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Are family sizes of parents and children still related? Revisiting the cross-generational relationship over the last century

Eva Beaujouan, Anne Solaz

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ARE FAMILY SIZES OF PARENTS AND CHILDREN STILL RELATED? REVISITING THE CROSS-GENERATIONAL RELATIONSHIP OVER THE LAST CENTURY

Eva Beaujouan
Wittgenstein Centre for Demography and Human Capital
Vienna Institute of Demography/Austrian Academy of Sciences
Anne Solaz
Institut National d'Etudes Démographiques (INED)

Abstract
The fertility levels of parents and children are positively correlated. The strength of this intergenerational transmission of fertility has rarely been studied on the long run. This article aims to analyze whether and to what extent men's and women's fertility over the last century has been related to the fertility in their family of origin. Using the French Enquête Famille et Logements 2011, a large-scale survey linked to the census, our estimation methods (Poisson and jittered count data) take into account the discrete nature of fertility variables, their possible non-linear relationships and the role of confounding factors. Results show a weak but significant and positive correlation of around 0.12-0.15 always stronger for women than men, in line with levels observed in other countries. The size of the family of origin became a weak determinant across birth cohorts, supporting the idea that family has lost implicit and explicit influence on fertility. In times when the two-child family model was becoming more widespread, extreme family sizes (both large and small) were much more likely to be reproduced. Whereas the higher fertility level of men and women from large families is largely explained by socio-economic factors, mimetism of parents' fertility prevails in small families. This transmission of small families might provide insights into fertility prospects and could partly explain why some European countries fail to escape low-fertility levels.
Keywords :
Fertility, Intergenerational transmission, family size, birth cohorts, siblings, quantile regression

Résumé
Les niveaux de fécondité des parents et des enfants sont liés mais la force de cette relation intergénérationnelle a rarement été étudiée sur le long terme. Cet article vise à analyser si, et de quelle manière, la fécondité des femmes et des hommes est liée à la fécondité de leur parents au cours du siècle. Utilisant une enquête de grande ampleur liée au recensement (Famille et Logements 2011), nos méthodes d'estimation (Poisson et modèle de comptage) tiennent compte de la nature discrète des variables de fécondité, leurs relations non linéaires et le rôle des autres facteurs. Les résultats montrent une corrélation faible mais significative et positive de l'ordre de 0,12 à 0,15 toujours plus forte pour les femmes que les hommes, proche des niveaux observés ailleurs. Le nombre de frères et sœurs a un pouvoir explicatif de plus en plus faible au fil des générations, soutenant l'idée que la famille a perdu de son influence implicite et explicite sur les choix de fécondité. Avec la diffusion de la famille de deux enfants, les tailles de familles extrêmes (nombreuses et petites) se démarquent et sont plus reproduites. Toutefois, alors que le niveau de fécondité plus élevé des enfants de familles nombreuses est largement expliqué par des facteurs socio-économiques, un mimétisme de fécondité entre parents et enfants prévaut dans les familles de petite taille, résultat qui peut en partie expliquer pourquoi, dans certains pays européens, les niveaux de fécondité restent faibles.
Mots clef
Fécondité, relation intergénérationnelle, taille des familles, générations, fratrie, quantile regression,

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Introduction

One salient feature of fertility is that people coming from large families tend to have more children, and those coming from small families fewer (Murphy 2013). Among several determinants of fertility intentions and behaviors in developed countries, the number of siblings – or, more generally, the size of the family one comes from – is a strong determinant of one's own number of children. A positive and generally significant correlation between parents' and children's fertility levels, ranging from 0.10 to 0.20, has been observed in several countries with very different fertility contexts. If this positive link between number of siblings and one's own fertility seems to have resisted the massive changes that occurred in families in developed countries during the last century (Dahlberg 2013; Murphy 2013), the strength of this relationship might have varied over the century and deserves deeper study.

Many fertility changes have occurred in the last century, most commonly in Western Europe and the English speaking countries. For instance, fertility fluctuated in France from 2.1 children per woman born in 1900 to completed fertility peaking at 2.65 for the 1930 birth cohort and then dropping back to 2.0 children per woman born in 1970 (Daguet 2002; Wittgenstein Centre 2012). After a sharp decrease, a rebound or stabilization in family size was observed in these regions during the baby boom (cohorts born around the 1930s), followed by a new decrease. One notable and widespread feature of fertility is that the two-child model diffused massively from cohorts born in the 1930's to those born in the 1950's (David and Sanderson 1987; Frejka 2008; Van Bavel et al. 2015). More than four out of ten women born in the 1950s and afterwards had exactly two children in France and in many developed countries. The diffusion of this strong new societal norm may have eroded the impact of family norms inherited from parents, implying a decline in fertility transmission from parents to children.

In addition, pathways to forming families changed and childbearing postponement may have weakened the strength of the association between parent's and children's fertility levels. The increasing delay in family formation and first parenthood observed from the 1950s cohorts in many countries could have made people more autonomous from the parental sphere at childbearing ages than some decades ago (Billari and Liefbroer 2010; Prioux 2006), as well as less dependent on parental and social approbation. Though it has been shown that women born at the turn of the ninetieth century already regulated their family size in France and in most developed countries (Bonvalet et al. 2014; Van Bavel and Reher 2013), the diffusion of oral contraception from the 70's allowed couples to choose more easily both the timing and the size of their family. Moreover, the recent access to assisted reproduction might partially help an increasing number of couples reach the desired number of children (te Velde et al. 2012). Overall, we observe more individual freedom in the ways of forming families, which may weaken the bond with family-of-origin characteristics.

Are family sizes of parents and children still related?

In this changing context, did people steadily replicate the size of their family of origin? Who are the people most likely to reproduce their parents' fertility?

In this article, we explore the strength of the relationship linking parents and children's family size over the twentieth century in France. We take advantage of the huge sample size of a French retrospective survey supplemented to the census in 2011, which covers almost one century of French fertility. This long-term approach collects the fertility of French birth cohorts born since 1922 and compares it with their parents' fertility, taking into account both women and men. An important methodological asset is that we use quantile regression to analyze the role of large and small families over time in perpetuating the family size of origin. We systematically test to what extent the relationship is driven by possible confounding effects, notably in terms of the parents' and children's social background. Our methodology is based on indicators and estimation methods (Poisson and jittered count data) that take into account the discrete and non-linear nature of fertility variables.

Mechanisms behind intergenerational family size relationship

Mechanisms by which fertility behavior of children might be related to parents' behavior are well established (see e.g., Kolk 2014; Murphy 1999). First, there is a possible social transmission of behaviors that could go through two channels: socialization process and social capital (Kalmijn 2015).

Socialization process appears as a major mechanism explaining family size correlation. Children observe their parents' behavior and are thus exposed to "intra-family norms" (Booth & Kee 2009) and parental values (Axinn and Thornton 1993). They are then more likely to reproduce the parents' behavior at adult ages. Growing up within a large or small family could increase preferences for the same type of family size through a need to perpetuate the family image that was instilled during childhood (Lois & Arránz Becker 2013). Authors such as Deville (1979) in France noted that there is a grown-up desire to recreate the childhood family atmosphere. The "good"[1] experience of growing-up with brothers and sisters might give preferences for also providing the first child with brothers and sisters and extending the family. On the other hand, growing up alone with possibly more attention from parents could give preferences for having a small family.

Another emphasized driver of family size transmission is social capital. Less connected to learning aspects, this stresses the importance of the transmission of family culture and values in shaping society (Bourdieu 1994) and then adult behaviors. Notably, family size is sometimes considered a typical social feature or social capital that will shape future behaviors. Berent (1952) noted that "class habits relating to family size seem to be, so to speak, "inheritable". In addition to these learning

[1] However, it is not clear if a "bad" experience of sibling relationships during childhood might have the opposite influence on fertility preferences.

dimensions, family size preferences could also be exerted through "social pressure and subjective obligation" (Bernardi 2003) shaped during childhood.

A range of research also points toward biological dimensions in terms of a possible transmission of physiological ability to have children (Kohler, Rodgers, & Christensen 1999; Murphy & Knudsen 2002): the physiological ability to conceive can be transmitted, and thus some people would inherit a constraint on their ability to conceive and – like their mother/father – be less likely to conceive (or the other way around). This type of interpretation has its limits, because over time such a case would lead to the most fertile persons quickly becoming the large majority by having many more children, which in turn would lead to them having surpassed those who are less fertile.

One difficulty in analyzing the intergenerational relationship between fertilities is that both parents' and children's completed fertility might be linked to external factors that are more or less observable. It is generally hard to disentangle the origin family size from other socio-economic and cultural factors, and vice-versa. For instance, it is well-known that family size and ethnicity are correlated, and it appears that the larger size of the family of origin among ethnic minorities at least partly explains their higher fertility, but it is not clear to what extent (Hannemann and Kulu 2015). A positive correlation is also generally observed between fertility and religiosity. A more religious population is also more likely to have a large family of origin. But, again, how can we disentangle different effects from among determinants that are highly correlated? This also holds for social status or level of education, for instance. Notwithstanding several overlaps and interactions between possible observed factors, many factors that are likely to affect the parent-child transmission certainly remain unobserved.

Some researchers are interested in the correlation between parents and children fertility, particularly when evaluating to what extent it could explain fertility changes and help forecast future fertility levels and population; but they do so only *per se,* without taking into account external drivers (Preston 1976; Murphy & Knudsen 2002; Pullum and Wolf 1991). However, most of the research tries to consider the importance of social status in explaining this intergenerational transmission. Some have noticed a greater concentration of fertility among less educated women in France (Shkolnikov et al. 2007; Vaupel and Goodwin 1987). Deville (1979) observed a U-shaped curve of transmission centered on those holding a lower secondary diploma. In contrast, Kolk (2014) found in Sweden that socioeconomic status is of little use in explaining the intergenerational correlation in family size. Others also focus on its interrelation with other cultural or socioeconomic determinants of fertility (Anderton et al. 1987; Bernardi and White 2010; Booth and Kee 2009; Dahlberg 2013; Johnson and Stokes 1976).

In this article, we decided to systematically show the results with and without some controls on the characteristics of parents and children. In this way, we are able to measure the extent to which including controls can change the general relationship and the trend of the relationship.

While most of the literature focuses only on women, works that study both sexes or include the male partner's characteristics show that the number of siblings plays a role for both sexes (Booth and Kee 2009), but with a higher intergenerational correlation for women than for men. This is in line with studies supporting that women would have more influence on fertility choices than men. Thus, their family background, including their number of siblings, would have more impact on the couple's fertility. However, recent studies find that the stronger influence of women in couple fertility decisions has vanished (see e.g., Bauer and Kneip 2013). This challenges results that indicate a higher effect of parental family size for women than for men, especially in the recent period, and it reinforces the adequacy of a systematic long-term approach that could highlight such changes across cohorts.

Changes over time in the parent-child fertility relationship

The change in the correlation between parental and offspring fertility over a long period of time has been only partially explored. Up to now, the rare studies which analyze the parent-child fertility relationship over time produce somewhat contrasted results for a selected period. Furthermore, they mainly focus on women only. Using Poisson models, Murphy and Wang (2001) show that, among women in several countries who are in age groups that have not yet completed their fertility, the relationship between number of siblings and children tends to become stronger over time for cohorts born in the middle of the 20th century. Murphy (2013) shows a rather stable correlation using a comprehensive collection of datasets in the most recent period. Finally, Dahlberg (2013) establishes that intergenerational continuity in fertility behavior remains stable in Sweden between the 1940 and 1955 birth cohorts for men as well as women. Although they show short-term trends of the intergenerational link, these papers do not allow evaluating the changes over a very long period because of limited data. Why should the correlation between two generations' fertility change over time?

One century of French fertility

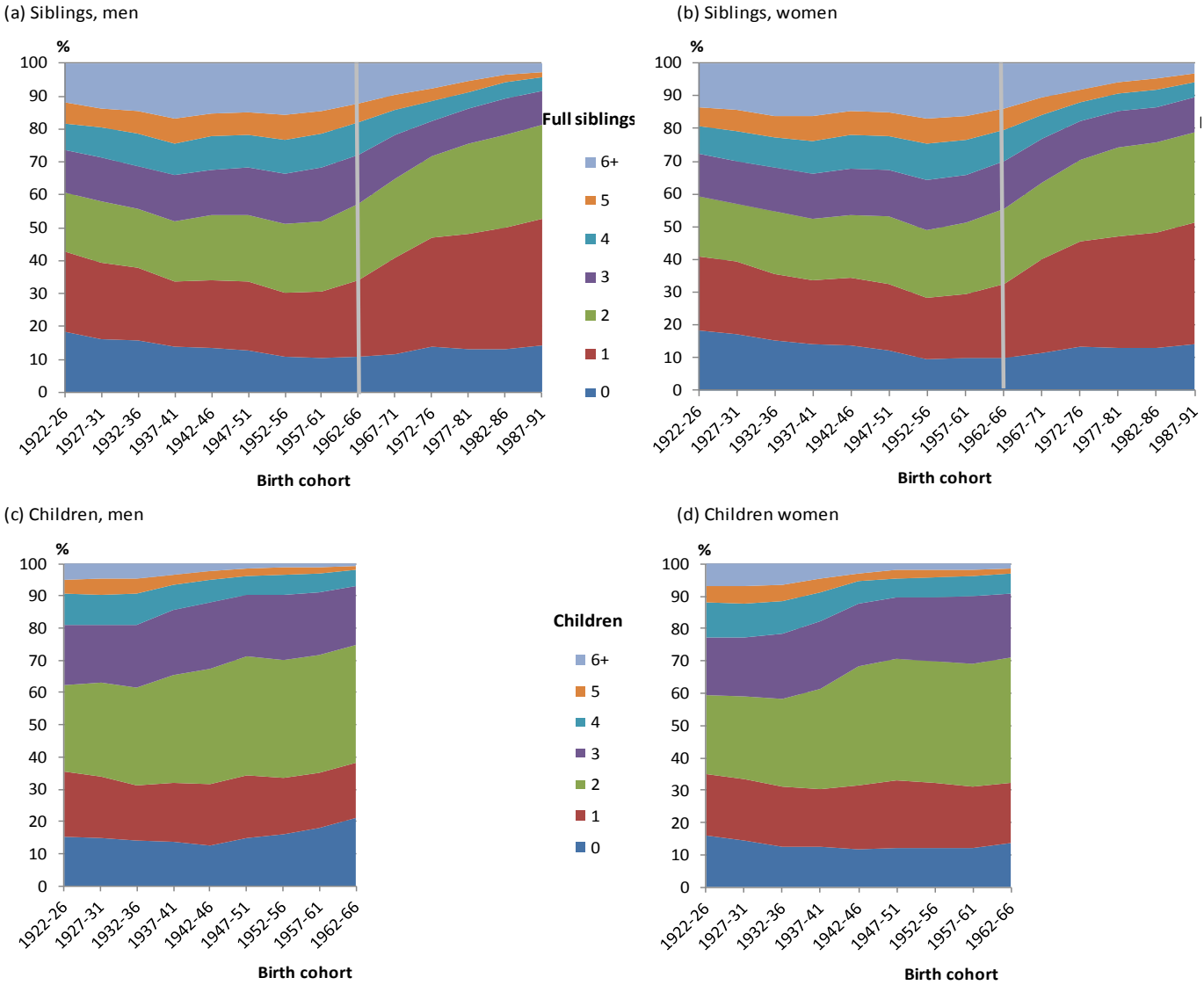
Over a long time period, intergenerational correlation of fertility behaviors can hardly be disconnected from historical changes in fertility. The 2011 French Family survey allows observing the completed fertility at age 40 for individuals born from the 1920's until the end of the 1960's – the last birth cohort to have finished their fertility period. As respondents were also asked for their number of siblings, the fertility of their parents born at the end of the nineteenth century is also featured, painting a broad picture of historical changes in fertility over the last century.

Fertility has followed common patterns in developed countries over the twentieth century. The completed fertility of French women born in the 1910's was 2.3, a level very close to those also observed for the same US cohorts (Frejka and Calot 2001). This low level reminds us that people were already regulating their fertility with natural contraception methods and through marital strategies (Bonvalet et al. 2014; Van Bavel and Reher 2013). France was the European country that displayed the trend which was closest to the US in total fertility over the last century. Both countries

experienced a sharp increase in the fertility of the baby boom cohorts (up to 3.2 in the US 1932 birth cohort, and to 2.7 in the French 1929 cohort), followed by a strong decrease and stabilization (Frejka and Calot 2001, Figure 1). Like the US, France experienced over the century a decrease in the share of large families (3+ children) and a massive diffusion of the two-child family (Fig. 1c-d): Comparing women born in the 30's with those born in the 50's and afterwards, the probability of having exactly two children rose from three out of ten to four out of ten (Frejka and Kingkade 2001).

While the 1922-66 birth cohorts were driving changes in the distribution of the number of children, their number of siblings remained quite stable over time, except in the latest cohorts (Fig.1a-b). Minor changes consisted of a small decrease in the number of persons with or without one sibling.

Fig. 1 Distribution of number of full siblings and of number of children by birth cohorts



Sample: women aged 20-89 at survey
Source: Enquête Famille et Logements 2011 (EFL, Ined-Insee)

Factors of change in the parent-child relationship over time

Many factors could have played a role over the long-term. First, with the diminution of the range in the number of children and the rise in the two-child family, particularly over and after the baby boom cohorts (Frejka 2008; Van Bavel et al. 2015; see also Fig. 1), we could envisage less variability in the number of children and then a weaker correlation because of the high prevalence of this family model. Having grown up in a two-child family became more common in the last cohorts that we cover: individuals born in the late 1950's (Fig. 1a and 1b) became more likely to have only one brother or sister. We can expect that in the first stage, as two-child families were becoming more commonplace, the parental norm lost its importance in the face of the societal norm, thus leading to a weaker correlation. However, in the second stage that is visible at the very end of our study period, the family with two children can be reproduced by the next generation and the correlation might increase because of the succession of two-child families.

In addition, after a phase of family size limitation constrained by the lack of reliable contraception, efficient medical contraception in the second half of the century (and new procreative methods for the most recent generations) permitted better planning of pregnancies and possibly also reduced the gap between desired and realized number of children. Thus, since childbearing desires seem influenced by the size of the family of origin (Hayford 2009; Heiland et al. 2008; Régnier-Loilier 2006a), the actual number of children could grow closer to it. However, a lot of constraints can mitigate the positive effect of efficient fertility control, such as bad economic conditions that could prevent or delay childbearing projects, or educational disparities in control over reproductive life. Efficient contraception can also be seen as a way to enjoy more freedom and to be able to choose a number of children that is independent of the previous generation and of family pressure. In particular, the second demographic transition (SDT) started concomitantly with the end of the baby-boom (approximately in cohorts born in the 1940's) and was characterized by the increasing importance attached to individuality, which would suggest that the family background would have less importance in fertility choices. In the same way as with secularization, religion might gradually have lost its overall influence on family-size norms over the 20th century, though religious affiliation maintained greater relative importance in specific groups (Adsera 2006).

In most European countries, one of the key observed features of the SDT was a delay in family formation, which could also suggest more autonomy from the family at the moment of forming a couple, and thus a weaker influence from the childhood background. Results also indicated that children become less influenced by their parents as they grow older (Dahlberg 2013; Lois & Arránz Becker 2013). People tend to desire a number of children close to their family of origin's size during their youth (Régnier-Loilier 2006b), but less so upon getting older, suggesting a decrease in the correlation with advanced age in couple formation. Recently, Booth and Kee 2009 found no significant effect of family size on childbearing in the United-Kingdom. The delay in family formation thus conjectures a weaker correlation with parents' fertility for cohorts who lived through the SDT than for cohorts born before the Second World War.

Overall, more distance between the parents' and children's family models is implied by the diffusion of the two-child family norm, the second demographic transition, and the increasing delay in family formation. Therefore, we expect that the intergenerational transmission of family sizes has reduced across cohorts.

Mimetic behavior within small and large families

Some people grow up in large families and others in small families. The extent to which the reproduction of parental fertility differs at the bottom and top of the fertility distribution is also of great interest and has been explored very little up to now.

At the top of the fertility distribution, the reproduction of large families can be driven by families with strong religious convictions and family values, notably at the beginning of the twentieth century (Glass et al. 1986; Lehrer and Chiswick 1993). With the loss of religious importance, religious families became less numerous; so perhaps less transmission should be expected among large families. On the other hand, very large families became scarcer as well, and they may presently have specific behaviors that are distinct from the large families of earlier cohorts. It is thus not clear to what extent the fertility behavior of children in such families will be closer to those of their parents today than in the past.

At the bottom of the fertility distribution, it also seems reasonable that mimetic fertility behaviors can be observed between children and parents. People from small and wealthy families may have wished to have few children in order to maintain certain standards of wealth. A numerous family could lead to the fragmentation of accumulated wealth, depending on the inheritance laws. For the self-employed, family size could be related to strategies for transferring holdings and expanding business (Bourdieu and de Saint Martin 1978; Goody 2009)[2]. Again, the trend in this intergenerational transmission of small families is difficult to predict. Small families were probably more specific at the beginning of the century than nowadays. But the expectation of social mobility and better education for one's offspring (i.e., better quality) has contributed to a decrease in the number of children (quantity), leading also to a possible increase in the perpetuation of small families.

Therefore, while we probably expect that, because the determinants differ, the force of the relationship will be different if the individual grew up in a small or large family, the evolution of the relationship for both small and large families over birth cohorts is still difficult to predict. Thus, the expected change in the strength of the intergenerational transmission of family size for small and large families over the last century is still undetermined.

[2] However, at the beginning of the century in France, this was not the case for farmers with the largest family sizes (Desplanques 1985).

Data

The Enquête Famille et Logements 2011 (EFL, Ined-Insee) is a complementary survey to the French census. It is oriented towards the family and therefore provides us with the fertility history of the respondents. The sample covers 360,000 men and women, aged 18 or over. For our study, we selected 136,735 women and 68,331 men, all of whom were at the age of having completed their fertility (45 to 89 years old) at the time of the survey. They are grouped into nine 5-year birth cohorts.

Interestingly, we know the number of full and half-siblings for all respondents. We can tell the difference between full and half–siblings, but not whether the half-brother or half-sister shares the same father or mother with the respondent[3]. We can also tell the differences between brothers and sisters[4].

The number and date of birth of respondent's children are also available for all biological, adopted and even deceased children, as well as whether they live elsewhere or not. However, we cannot distinguish children from different unions. We have information on the professional occupations of the respondents and of their parents. The respondent's level of education and marital status is also reported. The place of birth is known for the respondents and their parents. The survey did not interview all the household members, but was instead restricted to either all the adult women or all the adult men within the household. Consequently, it was not possible to adopt a couple perspective that would use fertility information on both partners simultaneously[5]. However, such an approach would have to face selection bias issues, since stable couples are more likely to have numerous children. Our approach thus takes a broad approach and includes all women and men, whatever their current partnership status and conjugal history.

Our study covers the 1922-66 birth cohorts in France. But as the oldest generations were born of mothers who themselves were born at the turn of the 19th century, it covers an even larger period: almost one century of fertility. This very large sample size is a definite strength of the data, but of course, it also has drawbacks. First of all, the number of own children is probably under-estimated, given the self-reported aspect of the questionnaire, though many biases have been corrected through imputations by the institutes that provide the data (Direction des Statistiques Démographiques et Sociales - Insee 2014). But still, it's possible that at later ages the answers to questions on own fertility might be less precise if the respondent lost contact with some of their children. Imprecise reporting of sibship size is also possible, particularly if siblings died. Consequently, the risk of underestimation of both sibship size and offspring exists, and it is probably stronger for the first birth cohorts. Another risk for the oldest cohorts is linked to the selectivity of mortality, since our cohorts are aged 45-89 at survey. If people who come from large families or who have more

[3] In the cohorts studied here, the share of persons having a half-sibling was fairly stable at around 7%: it started increasing only for people born in the mid-60s, i.e., too late to provide any interesting insight into changes in transmission related to sibling type. For the cohorts studied, including or excluding the half-siblings does not affect results (see also the discussion).

[4] Again our results seem to not be sensitive to the sex-ratio of sibship.

[5] The survey provides information on last or current partnership; but, unfortunately, separations are known only if the respondent is not in a couple at survey time.

children are at a different risk of mortality, the observed cohorts (for which we observe only survivals) might be specific.

However, these cautions should not be considered as a strong drawback of the study, since we do not observe discontinuities in our results over cohorts. Furthermore, as a precaution, we took the three previous comparable surveys (conducted in 1982, 1990 and 1999) and calculated the number of siblings in the same birth cohorts. There was a downward bias among all the cohorts in the 2011 survey, due to a change in the formulation of the question[6]. However, the levels were consistent and the bias was not stronger in the oldest cohorts. It means that differential mortality according to the number of siblings might be limited. This cannot be completely assessed, of course, and we will be careful in interpreting the changes in the very early cohorts.

Method

The intergenerational transmission of family size is measured by the effect of parents' fertility on the respondent's number of children. Our dependent variable is completed fertility (the total number of children of respondents aged 45+), so that our results will not be sensitive to calendar effects such as increased delay in motherhood. Our main variable of interest is the respondent's number of siblings, including full and half-siblings. If we exclude step brothers and sisters, that number is also approximately the total number of children of their two parents. The discrete nature of the variable "number of children" does not facilitate the analysis of the intergenerational correlation (Barakat 2014), for instance, when comparing it to other works on intergenerational income mobility and we thus adopt specific modeling strategies.

First, we calculate both linear and rank correlation indicators. Rank correlation, such as Spearman and Kendall estimates (see Appendix A), is less sensitive to extreme values of indicators when compared to linear correlation estimator, and it is more adapted to the discrete nature of the number of children. Linear correlations are also presented for comparison purposes with previous studies that used them.

Second, we created multivariate models. Using OLS regressions is not satisfactory for studying the number of children, again because of the discrete nature of the variable. Poisson can be applied to model the number of children (Baudin 2008; Murphy and Wang 2001, Booth and Kee 2009). To check robustness, we also performed ordered logit models and generalized ordered probit and the results (available upon request) were very similar.

In all models, we assess whether there has been a change in the intergenerational family size relationship, net of the fertility changes over time, and do so by considering the following regression between the respondent's number of children and the number of his or her siblings:

[6] So far respondent had been asked for the number of children of their mother, while in 2011 they have been asked for their number of brothers and sisters.

$$Total\ number\ of\ children = a^* Cohort_t + b^* Number\ of\ siblings + c^* Cohort_t{}^* Number\ of\ siblings$$

We include nine five-year birth cohorts for people born between 1922 and 1966. The coefficient *a* expresses the variation of fertility over the period, whereas *b* returns the general correlation. The coefficient *c* of the interaction between birth cohort and sibship size expresses the strength of the intergenerational relationship over time. We can then measure the trend of this intergenerational relationship between parents and children fertilities, net of the fertility changes that occurred simultaneously over the century.

Third, the level of fertility has changed over the long period studied, implying a weakening of the contrasts in parity outcomes, and it raises questions about the comparability of coefficients between birth cohorts. Up to now, the models informed us about the effect on fertility realizations at the mean as a result of having one additional sibling. Another way to compare two distributions with different fertility levels is to use dispersion indicators such as quantiles rather than means in order to see the extent to which having one additional sibling has the same effect at the bottom and top of the distribution. This has the further advantage of showing whether the correlation between parents and children is driven mainly by large or small families. To go further, we then propose applying a quantile regression. Furthermore, as we perform regression cohort by cohort, we are able to define small and large families in relative rather than absolute terms. For instance, we compare whether having one additional sibling affects the ten percent larger families differently from one cohort to the other. The absolute average number of children in this higher decile can be different from one cohort to the other.

Due to the discrete nature of the variable number of children (Booth and Kee 2009; Miranda 2007), this quantile regression uses the jittering method suggested by Machado and Santos Silva (2005), which allows smoothing the discrete data function. The smoothing is obtained by adding uniformly distributed noise. All in all, this method allows evaluating the effect of our main variable of interest (number of siblings) on the whole distribution of completed fertility cohort by cohort, so that we can analyze to what extent small or large families are more or less sensitive to sibship size over time. For sample size reasons and for better model performance, we grouped birth cohorts further and used 10-year birth cohorts.

The intergenerational correlation between parents' and children's fertility might be driven by other confounding intergenerational relationships (Anderton et al. 1987). For instance, similarities between occupation of mothers and daughters are also observed, which can be linked to their fertility levels. In all these models, we systematically perform specifications including control covariates step by step in order to test whether the observed trend might be sensitive to these possible confounding factors. Some of the control covariates are directly related to the respondent: level of education, occupational status and country of birth. Some additional covariates are related to their parents: their most recent occupational status as well as the mother's and father's country of birth.

Separate models are systematically performed for men and women.

Results

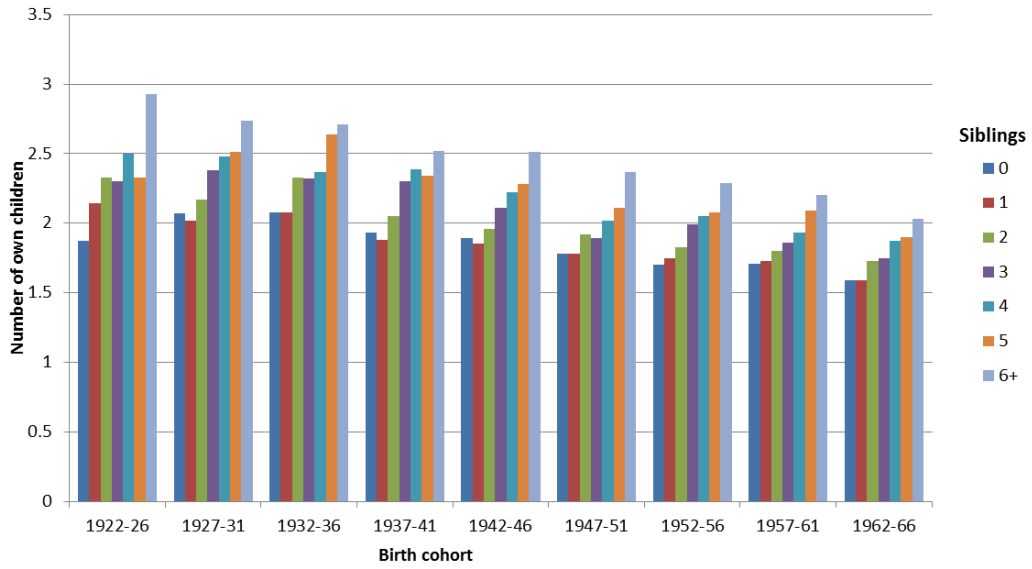
Descriptive statistics

Figure 2 shows the clear positive association between family size of parents and children. The mean number of children increases steadily with the number of siblings[7] in the family of origin for both men and women. As time passes, the magnitude of the contrast between those with few siblings and those with many siblings diminishes strongly, probably due in part to a reduction in the range of fertility. For women, the fertility of only children still differed from the fertility of one-sibling respondents in the first half of the century, whereas recently it has become similar. For men, the fertility of these two groups appeared to be similar, not only recently but across all the cohorts, suggesting that having zero or one sibling is the same. Murphy and Knudsen (2002) found a similar result for both men and women from a recent cohort in Denmark (1968-69): fertility was equivalent whether there was zero or one, but beyond this number fertility increased with each additional sibling.

One possibility is that small families became less differentiated with the spread of the two-child model for women in most recent birth cohorts. Another is that fertility patterns of children who grew up with one sibling or as an only child may be guided by other determinants related to their socio-economic background rather than parent's family size. These descriptive results thus call for further modeling with covariates.

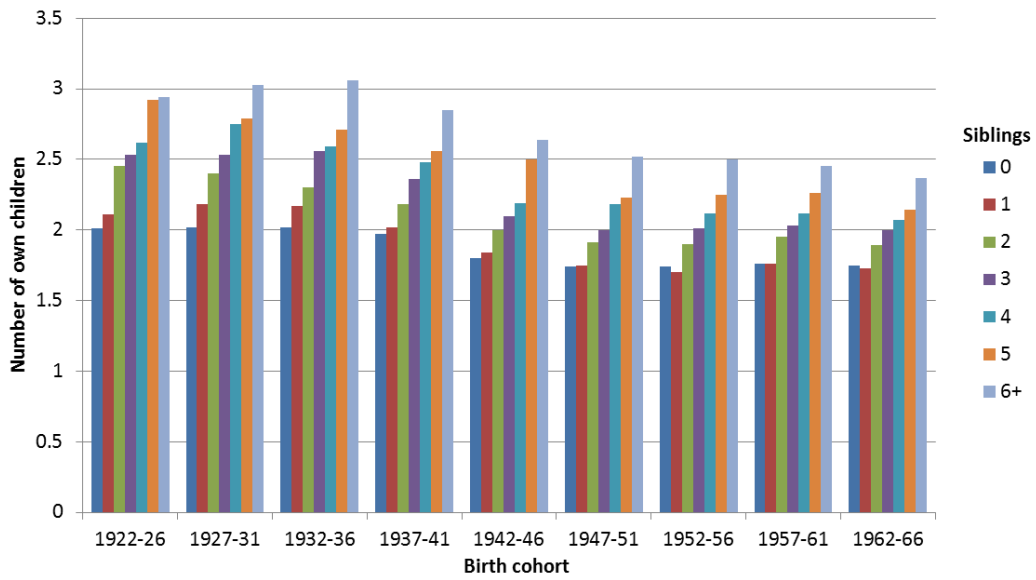
Fig. 2 Mean number of own children by total number of siblings among women aged 45-89 in 2011, by birth cohort.

(a) Men



[7] Whether half-siblings are included in or excluded from the sibship, the story is the same (see also Murphy and Knudsen 2002 for in-depth results on the difference in transmission for full and half-siblings).

(b) Women



Sample: women aged 45-89 at survey
Source: Family Survey 2011 (EFL, Ined-Insee)

Correlations

Table 1 presents the linear and rank correlations between male and female respondents and their parents' fertility, by sex and birth cohort. The level of simple linear correlation remains positive and significant, at comparable levels to those observed in previous studies: 0.17 for women and 0.13 for men (between 0.1 and 0.2). The stronger correlation for women than for men is also confirmed. The two other indicators of rank correlation also show higher magnitudes for female correlations than for men[8]. Women still adopt fertility levels that conform more to their parents' than do men.

Table 1: Linear and rank correlations of the number of children and number of siblings, by sex and birth cohorts

	Linear		Spierman		Kendall		N	
	Men	Women	Men	Women	Men	Women	Men	Women
All	0.127	0.167	0.120	0.162	0.094	0.128	68318	136735
1922-26	0.167	0.147	0.152	0.164	0.122	0.129	2154	6573
1927-31	0.140	0.167	0.130	0.161	0.108	0.123	3988	10252
1932-36	0.123	0.176	0.110	0.158	0.085	0.123	5367	12059
1937-41	0.136	0.187	0.134	0.172	0.107	0.134	6024	12151
1942-46	0.146	0.191	0.144	0.183	0.112	0.143	7601	14449
1947-51	0.143	0.186	0.129	0.180	0.102	0.142	10505	20075
1952-56	0.131	0.188	0.129	0.178	0.100	0.140	10470	19770
1957-61	0.112	0.166	0.110	0.166	0.087	0.131	10848	20318
1962-66	0.111	0.153	0.102	0.147	0.080	0.117	11361	21088

Sample: birth cohorts 1927-66, men and women aged 45-89 at survey
Source: Enquête Famille et Logements 2011 (EFL, Ined-Insee)

[8] The absolute levels of the different indicators are not directly comparable.

Concerning the correlation over time, the two indicators based on rank correlation (considered to be the most appropriate – see Method section) show similar patterns. The correlation between number of children and number of siblings decreases for both men and women from the 1922-1926 birth cohort until the last cohorts for parents of the baby boomers (1932-36). It then rises, reaching a maximum for the cohorts born during the Second World War before substantially decreasing afterwards.

The patterns are in line with observations over the period. The 1927-1936 birth cohorts (parents of the first wave of baby boomers) were not acting like their parents, who in fact had few children (Bonvalet et al. 2014; Van Bavel et al. 2015). At that time, there was a major reshuffling in family size distribution, which corresponded to low correlation levels between the fertility of generations. The baby boomers born from 1946 were the cohorts who initiated the second demographic transition, and they in turn changed their family and fertility behavior in comparison with their parents' generation. Despite their large numbers of siblings, they themselves had smaller families. The decrease in the intergenerational correlation is observed with the three indicators from that time and for both sexes. It corresponds to the beginning of the 1970's, when there was both better control of fertility resulting from the introduction and diffusion of the pill, and more freedom in sexual and conjugal life resulting from the increase in unmarried unions. This new freedom could have gradually weakened the link with family background and, subsequently, the correlation between children's and parent's fertility. The slight increase in correlation for cohorts born in the interim (1937-41 to 1942-46) is more difficult to understand at this stage, and we investigate its resistance to further modeling. It is indeed possible that trends in observed correlations are linked to fertility trends and to changes in other patterns over the period, such as the huge increase in education, which led us to implement multivariate models.

Models

The Poisson model controls for family size over time. Figure 3 shows the coefficients of the interaction terms between the number of siblings and the birth cohort, starting without covariates and adding additional controls by groups. The table showing the coefficients and standard errors for all covariates is available in Appendix B. In the basic model that includes only birth cohort and the interaction between birth cohort and number of siblings (model 1), we observe a decreasing trend in the relationship between sibship size and number of children for both sexes, though it is more regular for women. This means that, net of the fertility decline over cohorts, the strength of the relationship between parent and children fertilities is weaker and weaker. For men, the rebound[9] observed in the previous basic correlations is still observed, but a decreasing trend is also observed from the first post-war birth cohort; however, it is less marked than for women.

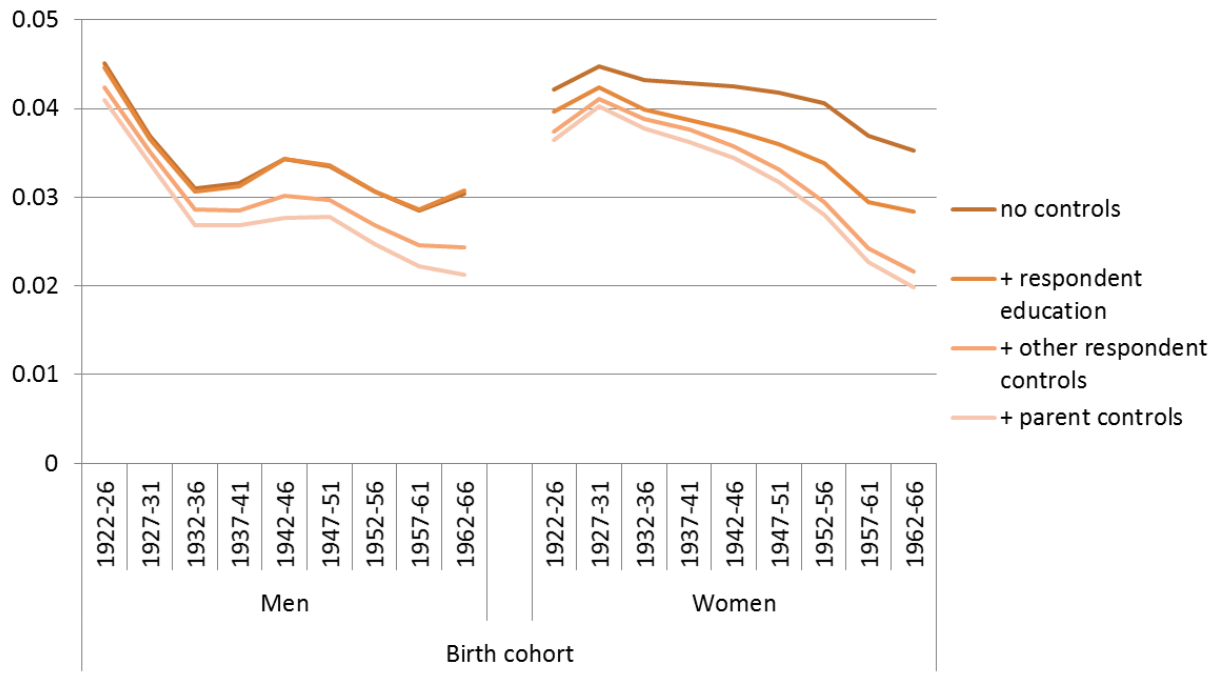
[9] The male trend for the first two cohorts should be viewed with caution because of a possible statistical artefact or selective mortality. Indeed, when checking the correlation of the same cohorts with the previous survey from 1999, the correlation trend of the men in these first cohorts is very similar to that of women.

The step-by-step addition of controls mostly reinforces this trend. We first introduce educational level (model 2). The intergenerational link previously observed is expected to change. Educational attainment may indeed affect the intergenerational link through several channels. Less educated people are more likely to come from large families. In addition, people with different educational backgrounds may react differently to the origin family size. Once education is controlled, we find that the decrease in the intergenerational correlation over cohorts becomes accentuated for women, whereas it does not change for men. Part of the intergenerational relationship previously observed thus seems to have been driven by educational attainment, especially for women in most recent cohorts. The huge increase in educational attainment over the period concerned women in particular, and this could explain the difference between men and women.

When model 3 includes other respondent controls (respondent's country of birth and professional occupation), the intergenerational link continues to diminish for both sexes, which is certainly due to the correlation between number of siblings and type of occupation, as well as to the change in the occupational structure over the period. Occupations such as white collar have gradually expanded, relative to manual workers. Finally, when model 4 includes parent characteristics (mother's and father's country of birth and professional occupation), this continues to lower the intergenerational link between numbers of children, but only slightly. This somewhat accentuates the decreasing trend for men. Note that the regression shows the professional position of the fathers figures prominently for own fertility, whereas the professional position of the mothers is of little importance. Instead, it is the activity status (whether the mother worked or not) that plays a role in the respondent's fertility level.

To conclude, though the relationship between sibship size and offspring was generally stronger for women than for men, this is no longer the case in the most recent cohorts once control factors are included. Also, the decrease over the long term has been more regular for women than for men. It seems that women have distanced themselves more than men from their family behavior since the cohorts born around 1930 (cohorts where women started working massively), thus becoming gradually more similar to men.

Fig. 3 Sibship size effect over cohorts on completed fertility, by sex. Poisson model



The coefficient of interaction term is shown, controlled for birth control.
Additional adjustment variables are respondent's level of education, country of birth, occupational status, mother's and father's country of birth and their occupational status (see Appendix B).
Sample: birth cohorts 1927-66, men and women aged 45-89 at survey
Source: Enquête Famille et Logements 2011 (EFL, Ined-Insee)

Quantile regression

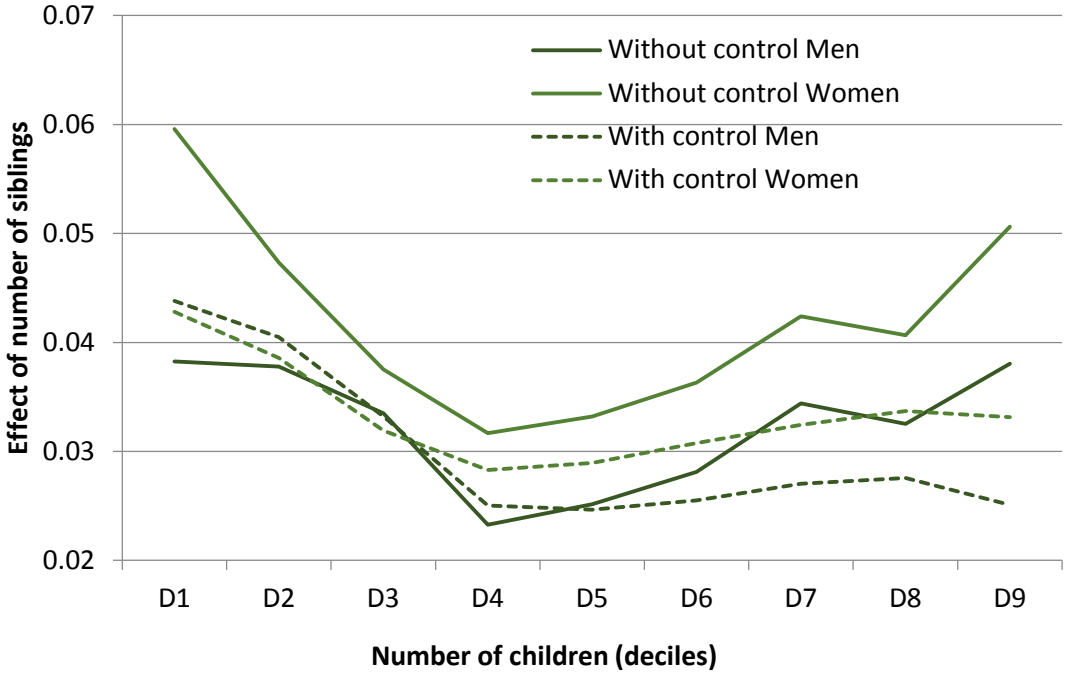
Up to now, we have measured the effect of sibship size on offspring at the mean. But of course having one more sibling can figure differently along the distribution of fertility when using quantile regression. In a context of fertility change, this method is also well-suited to comparing generations with different levels of fertility. Here we use a specific quantile model that is suited for discrete variables. We also present the coefficients of regressions performed on the whole population by sex (Fig. 4) and on each cohort separately by sex (Fig. 5), which are also available in table C of the Appendix.

The results confirm that women are more likely than men to reproduce the fertility of their parents (Fig. 4). This is true at all levels of the fertility distribution. The women at the bottom and at the top of the family size distribution show the highest correlation with their parents' fertility, indicating that extreme fertility behaviors are more likely to be reproduced. In contrast, the behaviors around the median of the distribution show lower intergenerational correlations.

When including controls, the effect of extreme values in the top deciles is very much attenuated – the curve is flatter for both men and women – meaning that part of the intergenerational correlation among large families is explained by socioeconomic factors. For small families, however, the higher correlation does not disappear so much and even increases for men when including controls. The interpretation is that there could exist a parent-child transmission that is independent of the socio-demographic characteristics in smaller families. Individuals coming from small families are more

likely in turn to have small families, all other things being equal. Let us now see whether this intergenerational transmission of small families exists across the whole period studied.

Fig. 4 Coefficients of the origin family size at each decile of respondent's number of children, by sex (quantile regression)



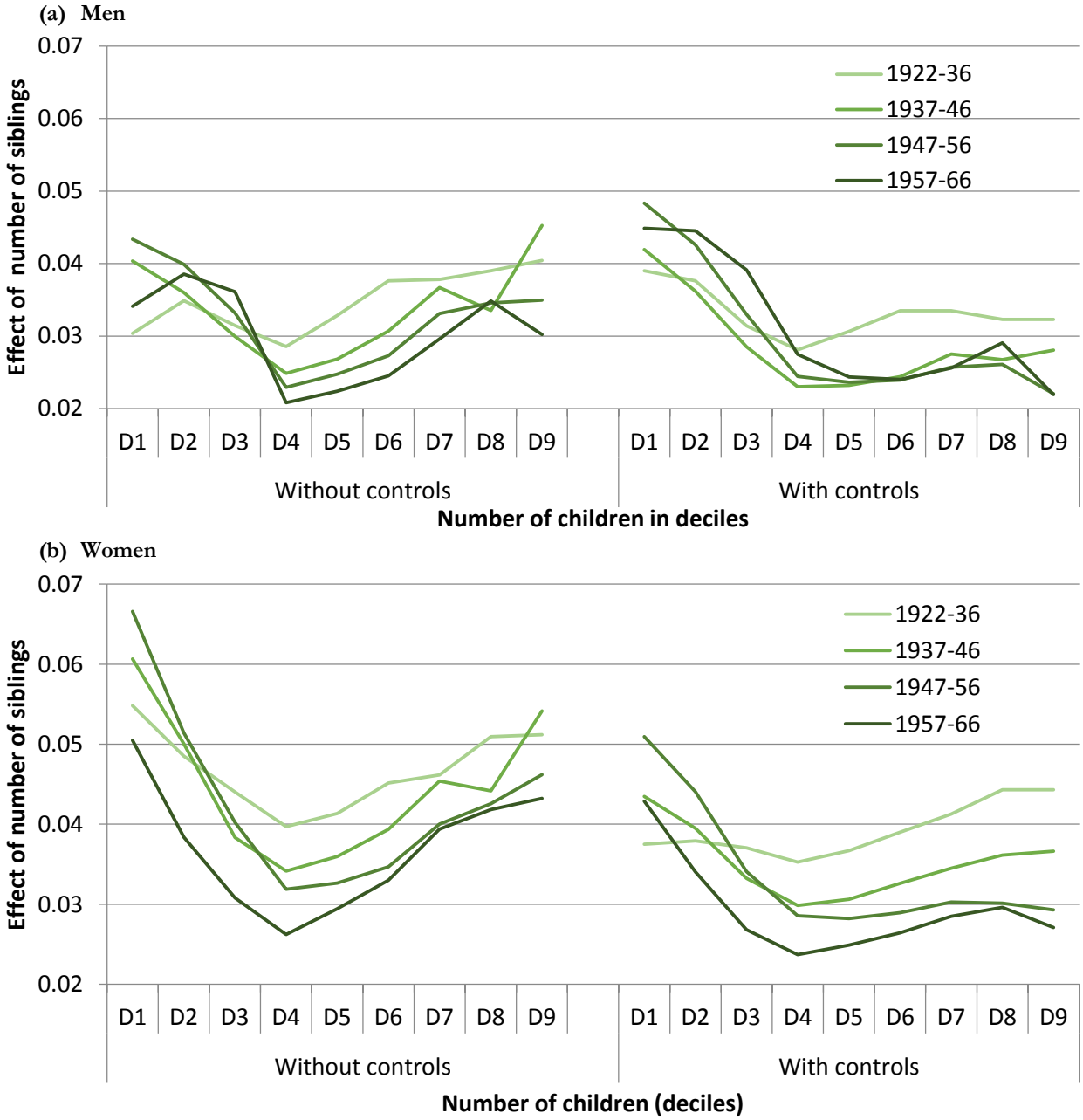
Reading: Having one additional sibling for women belonging to the first decile of the fertility distribution increase their fertility by 0.06 without controls, and 0.045 children with controls.
Adjustment variables: level of education, country of birth, occupational status, mother's and father's country of birth and their occupational status. (See Appendix C)
Source: Enquête Famille et Logements 2011 (EFL, Ined-Insee)

Figure 5 shows the same relationship by birth cohort and sex, with and without including controls. In absence of controls (Fig. 5, left side), we observe that stronger effects of sibship size at the queues of the distribution become more visible across birth cohorts for men and women. Whereas the older cohort's curve was only slightly curvilinear, a U-shaped form clearly appears for the most recent cohorts for men just as it does for women, although the magnitude is still larger for women. In the most recent cohorts, most people around the fourth decile actually have exactly two children (as indicated by the predicted value in Table C of the Appendix). This massive diffusion over time of the two-child family reinforced the effect of the family of origin for those who are escaping this norm. Thus, the family size effect is largely more pronounced at the queues of the distribution for recent birth cohorts. For those following this two-child model, the size of the family of origin counted less and they could come from any type of family. To sum up, while children were adopting the norm of having two sons or daughters, their behaviors were less linked to those of their parents.

As already seen above, the parent-child correlation among numerous families is stronger before the introduction of controls (Fig. 5, right side). After controlling for covariates, the correlation diminishes drastically for large families from the 1937-46 birth cohort and afterwards. This means that the large family size transmission is then partly driven by confounding factors. This erosion of

the intergenerational transmission of family size among numerous families is gradual over cohorts for women, whereas the correlation is already low from the 1937-46 birth cohort for men. The reproduction of small families is visible for both men and women, whose patterns are quite close in the last cohorts studied, all other things being equal and despite their strong contrast before controls. We confirm here that socio-economic characteristics were particularly important for explaining the strong link between parent and children fertilities among large families. The increases in education level and labor force participation have played a paramount role for women.

Fig. 5 Coefficients of the origin family size at each decile of respondent's number of children, by birth cohort and sex (quantile regression), with and without controls



Sample: 1922-66birth cohorts, men and women aged 45-89 at survey
Adjustment variables: level of education, country of birth, occupational status, mother's and father's country of birth and their occupational status. (See Appendix C)
Source: Enquête Famille et Logements 2011 (EFL, Ined-Insee)

Discussion

As the intergenerational correlation between fertility levels is well-established, it was necessary to conduct a more in-depth study of the strength and distribution of this link in the long run. This clarifies the mechanisms behind the unexpected low levels of fertility reached in many developed countries, and it could provide guidance for evaluating fertility prospects. Indeed, the context of low fertility (below two children per woman) that has been observed in many European countries might persist longer than expected if people with low fertility outcomes give birth to children who will reproduce the same type of fertility behavior. A high and hardly flexible level of intergenerational correlation would limit the possibility of the next generation departing from the previous one, and thus breaking away from low fertility; whereas a low level of correlation is less deterministic for the future[10].

First, we confirm a persisting positive link between parents' and children's fertility, meaning that the family size of origin is still a determinant in fertility decisions. However, even though the current correlation is comparable to those observed in other countries, it remains low and thus leaves margins for straying away from parental behavior. Furthermore, the strength of the relationship diminished over the long period studied. The effect of the family of origin was much higher for those born in the 1920s. The subsequent decrease possibly reflects a loss of the family's implicit or explicit power in forming fertility decisions.

Another original aspect of the present study is that it goes beyond the standard relationship at the means and instead looks at the overall distribution of fertility. As we observed that the correlation is driven mainly by extreme family sizes (i.e., both small and large families), the confounding factors appear to be primarily responsible for the correlation among large families. Once taking into account the respondent's education, the respondent's and parent's country of origin and social group, the correlation for high fertility levels diminishes drastically. This reveals that the perpetuation of large families could have been the choice of specific educational and social groups. For instance, at the beginning of the century in France, farmers had the highest family size (Desplanques 1985). Religiosity, which we unfortunately could not control for (particularly Catholicism, the dominant religion in France), was also probably a key instrument in perpetuating large families (Glass, Bengtson, & Dunham 1986; Lehrer & Chiswick 1993).

One noticeable result is also the transmission of small families. At the beginning of the century in France, white collar workers were having smaller families (Desplanques 1985). For the self-employed, family size could also be related to strategies for transferring holdings and expanding business (Bourdieu & de Saint Martin 1978; Goody 2009). But here, the transmission of small families persists once socio-economic background is controlled for, meaning that this transmission is driven not only by such socio-economic factors. Furthermore, an increase in this transmission of small families over birth cohorts is clearly observed, which means preferences for having small

[10] Insights from the intergenerational correlation in family size already support, for instance, the reconstruction of the influence of kin networks in micro-simulations of fertility (Pullum & Wolf 1991)

families are transmitted from parents to children. This is probably related to a desire for investing more in fewer children and following the well-known child quality-quantity trade-off. If such transmission persists over time and exists in other developed countries, especially those with low fertility levels, it could probably cause some repercussions on the fertility prospects of the next generation. This may partly explain why low fertility countries have difficulties in changing their status.

We also noticed that in this period when the two-child family norm was spreading extensively, extreme family sizes were much more likely to be reproduced. Two-child families were themselves formed by people originating from all family sizes. It was only in the very last cohort observed that a substantial share of people had grown up in two-child families. With two-child families becoming increasingly frequent in the subsequent cohorts, we can expect that more and more people will have two children just as most of their parents did, and the correlation may increase again.

In the 1922-1966 birth cohorts, the size of the family of origin was always related to fertility realizations more for women than for men. There was, however, a sign of convergence between men and women's correlations, once basic sociodemographic characteristics were controlled for. This result questions the gender role theory approach, according to which women support family values more than men do and would thus be more likely to reproduce the parental model. This is nevertheless in line with results showing a possible shift towards men taking a more important role in the couple's fertility decisions (Bauer and Kneip 2013). Another difference that could play a role is that, given the age gap between partners, women enter partnerships sooner. Thus, the memory of family life is more recent for women than for men at couple formation. However, the impact of childhood experience could weaken with the general postponement of family formation, all in all. This timing argument may also explain why women's fertility is linked more to that of the parents' than to men's fertility. The last and probably strongest argument for gender convergence adheres to the growing autonomy of women, with their greater access to education and to the labor market in more recent birth cohorts, which gave them more freedom from the parental family model.

Although the large sample size and retrospective nature of the database is a great advantage, the data remains restricted in other aspects that potentially limit the present study. First, the birth order of the respondent is not known, nor the age of the mother at birth, both of which are known to be related to fertility transmission (Barber 2001; Dommermuth 2012; Murphy and Knudsen 2002). Second, we cannot explore the gender difference further, as we were unable to control simultaneously for both partners' families of origin size. Previous studies, notably Booth & Kee (2009), found that the origin family sizes of both the wife and husband matter. Third, the definition of siblings used is quite broad and includes adopted, half, deceased and full siblings. Even if the generations born before the 70's did not have many half-siblings (around 7% had half-siblings in the generation studied), it is possible that half-siblings would have a different effect (probably weaker), because they did not necessarily grow-up physically with the respondent as a child. This would have been the case if the other parent had custody or if the age gap with the new siblings was very wide. However, some robustness checks excluding half-children gave very similar results. This choice for

the definition of sibship and whether or not to include half and step-children might become more important in the future, given the magnitude of the expected increase in stepfamilies in coming generations. Finally, we not able to control for parent's separation, which could potentially moderate the degree of intergenerational reproduction of fertility behaviors (Axinn and Thornton 1996; Kalmijn 2015).

All in all, through analysis of the relationship between parents' and children's fertilities, its magnitude, and changes over the last century, this study provides insight into the current and future transformations of fertility. If the positive link between the number of an individual's siblings and her/his own fertility is weaker today, it is probably because the family of origin's cultural habits are becoming less important to the generations born in the second half of the twentieth century. The increasing importance attached to individuality during the second demographic transition already suggests that family background had become less prominent. Other demographic events also became less linked to the family background. For instance, parental divorce appears less linked to separation of their offspring in today's societies, where marriage norms are weaker than in societies with higher divorce barriers (Wagner and Weiss 2006). While family background is losing its importance, the achieved level of fertility might depend more today on economic factors, especially in a context of economic crisis and in which the dual-earner family is widespread (Balbo et al. 2013). This possible transition from family drivers to economic drivers could explain the forces of fertility in developed countries. If so, it reinforces the necessity of giving more support to public policies that help families reach their desired number of children and reduce economic inequalities.

Finally, it is also important to consider this study in the French context. France has one of the highest levels of fertility within Europe, has benefited from very generous family policies for decades, and has great tolerance for the marital status of parents who can decide quite freely whether to have children in consensual "pacs" (civil partnership) or in married unions. This family-friendly context is likely to help parents make decisions about their offspring with more freedom and autonomy than elsewhere, even though in such a family-oriented country this could also translate into more social pressure to have children. It is then important that, in the long run, such a study should be replicated in other countries in order to see whether the weakening of family continuities is also observed elsewhere.

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Appendix A: ***Correlation coefficients***

The most frequently used correlation is the linear, (also called Bravais-Pearson's) correlation indicator. It measures the intensity of the linear relationship between the parents' and children's levels of fertility. It corresponds to the relationship between the covariance of the variables and the product of their standard deviations. It is calculated with the following formula:

$$r_p = \frac{\sum_{i=1}^{N}(F_{c,i} - \bar{F}_c)(F_{p,i} - \bar{F}_p)}{\sqrt{\sum_{i=1}^{N}(F_{c,i} - \bar{F}_c)^2}\sqrt{\sum_{i=1}^{N}(F_{p,i} - \bar{F}_p)^2}}$$

where $F_{c,i}$ represents the child's completed fertility and $F_{p,i}$ his or her parents' fertility proxied by the child's number of siblings. This coefficient ranges between –1 and +1, with a positive value indicating a linear correlation in the same direction between the variables, and a negative value indicating a relationship in the opposite direction. A nil coefficient corresponds to an absence of correlation. This coefficient has two limitations: it only measures linear relationships; and it remains sensitive to extreme values.

The rank coefficient provides a means to circumvent these limitations. Spearman's correlation coefficient is defined as the linear correlation coefficient calculated on the ranks of the variables considered. We thus calculate:

$$\rho = \frac{\sum_{i=1}^{N}(f_{c,i} - \bar{f}_c)(f_{p,i} - \bar{f}_p)}{\sqrt{\sum_{i=1}^{N}(f_{c,i} - \bar{t}_c)^2}\sqrt{\sum_{i=1}^{N}(f_{p,i} - \bar{f}_p)^2}}$$

where $f_{c,i}$ represents the rank of $F_{c,i}$ and $f_{p,i}$ that of $F_{h,i}$. This coefficient is less sensitive to extreme values and can be used to measure the intensity of a monotonic relationship between the variables (and not only a linear one).

Last, we calculate Kendall's correlation coefficient. This coefficient is built non-parametrically from the ranks of variables, thanks to the definition of "concordant pairs" and "discordant pairs". A pair $((F_{ci}, F_{pi}), (F_{cj}, F_{pj})$ is defined as "concordant" if $t_{c,i} < t_{c,j}$ et $t_{p,i} < t_{p,j}$, i.e., if the woman's fertility is higher in family j than in family i, for both the parents' and the children's generations. The pair is defined as "discordant" if $t_{c,i} < t_{c,j}$ et $t_{p,i} > t_{p,j}$, i.e., if the child of family j has more children than the child of family i but the parents of family j have fewer children than those of family i.

The coefficient is calculated as follows:

$$\tau = \frac{(\text{number of concordant pairs}) - (\text{number of discordant pairs})}{n(n-1)/2}$$

Spearman's and Kendall's coefficients also take values between –1 et +1, with a nil coefficient corresponding to the absence of a link between variables. A coefficient below zero indicates a negative relationship between the children's and the parents' fertility.

Appendix B: Table B1: Poisson model of completed fertility, by sex (Coefficients)

	Women Model 1	Model 2	Model 3	Model 4	Men Model 1	Model 2	Model 3	Model 4
Interaction birth cohort and total number of siblings								
Coh. 1922-26 * total no. siblings	0.042***	0.040***	0.037***	0.036***	0.045***	0.045***	0.042***	0.041***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)
Coh. 1927-31 * total no. siblings	0.045***	0.042***	0.041***	0.040***	0.037***	0.037***	0.035***	0.034***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Coh. 1932-36 * total no. siblings	0.043***	0.040***	0.039***	0.038***	0.031***	0.031***	0.029***	0.027***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Coh. 1937-41 * total no. siblings	0.043***	0.039***	0.038***	0.036***	0.032***	0.031***	0.029***	0.027***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Coh. 1942-46 * total no. siblings	0.043***	0.038***	0.036***	0.034***	0.034***	0.034***	0.030***	0.028***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Coh. 1947-51 * total no. siblings	0.042***	0.036***	0.033***	0.032***	0.033***	0.034***	0.030***	0.028***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Coh. 1952-56 * total no. siblings	0.041***	0.034***	0.029***	0.028***	0.031***	0.031***	0.027***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Coh. 1957-61 * total no. siblings	0.037***	0.029***	0.024***	0.023***	0.028***	0.029***	0.025***	0.022***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Coh. 1962-66 * total no. siblings	0.035***	0.028***	0.022***	0.020***	0.030***	0.031***	0.024***	0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Birth cohort respondent (ref = 1922-26)								
1927-31	0.001	0.005	0.000	-0.000	0.011	0.013	0.006	0.006
	(0.015)	(0.015)	(0.015)	(0.015)	(0.026)	(0.026)	(0.026)	(0.026)
1932-36	-0.004	0.011	0.007	0.007	0.020	0.026	0.018	0.020
	(0.015)	(0.015)	(0.015)	(0.015)	(0.025)	(0.025)	(0.025)	(0.025)
1937-41	-0.064***	-0.029**	-0.030**	-0.029*	-0.047*	-0.040	-0.051**	-0.049**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.025)	(0.025)	(0.025)	(0.025)
1942-46	-0.153***	-0.099***	-0.096***	-0.096***	-0.107***	-0.100***	-0.107***	-0.104***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.024)	(0.024)	(0.024)	(0.024)
1947-51	-0.205***	-0.134***	-0.139***	-0.141***	-0.157***	-0.150***	-0.152***	-0.151***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.023)	(0.024)	(0.024)	(0.024)
1952-56	-0.214***	-0.132***	-0.143***	-0.148***	-0.168***	-0.158***	-0.160***	-0.158***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.024)	(0.024)	(0.024)	(0.024)
1957-61	-0.194***	-0.098***	-0.099***	-0.105***	-0.190***	-0.180***	-0.182***	-0.179***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.024)	(0.024)	(0.024)	(0.024)
1962-66	-0.212***	-0.106***	-0.097***	-0.105***	-0.251***	-0.241***	-0.234***	-0.231***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.024)	(0.024)	(0.024)	(0.024)

Level of education respondent (ref = lower secondary)						
Upper secondary	-0.149***	-0.110***	-0.105***	-0.043***	-0.027***	-0.023***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Tertiary	-0.181***	-0.088***	-0.083***	0.017**	0.007	0.008
	(0.006)	(0.007)	(0.007)	(0.008)	(0.009)	(0.010)
Country of birth respondent (ref = France)						
Southern Europe		0.060***	0.169***		0.106***	0.179***
		(0.011)	(0.016)		(0.015)	(0.023)
Rest of Europe		-0.027*	0.006		-0.063***	-0.021
		(0.015)	(0.020)		(0.023)	(0.029)
North Africa		0.239***	0.172***		0.283***	0.157***
		(0.008)	(0.014)		(0.011)	(0.020)
Rest of the world		0.111***	0.091***		0.202***	0.143***
		(0.011)	(0.019)		(0.015)	(0.027)
Respondent's occupational status (ref = never worked)						
Farmer		0.016*	0.014		0.078***	0.062***
		(0.010)	(0.010)		(0.016)	(0.017)
Independent		-0.190***	-0.183***		0.066***	0.065***
		(0.010)	(0.010)		(0.014)	(0.014)
White collar		-0.308***	-0.304***		0.070***	0.071***
		(0.010)	(0.010)		(0.014)	(0.014)
Blue collar		-0.217***	-0.213***		0.025*	0.028**
		(0.007)	(0.007)		(0.013)	(0.013)
Clerk		-0.133***	-0.130***		-0.013	-0.010
		(0.006)	(0.006)		(0.014)	(0.014)
Manual worker		-0.101***	-0.102***		0.059***	0.059***
		(0.007)	(0.007)		(0.012)	(0.012)
Mother's occupational status (ref = never worked)						
Farmer			-0.018**			-0.009
			(0.009)			(0.013)
Independent			-0.017*			-0.002
			(0.009)			(0.014)
White collar			0.004			-0.043
			(0.023)			(0.032)
Blue collar			0.017*			-0.014
			(0.010)			(0.014)
Clerk			0.002			-0.029***
			(0.006)			(0.009)
Manual worker			0.002			-0.024**
			(0.007)			(0.010)

Not available				-0.046***				-0.068***
				(0.006)				(0.009)
Country of birth mother (ref = France)								
Southern Europe				-0.063***				-0.035
				(0.015)				(0.022)
Rest of Europe				0.005				-0.039*
				(0.016)				(0.023)
North Africa				0.047***				0.075***
				(0.016)				(0.023)
Rest of the world				0.032*				0.020
				(0.020)				(0.029)
Father's occupational status (ref = never worked)								
Farmer				-0.218***				-0.236***
				(0.019)				(0.028)
Independent				-0.264***				-0.256***
				(0.019)				(0.028)
White collar				-0.233***				-0.240***
				(0.019)				(0.029)
Blue collar				-0.269***				-0.277***
				(0.019)				(0.028)
Clerk				-0.275***				-0.278***
				(0.019)				(0.028)
Manual worker				-0.219***				-0.246***
				(0.018)				(0.026)
Not available				-0.244***				-0.274***
				(0.018)				(0.027)
Country of birth father (ref = France)								
Southern Europe				-0.060***				-0.050**
				(0.013)				(0.020)
Rest of Europe				-0.049***				-0.019
				(0.016)				(0.023)
North Africa				0.031**				0.064***
				(0.015)				(0.022)
Rest of the world				-0.017				0.038
				(0.019)				(0.027)
Constant	0.774***	0.808***	0.907***	1.157***	0.720***	0.727***	0.666***	0.942***
	(0.012)	(0.012)	(0.013)	(0.021)	(0.021)	(0.021)	(0.024)	(0.035)
N	136,735	136,735	136,735	136,735	68,318	68,318	68,318	68,318

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Father's and mother's professional status are not available when the respondent didn't know their parent's profession (for instance, if the parent died when they were young, or was not present).

Appendix C: Table C1: Effects related to the number of siblings, calculated in a quantile regression on respondent's completed fertility by sex and birth cohort

			D1	D2	D3	D4	D5	D6	D7	D8	D9
Without controls	Men	Coef	0.038***	0.038***	0.033***	0.023***	0.025***	0.028***	0.034***	0.033***	0.038***
		se	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
		Predicted	0.62	1.22	1.77	2.17	2.46	2.74	3.06	3.52	4.14
	Women	Coef	0.06***	0.047***	0.038***	0.032***	0.033***	0.036***	0.042***	0.041***	0.051***
		se	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
		Predicted	0.82	1.42	1.91	2.25	2.54	2.83	3.16	3.65	4.36
With controls	Men	Coef	0.044***	0.04***	0.033***	0.025***	0.025***	0.025***	0.027***	0.028***	0.025***
		se	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
		Predicted	0.64	1.20	1.73	2.16	2.46	2.76	3.08	3.51	4.15
	Women	Coef	0.043***	0.039***	0.032***	0.028***	0.029***	0.031***	0.032***	0.034***	0.033***
		se	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
		Predicted	0.83	1.41	1.89	2.26	2.56	2.86	3.20	3.64	4.33
Men without controls	1922-36	Coef	0.03***	0.035***	0.031***	0.029***	0.033***	0.038***	0.038***	0.039***	0.04***
		se	(0.01)	(0.006)	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
		Predicted	0.71	1.33	1.88	2.29	2.65	3.01	3.47	4.01	4.95
	1937-46	Coef	0.04***	0.036***	0.03***	0.025***	0.027***	0.031***	0.037***	0.034***	0.045***
		se	(0.009)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
		Predicted	0.76	1.90	1.90	2.25	2.54	2.83	3.16	3.63	4.29
	1947-56	Coef	0.043***	0.04***	0.033***	0.023***	0.025***	0.027***	0.033***	0.035***	0.035***
		se	(0.007)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.65	1.25	1.78	2.17	2.54	2.71	3.00	3.42	4.00
	1957-66	Coef	0.034***	0.039***	0.036***	0.021***	0.022***	0.025***	0.03***	0.035***	0.03***
		se	(0.007)	(0.006)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.51	1.03	1.60	2.09	2.36	2.63	2.91	3.29	3.86
Women without controls	1922-36	Coef	0.055***	0.049***	0.044***	0.04***	0.041***	0.045***	0.046***	0.051***	0.051***
		se	(0.005)	(0.034)	(0.039)	(0.036)	(0.021)	(0.022)	(0.025)	(0.03)	(0.035)
		Predicted	0.76	1.38	1.91	2.44	2.73	3.15	3.64	4.23	5.31
	1937-46	Coef	0.061***	0.05***	0.038***	0.034***	0.036***	0.039***	0.045***	0.044***	0.054***
		se	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
		Predicted	0.89	1.48	1.97	2.30	2.60	2.90	3.26	3.76	3.76
	1947-56	Coef	0.067***	0.051***	0.04***	0.032***	0.033***	0.035***	0.04***	0.043***	0.046***
		se	(0.004)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
		Predicted	0.85	1.42	1.88	2.21	2.48	2.74	3.03	3.44	4.05
	1957-66	Coef	0.05***	0.038***	0.031***	0.026***	0.029***	0.033***	0.039***	0.042***	0.043***
		se	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
		Predicted	0.80	1.40	1.91	2.23	2.48	2.74	3.02	3.42	3.98
Men with controls	1922-36	Coef	0.042***	0.036***	0.029***	0.023***	0.023***	0.024***	0.028***	0.027***	0.028***
		se	(0.007)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.71	1.33	1.86	2.29	2.65	3.03	3.47	4.03	4.93
	1937-46	Coef	0.04***	0.036***	0.03***	0.025***	0.027***	0.031***	0.037***	0.034***	0.045***
		se	(0.009)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
		Predicted	0.77	1.36	1.87	2.25	2.54	2.84	3.18	3.63	4.28
	1947-56	Coef	0.048***	0***	0***	0***	0***	0***	0***	0***	0***
		se	(0.007)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.67	1.24	1.75	2.15	2.43	2.71	3.01	3.41	4.00
	1957-66	Coef	0.045***	0.045***	0.039***	0.027***	0.024***	0.024***	0.026***	0.029***	0.022***
		se	(0.007)	(0.006)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.52	1.03	1.57	2.03	2.35	2.62	2.91	3.28	3.85
Women with controls	1922-36	Coef	0.037***	0.038***	0.037***	0.035***	0.037***	0.039***	0.041***	0.044***	0.044***
		se	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.78	1.36	1.87	2.31	2.72	3.13	3.61	4.23	5.27
	1937-46	Coef	0.043***	0.039***	0.033***	0.03***	0.031***	0.033***	0.034***	0.036***	0.037***
		se	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
		Predicted	0.89	1.47	1.94	2.30	2.60	2.92	3.27	3.74	4.51
	1947-56	Coef	0.051***	0.044***	0.034***	0.029***	0.028***	0.029***	0.03***	0.03***	0.029***
		se	(0.004)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
		Predicted	0.86	1.41	1.86	2.21	2.48	2.75	3.05	3.44	4.03
	1957-66	Coef	0.043***	0.034***	0.027***	0.024***	0.025***	0.026***	0.028***	0.03***	0.027***
		se	(0.005)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
		Predicted	0.80	1.39	1.89	2.23	2.49	2.76	3.04	3.40	3.97

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Adjustment variables: the respondent's level of education, country of birth, occupation status, mother's and father's country of birth and their occupation status.
Source: Enquête Famille et Logements 2011 (EFL, Ined-Insee)