132	Observations 2,901	

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.

**Table 3. Probit estimates of contraceptive use at the time of the survey, and ever used
(marginal effects)**

	Current contraceptive use	Contraceptive ever used
Woman's age	0.0103*** (0.003)	0.0277*** (0.004)
Husband's age	0.0011 (0.002)	-0.0039 (0.003)
Woman never educated	-0.150*** (0.05)	-0.222*** (0.06)
Husband educated	0.014 (0.06)	0.059 (0.07)
Job and housekeeping compatibility	-0.080 (0.04)	-0.147** (0.05)
Woman employed before marriage	0.0072 (0.05)	0.009 (0.06)
Husband skilled worker	-0.019 (0.08)	0.146 (0.10)
Husband unskilled worker	-0.029 (0.05)	-0.007 (0.06)
Urban	-0.0006 (0.05)	0.069 (0.06)
Descending financial transfers	-0.352*** (0.09)	-0.290** (0.11)
Family interference	-0.146*** (0.04)	-0.158*** (0.05)
Intra-family marriage	-0.106** (0.05)	-0.080 (0.05)
Discussion between wife and husband	0.155 (0.15)	0.391** (0.16)
God gives baby	-0.583*** (0.18)	-0.475** (0.18)
Lost pregnancies	-0.289*** (0.08)	-0.330*** (0.08)
Number of desired children	-0.0385** (0.01)	-0.025 (0.01)
Constant	0.187 (0.25)	0.102 (0.29)
Observations	2,901	2,901

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1