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Modernization Before Industrialization: Cultural Roots of the Demographic Transition in France

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Abstract

This research shows that secularization accounts for the early decline in fertility in eighteenth-century France. The demographic transition, a turning point in history and an essential condition for development, took hold in France first, before the French Revolution and more than a century earlier than in any other country. Why it happened so early is, according to Robert Darnton, one of the “big questions of history” because it challenges historical and economic interpretations and because of data limitations at the time. I comprehensively document the decline in fertility and its timing using a novel crowdsourced genealogical dataset. Then, I document an important process of secularization at the time. Using census data available in the nineteenth century, I show a strong association between secularization and the timing of the transition. Finally, I leverage the genealogies to account for unobserved pre-existing, geographic, and institutional differences by studying individuals before and after the onset of the transition and exploiting the choices of second-generation migrants.

JEL codes: N33, O10, Z12

Keywords: fertility, development, secularization

And the race of man cannot, by any efforts of reason, escape from it.

—Thomas Malthus, *An Essay on the Principle of Population* (1798)

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1 INTRODUCTION

The demographic transition is a watershed moment in the process of development. Before the transition, and for most of human history, improvements in standards of living were offset by demographic expansion and populations trapped into stagnation. The decline in fertility during the demographic transition allowed income per capita to rise above subsistence in a sustained way and is traditionally explained by technological progress and the accumulation of human capital.

This research establishes that secularization brought about the early demographic transition in France. The decline in fertility took hold in France in the second half of the eighteenth century, more than a hundred years before it occurred in any other country. Yet, in many ways, France was a developing country in the eighteenth century. Why the historical fertility transition started in France first, before the French Revolution and more than a century before the rest of the world, remains a mystery. It is “the most important fact of all her [France] entire history” (Sauvy, 1962, p. p. 13) and, according to Darnton (1978), one of “the big questions of history” (p. 132) because of the lack of available data at the time and because it challenges standard explanations.

Using a novel crowdsourced genealogical dataset, I comprehensively document the decline in fertility and show that the transition took hold in 1760, earlier than previously thought. The data from the publicly available genealogies on geni.com spans centuries and contains millions of ordinary individuals (Blanc, 2020; Kaplanis et al., 2018). I compare the genealogical data to census data, which is only available in the nineteenth century, and to all other available sources; and I carefully show that selection into the sample is limited and that the genealogies provide the best available account of the decline in fertility.

Then, I document an important process of secularization, or dechristianization, that occurred at the same time, using historical evidence and data on wills. Braudel (1986) evokes “the liberation of Frenchmen from the teachings, the restrictions, and the yoke of the Catholic Church”, while according to de Tocqueville (1856) “irreligion was able to become a general and dominant passion” (Book 3, Chapter 2). In some regions the process took place exceptionally early, in the first half of the eighteenth century (Vovelle, 1973).

The aggregate-level results suggest that secularization accounts for the early decline in fertility and that the loosening of traditional religious moral constraints had a profound impact. Additionally, I study the cross-sectional determinants of the transition. I document a large and robust association between secularization and the timing of the transition using *département*-level population counts from the nineteenth century, after the decline in fertility, and using the genealogies. In particular, I leverage the genealogies to study individuals at the time of the onset of the decline in fertility and to account for unobserved pre-existing, geographic, cultural, and institutional differences, using a range of empirical strategies applied to this context for the first time.

In the cross-sectional analysis, I exploit variation in the intensity of religious beliefs after secularization, using the presence of refractory clergy in 1791 (Tackett, 1986). The Civil Constitution of the Clergy, passed in July 1790, required all priests and vicars to take an oath of allegiance to the secular state and transformed clergymen into civil servants. The oath had to be taken “on a Sunday at the conclusion of the mass” (Decree on the clerical oath). The share of refractory clergy is the best available measure of secularization at the time and is highly correlated with Easter attendance, which is only available in 1966.

I evaluate the determinants of the timing of the transition to low fertility across *départements* with census data from 1831 to 1961. Using ordinary least squares and Tobit to account for censoring, I estimate remarkably strong, significant, and robust coefficients across specifications. Increasing the share of refractory clergy from the 25th to the 75th percentile of the distribution predicts a delay in the year of transition of more than one standard deviation—no other variable has an impact nearly as important.

Then, I study the heterogeneous effects of the refractory clergy. The results suggest that the effect of secularization stems from a change in preferences for the quantity of offsprings, but also from the fact that the relaxation of moral and social constraints allowed individuals to reach their desired, optimal level of fertility; cultural and economic factors played complementary roles. Additionally, I perform a large number of robustness checks, including alternative specifications, variable selection, and methods of accounting for omitted variables and spatial dependence, to show that secularization was likely the main driving force behind the early decline in fertility.

Finally, I study ordinary individuals at the time of the decline in fertility using the genealogical data. The data includes individuals born all over France, in rural and urban areas. In line with the *département*-level results, I find that individuals born in places with refractory clergy have more children; the effect is large, statistically significant, and robust. Using distribution regressions, I also show that large families experienced the largest drop in fertility as religiosity declined (Chernozhukov, Fernández-Val and Melly, 2013).

Using the genealogies, I account for unobserved pre-existing, geographic, cultural, and institutional differences with a range of different empirical strategies and methods. The results suggest a causal interpretation. First, I study individuals born in the same *département* and decade with *département*-by-decade fixed effects to account for time-varying *département*-level institutional unobservables. Then, I compare the coefficient on the refractory clergy before and after the onset of the decline in fertility in 1760. I find that the presence of refractory clergy was positively associated with fertility after 1760 but had a null and insignificant effect before. Last but not least, I study second-generation migrants to account for unobserved geographic and institutional factors. I compare individuals born in the same district whose parents were born in different districts and find that the share of refractory clergy in the district of origin of the parents had a large effect on fertility, which persisted for generations and through migrations.

This paper makes numerous contributions. I identify the change in preferences at the root of the early demographic transition in France: dechristianization and the move away from the teachings of the Roman Catholic Church.¹ I also contribute to an emerging literature on the role of cultural factors in demographic outcomes (Beach and Hanlon, 2021; Spolaore and Wacziarg, 2019). Second, I contribute to a literature that has documented profound changes in religious beliefs in eighteenth-century France (Vovelle, 1973) with important consequences (Le Bras, 1942-5; Todd and Le Bras, 1981). Third, I contribute to a vibrant literature that has documented the persistence of culture over the very long run (Ashraf and Galor, 2013; Spolaore and Wacziarg, 2013; Voigtländer and Voth, 2012), but I empirically establish that cultural change, not persistence, is a determinant of development. Fourth, this study is the first research to exploit crowdsourced genealogies to study ordinary individuals in the past and the spatial determinants of fertility at the time of the demographic transition. Finally, the paper contributes to a large literature on the cultural and religious origins of the transition to sustained growth (Bénabou, Ticchi and Vindigni, 2021; McCloskey, 2016; Mokyr, 2016; Schulz et al., 2019; Squicciarini, 2020; Squicciarini and Voigtländer, 2015).

2 HISTORICAL BACKGROUND AND LITERATURE

2.1 Demographic change and development

In every respect, eighteenth-century France lagged one to two hundred years behind England, the cradle of the Industrial Revolution. France attained the GDP per capita enjoyed by England in 1750 in 1850 (Bolt and van Zanden, 2014; Lévy-Leboyer and Bourguignon, 1985), the rate of urbanization England had in 1750 in 1950 (Bairoch, Batou and Chèvre, 1988), and the rate of literacy England had in 1650 in 1850 (Buringh and van Zanden, 2009). Weber (1976) depicts French people as “peasants” and “savages”, Crouzet (2003) notes that “France remained fundamentally a peasant-based rural economy” (p. 236).

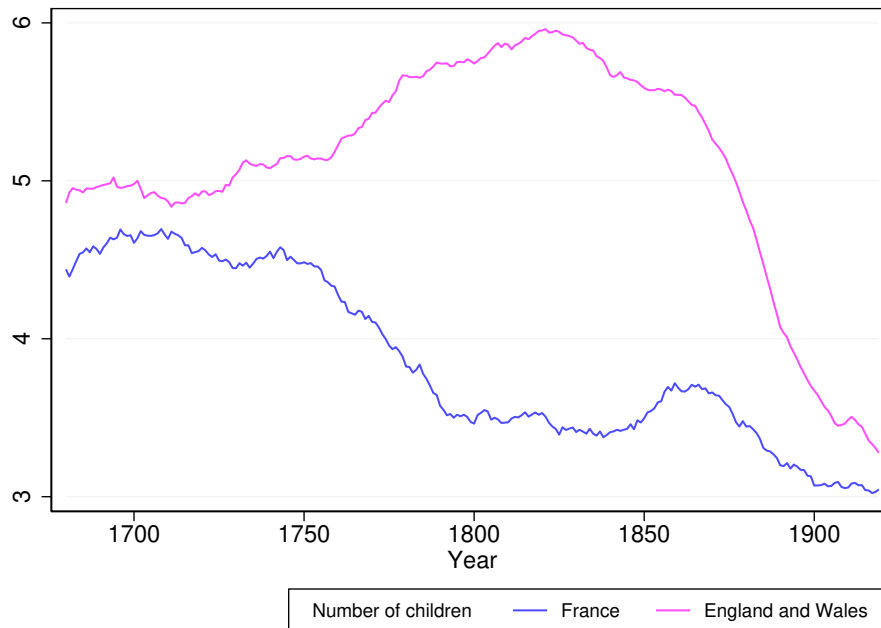
Yet, GDP per capita increased at about the same rate in France and England after 1750 and throughout the nineteenth century (Appendix Figure A1). The rate of population growth in England largely surpassed that in France: in the two centuries following 1750, the population of England increased from 5.5 to 40 million inhabitants, while the population of France increased from 24.5 to 40 million. If the population of France had grown at the same rate as the population of England, there would be more than 240 millions inhabitants today in France. In the second half of the eighteenth century, average fertility significantly declined in France, while it remained significantly higher in England and Wales until the end of the nineteenth century.

Figure 1 displays fertility in France and in England and Wales between 1680 and 1920

¹I also contribute to a literature that has emphasized the role of secular forces, often in the nineteenth and twentieth centuries, on fertility behaviors (Hacker, 1999; Lesthaeghe, 1983, 2010) and those forces’ interaction with economic forces (Brown and Guinnane, 2002; Coale and Watkins, 1986).

Figure 1: Demographic transition in France and England

Note: This figure displays the gross rate of fertility for France and for England and Wales over time. Appendix Figure A1 overlays GDP per capita on this graph. Source: Blanc (2020) (more details in 3)



(more detail in Section 3). The early decline in fertility in France, a century before the rest of Europe, in an epoch of stagnation and before the French Revolution, has been the subject of numerous studies, yet why it happened so early remains an open question. There is widespread agreement that cultural forces played a role (Braudel, 1986; Sauvy, 1962), but it remains one of the most important and unsolved puzzles in historical demography and economic growth.

According to standard economic theory, development is the best contraceptive (Hansen and Prescott, 2002; Kremer, 1993). The endogenous-growth models developed by Galor (2011); Galor and Weil (2000); Galor and Moav (2002) shed light on the interaction between human-capital accumulation, fertility, and technological progress in the long run: in the course of history, as technological progress accelerates, the return to human capital rises and fertility decisions are altered, triggering the transition. While a society is in the Malthusian trap, income per capita fluctuates around subsistence level because of the positive relationship between income and fertility. When quality is favored to quantity, the relationship reverses and the economy enters the modern growth era, in which human capital is the driver of progress. Institutional, cultural, and geographic factors interact with these forces but are not the main determinants of change.

In recent years, an important literature has studied the determinants of fertility in France

in the nineteenth century, yet the proximate causes of the early demographic transition are still a mystery.² Most of the existing research has weighed the relative importance of economic and cultural forces broadly (see de la Croix and Perrin, 2018; Murphy, 2015).³ On the cultural origins of the transition, Blanc and Wacziarg (2020); Daudin, Franck and Rapoport (2018) study the diffusion of norms of limited fertility within France, Spolaore and Wacziarg (2019) show that the reduction in the rate of fertility in nineteenth-century Europe was driven by a diffusion of norms originating in France, and Perrin (2021) evaluates the role of gender equality.⁴

2.2 Religion

This section briefly summarizes religious history in France before the radical change in beliefs and religiosity that took place in the mid-eighteenth century. Since medieval times, France has been portrayed as “the eldest daughter of the Roman Catholic Church,” French kings as “Rex Christianissimus” or ‘most Christian king’, and the French as “God’s chosen people” (Burleigh, 2005, p. 23). France even hosted seven successive popes from 1309 to 1378. During the Renaissance, and particularly after the reign of Francis I, Protestantism marginally spread, reaching an estimated 10 percent of the population in the mid-sixteenth century (most of these Huguenots). The second half of the sixteenth century was a period of violent religious wars and political unrest, with the massacre of thousands of Protestants on Saint Bartholomew’s Day in 1572. In 1593, after fighting a war of succession against the Holy League to gain access to the throne, Henry IV of France renounced Protestantism and, for the second time, was forced to convert to Catholicism, before the promulgation of the Edict of Nantes in 1598 put an end to the French Wars of Religion by granting Huguenots substantial rights and freedom of religion.

In the seventeenth century, France remained predominantly Catholic, and in 1685, Louis XIV revoked the Edict of Nantes with the Edict of Fontainebleau, effectively ending religious toleration. The edict deprived Protestants of all religious and civil liberties and ordered the destruction of Huguenots’ churches. *Dragonnades*—policies of legal persecution and forced conversion of Protestants ordered by Louis XIV—epitomized the fight and terror against the Protestant Reformation: dragoons (infantry soldiers) were billeted in Protestant households in order to harass and intimidate the Huguenots. Thousands of Protestants left France,

²It has been explored by a number of authors in the past, among many others, Cummins (2012); Knodel and Van de Walle (1979); Weir (1994); Wrigley (1985*a,b*).

³Murphy (2015) suggests that the French Revolution may have been one of many causes of the decline. He examines the cross-sectional determinants of fertility in France and devotes a couple of paragraphs to the effect of the oath on fertility at the *département* level in 1831. In a similar fashion, González-Bailón and Murphy (2013) study the role of social interactions on fertility following the Revolution.

⁴The existence of deep-rooted barriers to the adoption of innovation has been documented in Spolaore and Wacziarg (2009). See also Delventhal, Fernández-Villaverde and Guner (2019) for the diffusion of the fertility transition across countries and Beach and Hanlon (2021) for a fascinating account of changing norms of fertility following the Bradlaugh-Besant trial of 1877 in England.

and it set the course for the diffusion and strengthening of the Catholic resurgence.⁵

With the demise of Protestantism, the Counter-Reformation was able to spread unchecked for the most part with the rise of Jansenism in the early eighteenth century. Jansenism is a pious, austere, and rigorist theological movement unique to France Chartier (1991); Van Kley (1996). The Jansenists were at the center of the controversies and clashes of the time, especially with the monarchy and Jesuits, who embodied the religious and economic elite and were also at the forefront of the Counter-Reformation.⁶ Appendix Section A1.1 provides further details on clashes involving Jansenists, Jesuits, and the monarchy. Elites strongly opposed Jansenism, which sought to advance ideas of predestination of the elect to salvation, limitation of the sacraments, and the need for penitence—ideas also advanced in Protestantism. The opposition was not only theological but also political, as Jansenists came to embrace Gallicanism, a movement promoting the independence of the Church of France from the pope and from a monarchy endowed with divine right (Maire, 1998, 2019).

2.3 Contraception and the Catholic Church

Jean-Baptiste Moheau famously used the term fatal secrets, or ‘funestes secrets’, in 1778: “Already the fatal secrets *unknown to any animal but man* have penetrated in the countryside: *nature gets cheated* even in the villages.” Indeed, Moheau (1778) referred to the “*propagation of the species* as a dupery of olden times,” while Goudar (1756) writes that “It is the same love of ease and convenience that is filling France with bachelors ... men who vanish from the world with all their posterity” (p. 271). Van de Walle and Muhsam (1995) provide a detailed and fascinating account of these fatal secrets, and of the evolution of sexual and moral preferences in the eighteenth century, in particular regarding the spread of *coitus interruptus* (withdrawal) as a means of *cheating nature*.

The natural means of contraception such as withdrawal, or *coitus interruptus*, were widely known at the time.⁷ The method of withdrawal “is mentioned in the Bible, the Talmud and the Muslim tradition” (Van de Walle, 2005). Van de Walle (2005) argues that it “was frequently alluded to in libertine literature” (p. 2), which was particularly important in eighteenth-century France (Darnton, 1991) in such works as *Venus in the Cloister or The Nun in her Smock* (1683), *The Indiscreet Jewels* (1748) by Diderot, and *Philosophy in the Bedroom* (1775) by the Marquis de Sade. Importantly, the *coitus interruptus* was known and practiced not only by the elite but also by peasants in the villages (Moheau, 1778).

The modern methods of contraception became widely available well after the onset of the fertility decline. Condoms, known as *redingotes d’Angleterre*, or ‘English riding coats’, were

⁵See Hornung (2014) for the long-run effects of the forced migration of Huguenots to Prussia.

⁶Tackett (1986) writes that “during the first half of the eighteenth century, one issue in diocesan politics dominated all others: the issue of Jansenism” (p. 128).

⁷As opposed to its Catholic counterparts—*implexus restrictus* for non-ejaculation and *amplexus reservatus* for nonpenetrative, rubbing-only sex—which were not very widespread.

expensive and uncommon although they became more widespread in the Age of Enlightenment (for example, in his memoirs, Casanova reports radically changing his behavior and resorting systematically to condoms after 1760). Other methods of contraception include chastity, late marriage, sodomy, abortion, and infanticide (Van de Walle, 2005). Van de Walle and Muhsam (1995) also write of ‘the pleasures of the little goose’ (*les plaisirs de la petite oie*) to refer to mutual masturbation. Yet these methods are not particularly relevant or were not widely known.

What were the views of the Catholic Church regarding contraception and sex remains an open question. The Bible urges, multiple times, the faithful to “be fertile, increase in number, and fill the earth” (Genesis 9:1), and the account of the sin of Onan designated both masturbation and ‘unnatural’ intercourse as evil. Still, the pronouncements of the church against contraception, while clear, were often discrete and indirect (Noonan, 1965).⁸ In 1439, the multiplicative purpose of marriage “received its strongest official approval” (Noonan, 1965, p. 276) in the *Exultate Deo* papal bull: “Through matrimony [the church] is corporally increased.” With the Council of Trent (1545–63) and the Counter-Reformation, the views of the Catholic Church shifted toward more sexual austerity outside of marriage and an increased sacramentality of marriage, suggesting the increased importance of these matters. Hoffman (1984) argues that “evidence of the new sexual morality appears throughout the Counter Reformation: bans upon nudity in religious art, harsher rules against illegitimacy, prostitution, and concubinage, and more ‘puritanical’ standards of dress and behavior.”

According to Van de Walle and Muhsam (1995), “The orthodox position available to French literati in the late sixteenth century [was that] it is considered sinful in marriage to ejaculate outside of the natural receptacle (*ex vas naturale*), and only somewhat less sinful to use ‘unnatural positions’” (p. 269): not only was withdrawal sinful, but the purpose of marriage was explicitly multiplicative. In the seventeenth century, notorious clergy members such as Francis de Sales and Pierre de Bourdeilles (Brantôme) referred to withdrawal and other contraceptive methods and argued that ‘*marital fertility should not be interfered with*’ (Van de Walle and Muhsam, 1995). For example, in *Les Dames galantes*, published in 1666, “Brantôme concludes that the belief that marriage is instituted for pleasure is wrong and that the greatest blessing God can send in marriage is ‘a good lineage and not through concubinage’” (Van de Walle and Muhsam, 1995, p. 269). Hence, there is mounting evidence that the Catholic clergy in the eighteenth century understood marriage and sex to be acts of procreation, as opposed to pleasure. In the early eighteenth century, the sacramentality of marriage was also increasingly criticized by the lay population—especially following the Edict of 1715 forbidding Protestants from marrying and after the

⁸One of the inner struggles in the sexual morality promoted by the Catholic Church relates, indeed, to the dilemma between the multiplicative purpose of marriage and the sinful nature of ‘things of the flesh’ (Noonan, 1965). Noonan (1965) argues that “the value placed on human fecundity in the Old Testament as a whole is evident ... fruitfulness is a divine reward” (p. 31).

controversy of the *billets de confessions* in the 1750s when the Church denied sacraments and burial in consecrated ground to Jansenists (Maire, 2019).

3 SECULARIZATION AND THE DECLINE IN FERTILITY: AGGREGATE-LEVEL EVIDENCE

This section provides suggestive aggregate-level evidence that secularization accounts for the decline in fertility in France. I discuss the timing of the decline in fertility and of secularization using a novel crowdsourced genealogical dataset as well as data on wills.

3.1 The early decline in fertility in France

The early demographic transition in France is a long-established fact. Already in 1962, Sauvy (1962) argued that it is “the most important fact of all her [France] entire history”. We know that it took hold in the second half of the eighteenth century, yet its precise timing is unknown because there is no representative data available so long ago; and the lack of data has hampered the efforts to understand the origins of the decline. Figure 2 displays the time series of fertility from 1680 to 1920 in France and in England. I compare available sources to a novel crowdsourced genealogical dataset that allows me to comprehensively document the decline in fertility in France.

Available data The most representative and reliable data are censuses and the extraction of aggregate statistics from parish records, unfortunately these are not available in eighteenth-century France. The Princeton European Fertility Project and Coale and Watkins (1986) reconstruct series of marital fertility in Europe from the 1830’s onward—long after the onset of the demographic transition in France—using population counts from censuses. Their index of marital fertility I_g measures the fertility of a population relative to the maximum that might be attained without any form of limitation—defined as the fertility of the Hutterites, an Anabaptist sect without controls.⁹

In England, Wrigley and Schofield (1981) extract aggregate statistics from parish records in more than 400 parishes to reconstruct series of total fertility as early as in the sixteenth century. This series provides the best available account of the evolution of fertility over time in a pre-transition society. The aggregate nature of the data renders the process of collection relatively easy in a country such as England. Yet the data is not available in France, where such reconstruction is virtually impossible with more than 36,000 municipalities.

The only available source in the eighteenth century in France is complete family reconstitution using parish records, pioneered by demographer Louis Henry (Henry, 1972a,b, 1978;

⁹The index is constructed as follows: $(I_g)_i = B_i^m / (\sum_j M_{ij} G_j)$, where B_i^m is the total number of children born to married women in society i , M_{ij} the number of married women in age cohort j , and G_j the rate of fertility of Hutterites for age cohort j .

Henry and Houdaille, 1973) in France and Wrigley et al. (1997) in England. The demographers searched through and digitized handwritten baptism, marriage, and death records to study the entire population of selected small, rural villages, reconstituting the entire life histories of their inhabitants.

However, there are important issues with this data (see Alter, 2019; Blanc and Wacziarg, 2020; Schofield, 1972; Séguy, 2001, among others). First, because it requires a colossal effort of data collection, the demographers could only study 40 parishes in France and 26 in England, and only particularly small villages, raising important issues of selection and representativeness. Moreover, as a result, the data has very little spatial variation. Second, historical reconstitutions ignore migrants. Third, reconstructing fertility requires a full knowledge of all the births from given parents, with limited hints on where or when to look. Third, records often provide limited information, names change in different records, age or date of birth are not always provided, and dates are often rounded, and for that reason the method requires a significant investment to cross-check and validate each information. Finally, there is the issue of poor handwriting and dubious quality in early registers (e.g. see Figure A2). As a result of measurement error, under-recording, and issues of selection, the series in Figure 2 should be interpreted with caution. In France, Cummins (2012) estimates the onset of the sustained decline in 1776 using this data, with a peak in the 1750's.

Figure 2: The decline in fertility measured from different sources

Note: This Figure displays fertility from 1680 to 1920 in France (Panel A) and in England and Wales (Panel B), using different sources. Both Panels display fertility in the crowdsourced sample, using marital fertility from Coale and Watkins (1986) after 1851 (representative data from census), and the total fertility rate in the family reconstitutions of rural parishes by Henry (1972a,b, 1978); Henry and Houdaille (1973) in France and Wrigley et al. (1997) in England. Panel B also displays the series from aggregative extractions of vital statistics (Wrigley and Schofield, 1981).

(Panel A) France

(Panel B) England and Wales

Crowdsourced genealogies I rely on a novel individual-level dataset crowdsourced from publicly available genealogies to improve the measurement of the decline in fertility. Blanc (2020) reconstructs completed fertility from family trees scrapped by Kaplanis et al. (2018) on the genealogical website geni.com. I provide a detailed overview and analysis of the data and carefully assess the degree of selection by comparing the genealogies to census data when available in the companion paper. I show that the data is a representative sample of France from 1680 to 1920. Appendix Figure A3 displays the time series of urbanization and mortality in the crowdsourced data and in census data. There are no substantive differences, suggesting that selection into the sample is limited during that period of time.

The reconstruction of lineages from crowdsourced genealogies relies on the work of descendants reconstituting their family tree by searching through the same parish records as the ones used by demographers. Those records are scanned and available online with unrestricted access in all French *départements* from the mid-seventeenth century onward. However, the descendants have more incentives than demographers to thoroughly gather the information in the records, and they have a knowledge of family history and past migrations that may help them. As a result the data accounts for migration and has a substantial degree of spatial variation, with individuals from all over France included.

An important caveat of the genealogies is that a significant number of observations in the sample do not have a recorded horizontal lineage. Those reconstituting their family tree today often only record the vertical lineage (direct ancestors) rather than the horizontal branches. Yet the reconstruction of fertility relies on the knowledge of the horizontal lineage (see Appendix Figure A4). Following Blanc (2020) I deal with this issue by defining the *fertility sample*, the sample of individuals for which the horizontal branches were recorded in the previous generations; that is where at least one parent in any of the four previous generations is recorded as having a fertility rate different from one. Throughout the paper, I restrict the sample to the fertility sample since the observed fertility of these individuals should be close to their actual level of fertility.

Figure 2 shows that the genealogies provide the best available account of the decline in fertility in France. The genealogies are particularly consistent with censuses in the nineteenth century and, in England, superimpose almost perfectly with the series reconstructed from the aggregative extractions of vital statistics in the eighteenth century. The genealogies hence allow me to comprehensively document the exceptionally early decline in fertility in France and to date the onset of the decline to 1760, earlier than was previously thought.

3.2 Secularization in Provence: a case study

In the mid-eighteenth century, dechristianization spread to many regions of France. In comparison to the rest of Europe, the loss of influence of the Roman Catholic Church took place exceptionally early and at a particularly important scale in France (Todd, 1990).

France was the first country to secularize. According to Tackett (1986) secular beliefs spread “in a veritable flood” (p. 252), de Tocqueville (1856) writes that “irreligion was able to become a general and dominant passion in eighteenth-century France” (Book 3, Chapter 2), and historian Braudel (1986) evokes “the liberation of Frenchmen from the teachings, the restrictions, and the yoke of the Catholic Church”.¹⁰

The only available and exhaustive data on religiosity, easter attendance, is measured two hundred years after the onset of the process of dechristianization—in 1966. Data on devotion or religiosity hardly exists before that. Yet, secularization and its timing have been documented by historians in a number of regions. In particular, Vovelle (1973) documents a transition to secular attitudes (a *mutation de sensibilité collective*) in a fascinating and path-breaking study of Provence, in the south east of France. Similarly, Hoffman (1984) and Norberg (1985) find substantial changes in the rural parts of the diocese of Lyon and in the diocese of Grenoble in the eighteenth century. The change in attitudes could be observed in a decline in bequests and legacies for perpetual masses and offerings to the church, a decline in requests for burials in holy places, and a decline in the number of invocations of God, Jesus Christ, Virgin Mary, or various saints in wills at death, especially in Provence (Vovelle, 1973). In Brittany, evidence that such a change occurred is much more limited (Bois, 1960; Tingle, 2012).¹¹

In order to grasp the magnitude and the timing of secularization, I exploit detailed data on secular language across time and space in Provence from Vovelle (1973). The data includes the universe of wills in a comprehensive sample of villages and cities in four *départements* of Provence. The use of attitudes towards death as an indicator of devotion goes back to Ariès (1974). Although wealthier individuals were more likely to leave a will, Vovelle (1973) shows they were left by individuals of all social classes and in some places by more than 80 percent of deceased adults. If anything, the data is expected to underestimate dechristianization since wealthier individuals were more religious and secularized less (Vovelle, 1973). Additionally, this is the best available account of secularization since it is the only measure of devotion available both before and after it took place.¹² The language

¹⁰Why dechristianization happened so early is not well understood. The austere morality imposed by the Counter-Reformation in France, its association with political and economic elites, the rigorism of Jansenists, and the religious competition between the Jansenists and Jesuits are believed to have precipitated a backlash, with social unrest and secularization (Hoffman, 1984; Maire, 1998; Tackett, 1986; Van Kley, 1996). According to Hoffman (1984), “the Counter Reformation’s austere morality was imposed in full force ... not surprisingly, it was rejected by people who saw nothing wrong in combining devotion and gaiety” (p. 138). Tackett (1986) evokes “epic struggles with the Jesuits” (p. 6) and argues that “a whole series of affaires and causes célèbres, from the repression of the convulsionnaires in the 1730’s through the billets de confessions in the 1750’s and the expulsion the Jesuits in the 1760’s, had contributed in broadly publicizing and intensifying grievances toward the clergy.” (p. 257). According to Braudel (1986), “the drama played out in the 18th century was a sort of revenge on the part of the Reformation. Having hesitated, two centuries earlier, between Rome and Luther, or rather between Rome and Calvin, France had chosen Rome, but the choice backfired” (p. 200).

¹¹In Paris, Chaunu (1978) argues that there was substantial heterogeneity, with parts experiencing a much larger decline in devotion than others.

¹²Other measures such as church attendance or donations provide similar accounts but are not available across both time and space. Vovelle (1973) finds a decline in requests for perpetual masses after one’s death, from 90 percent of wills at the beginning of the eighteenth century to less than half before the French Revolution. Hoffman (1984) finds similar figures in the rural parts of the diocese of Lyon.

Figure 3: Secularization in eighteenth-century Provence

Note: This figure displays the median share of secular wills over time in Provence, from 1690 to 1789. The share of secular wills at the *bailiage* level is taken from and coded by Vovelle (1973).

used in the wills is an indication of the intensity of the devotion of those who wrote them and changes radically over the course of the eighteenth century, when references to God, Jesus Christ, the Virgin Mary, or various saints disappear and are replaced with secular language:

In the late seventeenth and early eighteenth centuries, testators consistently described themselves as adherent of the holy, apostolic Roman Catholic Church, who were prepared to meet their Maker, God the Creator, and Jesus Christ, His Son, by whose death and passion they hoped to be pardoned for their sins and to join the saints and angels in the Celestial Court of Paradise. ... By the 1780s most Provençal wills had reduced the traditional formula to a single clause: *'Having recommended his soul to God'*. The Virgin Mary and saintly intercessors were gone, the Celestial Court emptied of angels. Christ himself had receded into the background, while God the Father sometimes took the form of 'Divine Providence'. Many wills had become totally secularized, and some even described death as *'the indispensable tribute that we owe to Nature'*. (Darnton, 1978, p. 126)

Figure 3 displays the share of secular wills in Provence over time as coded by Vovelle

(1973). At the turn of the eighteenth century, only 13 percent of wills used secular language.¹³ Interestingly, following the Great Plague of Marseille, which killed as many as 100,000 people in the 1720s, the share of secular wills temporarily decreased in places most affected by the plague. After the 1730s, secularization took hold with significant increases in the share of secular wills. Provence, which was one of the poorest, most rural *départements*, experienced dechristianization particularly early, before most of France (Vovelle, 1973). On the eve of the French Revolution, more than 80 percent of wills were secular in Provence, where the population-weighted share of refractory clergy was 26 percent in 1791.

Although it is hard to precisely identify the onset of the process of dechristianization, the results show that it took hold before the French Revolution and around the same time as the decline in fertility, suggesting that it played an important role.

4 MAIN EMPIRICAL FINDINGS AT THE DÉPARTEMENT LEVEL

This section documents a large and robust cross-sectional association between religiosity and the timing of the decline in fertility at the *département* level.

4.1 The data

Religiosity. The main explanatory variable throughout the paper is the population-weighted share of refractory clergy in 1791—after the bulk of secularization.¹⁴ In July 1790, during the French Revolution, the National Constituent Assembly passed the Civil Constitution of the Clergy, which required all clergymen to swear an oath of loyalty to the secular state. I use the share of clergymen that did not take the oath (known as refractory clergy or non-jurors) in 1791 to proxy for religiosity. According to Tackett (1986), “The regional reactions of clergymen in 1791 can be revealing of the attitudes and religious options of the lay population with which the clergymen lived” (p. xvi).¹⁵ The data on the oath is constructed from the choices of more than fifty thousand parish clergymen, who made up more than 90 percent of all priests and vicars holding posts (Tackett, 1986, p. 39).

The share of refractory clergy is measured before the August 1792 decree that ordered all non-jurors to leave the country and before the War in Vendée, the Paris Commune, the Reign of Terror, and the establishment of anticlerical cults (the Cult of Reason and the Cult of the Supreme Being, among others). Moreover, before the 1792 decree, according

¹³This figure is likely overestimating secular beliefs before dechristianization since, as Vovelle (1973) argues, it is mostly the result of illiteracy or clergy members who deemed references to their faith too obvious (and are therefore coded as secular).

¹⁴Because the oath is measured at the district level, I use the district population-weighted average of the district-level share of refractory clergy in the analysis at the *département* level.

¹⁵The oath generated passionate reactions everywhere: “the issue of the oath soon became a veritable obsession, unleashing emotional reactions and factional strife in parishes everywhere” (Tackett, 1986, p. 4).

to Tackett (1986), “the National Assembly ... allowed the continued presence of the refractory clergy.” Hence, the refractory clergy in 1791 does not capture the effect of the main revolutionary events and policies of dechristianization but rather religious attitudes on the eve of the French Revolution. Additionally, in order to account for state legitimacy at the time of the French Revolution, I control for the share of deserters among conscripts in the French army between 1798 and 1805 throughout the paper (Forrest, 1989).

The oath has been used as a proxy for devotion on the eve of the French Revolution (see Franck and Johnson, 2016; Squicciarini, 2020). According to Tackett (1986), “The map of clerical reactions in 1791 was remarkably similar to the map of religious practice in the middle of the twentieth century” (p. xv). Table 1 and Appendix Figure A5 establish the relevance to the refractory clergy as a proxy to religiosity after secularization. The figure displays the spatial distribution of the refractory clergy in 1791 and different measures of the intensity of religious beliefs in the nineteenth and twentieth centuries: a dummy variable that equals one if Catholic practice in a *département* was deemed ‘good’ by the local administration in 1877 (Gadille, 1967) or if a district was coded as Catholic in 1947 (Boulard, 1947), the share of Catholic schools in 1901 (SGF, 1901), easter attendance in 1966 (Boulard, 1966), and the share of baptized births in 2013 (Vaillant and Dufour, 2013). These variables are more direct measures of devotion, although they are only available much later. The presence of refractory clergy is highly correlated with these measures.¹⁶

Table 1: Refractory clergy and religiosity

Note: This table displays the results of the cross-sectional regressions of different proxies for religiosity in 1877 (Gadille, 1967), 1901 (SGF, 1901), 1947 (Boulard, 1947), 1966 (Boulard, 1966), and 2013 (Vaillant and Dufour, 2013) on the population-weighted share of refractory clergy in 1791. All specifications control for the share of deserters among conscripts in the French army between 1798 and 1805. Specifications 1 and 3 report average marginal effects and are estimated with maximum likelihood. All observations are weighted by *département* population in the year of observation of the outcome variable. Robust standard errors are reported. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	(1) Dummy=1 if ‘good’ Catholic practice (1877)	(2) Share Catholic Schools (1901)	(3) Dummy=1 if Catholic (1947)	(4) Average Easter attendance (1966)	(5) Share baptized births (2013)
	Logit	OLS	Logit	OLS	OLS
Refractory clergy (1791)					
Marginal effect	1.570*** (0.197)		0.954*** (0.106)		
Standardized beta coefficient		0.313*** (0.116)		0.466*** (0.072)	0.418*** (0.108)
Observations	80	82	503	503	92
R^2	.	0.14	.	0.23	0.18

Finally, Appendix Section A1.2 shows that the share of refractory clergy in 1791 is positively associated with various proxies for development, suggesting that secularization was stronger in poor and rural places. The evidence is consistent with what Hoffman (1984); Norberg (1985); Vovelle (1973) find in Provence and in the rural parts of the dioceses of Lyon and Grenoble. These results suggest that the effect of religiosity on fertility is

¹⁶Squicciarini (2020) also shows that the share of refractory clergy in 1791 is highly correlated with the share of antireligious *cahiers de doléances* in 1789.

downward biased, since income, innovation, and the accumulation of human capital are traditional drivers of the decline in fertility.

Marital fertility. The main dependent variable at the *département* level is the year of transition to a marital-fertility index below 50 percent of the fertility of the Hutterites.¹⁷ Table A1, Panel A presents summary statistics for the index of marital fertility. The index is available for nineteen years (from 1831 to 1961) and decreases from 0.56 to 0.33. Since some *départements* had already experienced a sustained decline in fertility below .5 by 1831, the date of transition is truncated and I use OLS as well as Tobit regressions.

Controls. Throughout the paper, I account for proxies for religiosity before secularization to supplement the data on the refractory clergy in 1791 and to capture secularization. At the *département* level, the proxies for religiosity before secularization include the number of clergymen per capita in 1791, the average tithe in 1750, the number of abbeys in 1756, the duration of Jesuit presence before 1763, and the share of Protestants in 1815, after the revocation of the Edict of Nantes.¹⁸ These measures capture religiosity in the pre-1750 era.¹⁹ The prevalence of clergymen was particularly high, with one per five hundred inhabitants. Abbeys and monasteries played a significant role in local religious life (Heldring, Robinson and Vollmer, 2021) and are therefore included too. The average tithe is a correlate of religiosity in a club-good model à la Iannaccone (1998). Finally, the last two measures capture the presence of religious groups—namely, Jesuits and Protestants.

Appendix Section A1.3 provides suggestive evidence that religiosity in 1791 captures secularization rather than pre-existing differences, and that religiosity did not persist through dechristianization. In particular, I document a correlation between the share of refractory clergy in 1791 and the secularization of wills in eighteenth-century Provence, but not with the share of secular wills in the 1690s. The results hold when considering the share of secular wills in the 1780s.

In addition to the proxies for religiosity before secularization, I also account for potential determinants of the decline in fertility. I control for broadly defined cultural factors with a dummy that measures the presence of a printing press in 1500, the number of books printed in 1500, the log of *Encyclopédie* subscriptions per capita in the period 1776–79 (as a proxy for the diffusion of the Enlightenment), and linguistic distance from French in 1901. I also control for institutional factors, including dummies for *pays* status (fiscal regions in *Ancien Régime* France, which may capture differences in state capacity), and the share of

¹⁷I focus on marital fertility rather than overall fertility because it is the standard measure to detect the presence of fertility control achieved through parity-specific means (Coale and Watkins, 1986).

¹⁸I do not include the 1670 measure of the share of Protestants (the only other available year) because it would not capture the effect of the revocation of the Edict of Nantes in 1685. Including the 1670 share of Protestants instead does not change the point estimates but increases standard errors because the number of observations is lower.

¹⁹Clergymen per capita is measured in 1791, at the same time as the share of refractory clergymen is measured. However, this is a stock measure, and it is unlikely that the total number of clergymen would have immediately declined following the decline in religiosity (if it did, it would drive the coefficient on the share of refractory clergy to zero). Point estimates are larger in most regressions without adding this control.

deserters among conscripts in the French army between 1798 and 1805. I further control for education using the literacy rate of conscripts in the year of observation. In order to control for pre-industrial development, I include *département*-level population density (a standard proxy for development in the pre-industrial era—see Ashraf and Galor (2011)) and average soldier height before 1760. Finally, I control for contemporary development with the log rate of urbanization in the year of observation, defined as the share of the population living in towns with more than five thousand inhabitants. Table A5 details these controls while Figure A6 displays the spatial distribution of some variables of interest.

4.2 Baseline results

Determinants of year of transition. I study the cross-sectional determinants of transition date, the first year in which marital-fertility declined below .5. I estimate Equation 1 with OLS and a Tobit model (by maximum likelihood) in order to account for the left-censoring nature of the data since about a quarter of *départements* had already transitioned in 1831. The main variable of interest is the share of refractory clergy in 1791.

$$(1) \quad (\text{Transition date})_i = \beta \times \text{Ref. clergy}_{i,1791} + \mathbf{X}'_i \delta + \varepsilon_i$$

Table 2 reports the results, along with robust standard errors. Appendix Figure A8 plots the scatterplot and partial residual plot. A 10-percentage-point increase in the share of refractory clergy is associated with a delay in the year of transition of more than ten years. This is a remarkably large effect: moving from the 25th to the 75th percentile of the distribution of religiosity predicts a delay in the demographic transition of about forty years.

The estimates are stable and significant at the 1 percent level across all specifications. Specification 2 controls for proxies for religiosity before secularization in order to capture the effect of secularization. These controls include, notably, the number of clergymen per capita, the number of abbeys, and the average rate of the tithe collected by the church. Specification 3 controls for observed cultural and institutional factors. In particular, the share of deserters in the army during the French Revolution and fiscal status (*pays d'élection*, *d'Etat*, or *d'imposition*) in the *Ancien Régime* allow me to capture religiosity and not state legitimacy with the refractory-clergy measure. The specification also controls for linguistic distance to French (in order to capture the diffusion and adoption of new cultural norms (Spolaore and Wacziarg, 2019)) and *Encyclopédie* subscriptions (in order to capture the diffusion of the Enlightenment and the presence of local knowledge elites, who may have had an impact on cultural change and the modernization of society as a whole). Specification 4 adds twelve region fixed effects to account for unobserved cultural or economic factors that might confound the effect of the refractory clergy. For example, ancestry may have an effect on the diffusion of modernization (Weber, 1976), while the presence of nuclear

Table 2: Determinants of transition date

Note: This table displays the results of the cross-sectional regression of transition dates on the population-weighted share of refractory clergy in 1791. Transition date is defined as the first year with $I_g \leq .5$. Controls are described in Appendix Table A5. All observations are weighed by *département* population in 1831. Robust standard errors are reported.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	<i>dep var:</i> Transition date						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Refractory clergy (1791)							
Ordinary Least Squares	97.23*** (13.14)	98.29*** (13.42)	83.99*** (13.05)	101.07*** (22.54)	101.39*** (21.72)	101.27*** (22.49)	103.78*** (22.97)
Tobit (Maximum likelihood)	118.60*** (16.90)	117.55*** (16.74)	94.30*** (15.52)	113.16*** (24.19)	112.13*** (23.35)	111.65*** (24.08)	115.26*** (24.70)
Controls							
Religiosity (pre-secularization)		Yes	Yes	Yes	Yes	Yes	Yes
Cultural and institutional factors			Yes	Yes	Yes	Yes	Yes
Region fixed effects				Yes	Yes	Yes	Yes
Education and schooling					Yes	Yes	Yes
Pre-industrial development						Yes	Yes
Contemporary development							Yes
Mean of dep var	1863	1862	1861	1861	1861	1861	1861
Standard deviation of dep var	34	33	33	33	33	33	33
Perc. 25-75 Refractory clergy (1791)							
OLS	34	34	29	35	35	35	36
Tobit	41	41	33	39	39	39	40
Left censored observations	24	24	23	23	23	23	23
Observations	85	80	77	77	77	77	76
Adjusted R^2 (OLS)	0.40	0.40	0.55	0.61	0.63	0.61	0.60
Log likelihood (Tobit)	-322.3	-293.6	-267.9	-254.2	-253.0	-252.9	-248.6

family structure might influence on fertility (Todd, 1990).²⁰ Specification 5 controls for literacy to account for the quantity-quality trade-off, while specifications 6 and 7 account for development. The results remain virtually unaffected.

Finally, I estimate Equation 1 for alternative definitions of transition date in Appendix Table A6: below 30, 40, 50, 60, and 70 percent of the fertility of the Hutterites. The coefficient on religiosity is maximized for the first year in which marital fertility dropped below 0.6, which corresponds to a 10 percent decline from the average level of marital fertility in pre-transition Europe—about 0.65, compared to 0.55 in France (Coale and Watkins, 1986). A decline in marital fertility below 0.5 corresponds to a drop of about 25 percent.

Magnitude and mechanisms. Table 3 presents standardized beta coefficients for selected determinants of transition date. I evaluate and compare the magnitude of a number of factors that may have played a role in the early demographic transition in France, including religiosity but also Encyclopedie subscriptions, linguistic distance from the French

²⁰After including fixed effects for family structure, the estimated OLS coefficient drops to 95.19 (still significant at the one percent level). I do not report this in the table because of measurement and reverse causality (family structure is measured after the decline in religiosity and fertility), in order to limit the number of fixed effects, and for ease of interpretation.

language, literacy, and development. I report the results without any controls but also, in the last column, after accounting for the full set of controls.

The first column corresponds to the first specification of Table 2. In column (2), I evaluate the role of cultural attributes and find a large and significant correlation with subscriptions to Diderot and d’Alembert’s *Encyclopédie*. Decreasing the number of subscriptions per capita by one standard deviation is predicted to delay the transition date by one-third of a standard deviation, with or without controls. This is the second-largest effect after the refractory clergy in 1791 and is consistent with the pattern documented by Squicciarini and Voigtländer (2015, 2016). Yet, it is unlikely that it played a major role in the French demographic transition because Enlightenment ideas diffused throughout most of Western Europe and especially England and Scotland.

Table 3: Magnitude of the determinants of transition date

Note: This table displays the results of the cross-sectional regression of transition dates on a set of variables of interest. Transition date is defined as the first year with $I_g \leq .5$. Standardized beta coefficients and significance levels are reported. All observations are weighed by *département* population.
⁺ $p < 0.2$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	<i>dep var:</i> Transition date						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Standardized beta coefficients							
Refractory clergy (1791)	0.64*** (0.09)						0.69*** (0.15)
log 1 + Encyclopedie		-0.28** (0.11)					-0.30** (0.13)
Linguistic distance to French			0.23** (0.09)				0.02 (0.21)
Literacy				-0.13 (0.11)			0.34+ (0.20)
Population density					-0.03 (0.04)		-0.08 (0.23)
log 1 + urbanization						-0.03 (0.09)	-0.10 (0.11)
<hr/>							
Full set of controls							Yes
Observations	85	87	85	86	88	86	76
Adjusted R^2	0.40	0.07	0.04	0.01	-0.01	-0.01	0.60

Then, because religiosity could capture barriers to the diffusion of norms favoring limited fertility, rather than a direct effect of cultural differences, I look at linguistic distance from French in 1900 in (3).²¹ Without controls, the effect is large and significant yet the standardized beta coefficient is more than four times smaller than that of the effect of the

²¹Similar to what Spolaore and Wacziarg (2019) do in Europe as a whole, but I use data from the Atlas Linguistique de la France (Blanc and Kubo, 2021) in order to leverage more granular variation in linguistic distance within linguistic areas. Results are similar when using the data from Spolaore and Wacziarg (2019).

refractory clergy, suggesting that the main independent variable is capturing a direct effect of religiosity rather than barriers. After accounting for the full set of controls, the estimated coefficient becomes null and statistically not different from zero. Finally, neither literacy, nor population density, or urbanization had a significant or large effect on the timing of transition. These results suggest that the accumulation of human capital, pre-industrial, or contemporary development were not drivers of the transition in France, in line with the evidence at the macroeconomic level.

Appendix Table A7 shows the heterogeneous effect of religiosity in order to understand some of the mechanisms that could have played a role in the transition to low fertility. I interact the share of refractory clergy in 1791 with the same selected determinants used in the table above, and all variables are standardized—therefore the baseline coefficient for the refractory clergy in 1791 corresponds to the case where the interacted variable is evaluated at its mean. The first column corresponds to the first specification of Table 2. In (2), I estimate the heterogeneous effect of religiosity with respect to subscriptions to the *Encyclopédie*. It is possible that local elites allowed secularization to impact fertility, for example through the diffusion of the libertine literature to the general population. Yet, the effect is small and not significant. Similarly, the effect of linguistic distance and literacy is close to zero and not significant.

Finally, in column (5), I find that the effect of religiosity is twice as large when population density is one standard deviation away from its mean. The result suggest an important interaction between cultural and economic factors—suggesting that pre-industrial development was a necessary condition for the decline in fertility and that, before dechristianization, individuals had more offsprings than their desired level of fertility because of the constraints imposed by the Church. Coale and Watkins (1986); Spolaore and Wacziarg (2019) find a similar pattern in Europe as a whole. The results also suggest that overpopulation could have played a role, as suggested by Braudel (1986). I do not find the same pattern when looking at urbanization, another traditional proxy for development. The absence of heterogeneous effect could be explained by the fact that urbanization is only a proxy of development in the post-malthusian era, after the onset of the demographic transition, or it could be that the result above is really about overpopulation and not about some interaction between economic and cultural factors.

4.3 Robustness, sensitivity analysis, variable selection, selection on observables, and spatial correlation

Appendix 2 discusses a number of alternative specifications, variable selection, methods of accounting for omitted variables and spatial dependence using *département*-level data. The association between the year of transition and the refractory clergy is particularly robust. First, Appendix A2.1 shows that the refractory clergy is also associated with the level of

marital fertility I_g . Second, Appendix A2.1 estimates bounds on the effect of religiosity across all 131,072 combinations of covariates using sensitivity analysis (Brodeur, Cook and Heyes, 2020; Leamer, 1983) and shows that not a single specification returns a coefficient that is either statistically or economically insignificant. Third, Appendix A2.1 turns to variable selection with double-lasso, a supervised machine-learning technique, instead of using all covariates. Since the roots of secularization in France are not well understood, the method allows to select variables which may account for pre-existing or confounding factors in the distribution of both religiosity and fertility, abstracting from any priors. Fourth, Appendix A2.2 runs thousands of simulations by replacing the independent and dependent variables with spatially correlated noise (see Kelly, 2019). I find that only a negligible portion of these regressions returns significant coefficients. Additionally, I find that fixed effects remove the spatial dependence, and I compute Conley-adjusted standard errors at different cutoffs to improve the precision of the estimation. Finally, Appendix A2.2 estimates coefficients adjusted for selection on unobservables, with standard errors bootstrapped over thousands of replications (Oster, 2016). The results suggest that the OLS coefficient on religiosity is biased downward, in line with the evidence suggesting that secularization hit poor and rural areas disproportionately and was a separate process from the spread of the Enlightenment.

5 INDIVIDUAL-LEVEL RESULTS

In this section, I turn to individual-level analysis using crowdsourced genealogies. I relate the fertility decisions of ordinary individuals in the past to attributes of their place of birth.

5.1 The data

I leverage the cross-sectional variation in the individual-level dataset crowdsourced from publicly available genealogies presented in Section 3. The dataset contains thousands of individuals and is a nationally representative sample from 1680 to 1920, while the *département*-level data is only available after 1831. All observations contain geocoded places of birth, marriage, and death, which allows me to match individuals with the refractory clergy in 1791 at the level of their district of birth. Figure A14 displays the towns of birth included in the fertility sample. Summary statistics for the 17,358 individuals in the fertility sample are found in Table A12.

5.2 Baseline results

Empirical strategy. I model the conditional mean of fertility in Equation 2, where $fert_{i,t}$ is the completed fertility of individual i in decade t . I exploit cross-sectional variation in fertility with decade fixed effects λ_t . Each individual is assigned the share of refractory

clergy in 1791 of her district of birth $b(i)$.

$$(2) \quad \log \lambda_{i,t} = \beta \times \text{Ref. clergy}_{b(i),1791} + \mathbf{X}'_{i,t} \delta + \lambda_t \equiv \mathbf{z}'_{i,t} \gamma$$

$$\text{with } fert_{i,t} \sim \mathcal{P}(\lambda_{i,t}) \text{ and } \lambda_{i,t} = \lambda(\mathbf{z}_{i,t}) \equiv \mathbb{E}(fert_{i,t} | \mathbf{z}_{i,t})$$

In order to account for the count nature of the dependent variable, I use a Poisson-model framework to robustly estimate the conditional mean of fertility. In particular, I assume that fertility follows a Poisson distribution and that the log of the conditional mean of fertility is a linear function of observables. Equation 2 is therefore estimated with maximum likelihood as a Poisson regression in the bulk of the analysis (the results are robust to using OLS or other estimation methods to account for overdispersion and heterogeneity in count outcomes such as negative-binomial regressions).

The vector of controls include a quadratic in the age of birth of the first child, in order to not capture delayed marriage but rather parity-specific controls; the number of abbeys and the duration of Jesuit presence at the district level, in order to account for religiosity before secularization; and a dummy that equals one if an individual's place of birth was coded as urban at the time, and the log of Encyclopedie subscriptions per capita in a 50 kilometers radius of the individual's place of birth, in order to account for cultural factors and development. Finally, since the dataset does not always contain both spouses, I include the two whenever possible and cluster all regressions at the couple level, thereby accounting for couples fully recorded, and I use a male dummy in order to account for possible differences in gender.

Main results. Table 4 presents the baseline results at the individual level for observations after 1760, when dechristianization and the decline in fertility started. The estimated coefficient is particularly large and stable throughout specifications, with the marginal effect of the refractory clergy in 1791 on fertility estimated to be about one. This means that individuals born in a place with only refractory clergymen are predicted to have about one more child than those born in a place without any. This is roughly the size of the decline in fertility during the second half of the eighteenth century, when the number of children ever born went from 4.5 to 3.5 in about forty years (Figure 1).

All specifications include a male dummy and decade fixed effects. Standard errors are two-way clustered at the district-of-birth and couple levels.²² In specification 2, individual-level controls are included with a quadratic in the age at birth of the first child interacted with the male dummy: the reduction in fertility was not achieved by delayed age of marriage bur rather through parity-specific controls.²³ Specification 3 adds proxies for religiosity before

²²Indeed, information about both parents is not always available. Therefore only about 10 percent of individuals have spouses also included in the regressions.

²³Appendix Figure A15 plots the average timespan between the births of the first and last child (Panel A) and average duration between births of children (Panel B). Lower fertility was indeed achieved mostly through parity-

Table 4: Determinants of fertility at the individual level

Note: This table displays the results of the individual-level regression of the log total number of children ever born on the share of refractory clergy in 1791. The main explanatory variable is defined as the population-weighted share of refractory clergy in 1791, at the district-of-birth level. All specifications include a male dummy and decade fixed effects. Individual-level controls include a quadratic in the age of marriage interacted with the male dummy. Religiosity (pre-secularization) controls include the number of abbeys in 1756 and the duration of Jesuit presence until 1763 (both at the district-of-birth level; plus dummies). Development and Enlightenment controls include the urban status of the town of birth in the year of birth and the log of *Encyclopédie* subscriptions in 1777 – 79 at the district level (plus a dummy for nonzero subscriptions). Two-way clustered standard errors (at the couple and district levels) are reported. Average marginal effects are reported. The results were generated using the Stata program provided by Correia, Guimarães and Zylkin (2020). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	<i>dep var:</i> log fertility			
	(1)	(2)	(3)	(4)
Refractory clergy (1791)	0.252*** (0.083)	0.297*** (0.084)	0.281*** (0.090)	0.233*** (0.075)
Marginal effect of religiosity on fertility	0.893***	1.055***	0.997***	0.829***
Controls				
Individual-level		Yes	Yes	Yes
Religiosity (pre-secularization)			Yes	Yes
Cultural factors and development				Yes
Observations	11,887	11,728	11,728	11,727
Clusters (couples)	10,358	10,228	10,228	10,227
Clusters (districts)	440	440	440	440
Pseudo R^2	0.01	0.06	0.06	0.06

secularization at the district level: the presence (dummy) and number of abbeys in 1756, and the presence (dummy) and duration of Jesuit presence before 1763. In the last column, I control for a (time varying) dummy capturing the urban status of the town of birth at the time and I control for the presence (dummy) and number of knowledge elites by using *Encyclopédie* subscriptions at the district level.²⁴ The results are statistically significant and stable throughout.

Robustness to method of estimation. Poisson regressions are appropriate for non-negative count dependent variables, yet they rely on the assumption of equality of the mean and variance. That said, the fact that the Poisson distribution is specified by only one parameter is attractive to the extent that, in the post-Malthusian period, it is likely that

specific controls: there is no significant change in duration, and age of marriage only increases slightly. A previous version of the paper also included the log fertility of parents. Estimates were smaller because the fertility of parents is obviously collinear with the refractory clergy for non-migrants.

²⁴It is also possible to control for soldier height before 1760, at the town-of-birth level, as a proxy for development: this increases the point estimate of the share of refractory clergy in 1791 but decreases the number of observations by one-third; hence the result is not reported here. Similarly, I can control for age at death since adult longevity may confound the effect of religiosity on fertility. Yet evidence suggests that religiosity declines with age (Lechler and Sunde, 2020), which would bias the estimates of the impact of religiosity on fertility downward. When I include age at death (which also results in a significant drop in the number of observations), point estimates are virtually unaffected. Results are available upon request.

there was less variance as the mean fertility declined.²⁵ As a result, the standard error of the estimated coefficient may be too small and significance could be overestimated. Hence, in order to evaluate the robustness of the results and to account for overdispersion, Appendix Table A13 estimates Equation 2 with OLS, overdispersed Poisson, and negative-binomial regressions. Results are practically unchanged. In overdispersed Poisson, the conditional variance is scaled by a parameter $\phi \equiv \chi^2_{Pearson}/p$ in order to directly account for the observed overdispersion. In negative-binomial regression, heterogeneity among individuals is accounted for by assuming that the outcome follows a negative-binomial distribution, hence adding variability that Poisson regression does not allow for.

Distribution regression. Is the effect of higher religiosity uniform at all levels of fertility? I run a distribution regression in order to trace out the effect of the refractory clergy on the cumulative distribution function (CDF) of fertility, following Chernozhukov, Fernández-Val and Melly (2013).²⁶ This method allows to estimate the entire conditional distribution, and, importantly, it does not require the outcome to have a smooth conditional density as in quantile regressions. Therefore it is more adapted to the study of fertility, which is a discrete outcome. I evaluate the effect of the refractory clergy on the cumulative distribution of fertility for all observed levels, and I estimate Equation 3 with OLS, where $\mathbb{1}_{fert_{i,t} \leq f}$ is a dummy that equals one if individual i had less than f children.

$$(3) \quad \mathbb{1}_{fert_{i,t} \leq f} = \beta_f \times \text{Ref. clergy}_{b(i),1791} + \mathbf{X}'_{i,t} \delta + \lambda_i + \lambda_t + \epsilon_{i,t}$$

Figure 4 plots the results at different levels of fertility. The effect of the refractory clergy in 1791 on the cumulative distribution is negative everywhere and is the most important for large families with fertility above the mean and median. Especially, increasing religiosity by 100 percentage points is predicted to increase the probability of having more than six children by about 12 percentage points.²⁷ Finally, a property of distribution regressions is that the estimated coefficients on the CDF (with the linear-probability model) sum up to the OLS coefficient of the effect of the refractory clergy on fertility in Appendix Table A13.²⁸ Hence, it fully characterizes the average effect of the refractory clergy on fertility.

5.3 Accounting for unobserved pre-existing, geographic, cultural, and institutional differences

The crowdsourced genealogical data allows me to employ three different strategies to account for unobserved pre-existing, geographic, cultural, and institutional differences, and

²⁵For example, see Spolaore and Wacziarg (2019).

²⁶A thoughtful implementation of this methodology is provided by Goodman-Bacon (2016).

²⁷In order to visualize the effect of secularization on the CDF of fertility, I generate a counterfactual distribution by setting religiosity to the maximum level everywhere in Appendix Figure A16.

²⁸This is why I estimate Equation 3 with a linear probability model instead of logit or probit.

Figure 4: Effect of the refractory clergy on the cumulative distribution of fertility

Note: This figure displays the estimated impact of the population-weighted share of refractory clergy in 1791 on the cumulative distribution function of fertility, with robust standard errors, for all levels of fertility up to twenty children (the maximum observed is thirty-six).

to suggest a causal interpretation. To the best of my knowledge, this is the first time any of these strategies are used in a historical context.

First, it is possible to study within-*département* variation using fixed effects. In particular, *département*-by-decade fixed effects account for time-invariant *and* time-varying unobservables at the *département* level. This is particularly important to the extent that *départements* are the main administrative units, hence exploiting within-*département* variation allows to account for most institutional differences. For example, some *départements* may have been more affected by the French Revolution than others (for example, during the War in the Vendée or during the Reign of Terror), or the crowdsourced data may be of higher quality in some periods in some *départements* since the records are kept in the online *départemental* archives, which could result in bias.²⁹

Second, by extending the sample to individuals observed before dechristianization took place, it is possible to compare the effect of the refractory clergy in 1791 before and after the onset of the transition and secularization using a strategy similar to a difference-in-differences framework with continuous treatment. The effect of religiosity on fertility can

²⁹This issue is known and has been acknowledged—for example, in Henry (1972*a,b*, 1978); Henry and Houdaille (1973); Séguy (2001)—and experienced firsthand by the author (Blanc and Wacziarg, 2020).

be identified by differencing its effect after the decline in fertility from its effect before using 1760 as the cutoff for the onset of the decline in fertility. The true date is an unknown parameter and neither is it discontinuous (or clear-cut) nor is it, in all likelihood, identical across space. Moreover, the distribution of religiosity before secularization is unknown. It is impossible to directly address these issues, and therefore the common-trend assumption cannot be tested for and neither de Chaisemartin and D’Haultfœuille (2017) or Callaway, Goodman-Bacon and Sant’Anna (2021) can be implemented formally. Nevertheless, the fact that secularization and the decline in fertility were a smooth process would likely result in the underestimation of the true effect since some places were likely already treated before 1760 and the design relies on the assumption that that was not the case. Moreover, by estimating the effect of the refractory clergy in 1791 on fertility before secularization, it is possible to further draw inferences about whether it captures pre-existing differences or the extent of secularization.

Finally, it is possible to study the fertility decisions of second-generation migrants while holding constant unobserved institutional characteristics of places of arrival, following Algan and Cahuc (2010); Fernández (2011); Guiso, Sapienza and Zingales (2004). This methodology allows me to separate the effect of religious beliefs and norms passed through generations from that of confounding institutional and geographical characteristics that are location-specific. What is particularly novel in this setting is both the historical dimension and the fact that it accounts for institutional and cultural variation within the country. Indeed, the traditional approach only uses migrants surveyed recently, leverages between-country variation in place of origin, and assumes that there is no institutional variation within country in either place of origin or place of arrival. Here I leverage variation in the refractory clergy at the district-of-origin level, holding constant district-of-birth characteristics.³⁰

Table 5 displays the results.³¹ The first specification displays the baseline results with the full set of controls at the individual, town, and district-of-birth levels. In specifications 2 and 3, I add, respectively, fixed effects for *département* of birth and *département* of birth by decade. Point estimates increase, as suggested by the analysis in the rest of the paper, and the marginal effect of the refractory clergy on fertility is estimated to be between 1 and 1.3 children. All results are significant at the 1 percent level. In specification 4, I extend the sample to all individuals observed between 1680 and 1920. Interacting the refractory clergy in 1791 with a dummy that equals one if the individual was observed after the onset of the transition in 1760 allows me to account for unobserved pre-existing differences. The point estimate is similar to that in the previous specifications and is significant at the 5

³⁰In order to account for correlation among parents (less than a third of second-generation migrants had parents born in different districts from each other), I also implement multiway clustered standard errors at the parents and districts of birth of parents levels.

³¹In Appendix Figure A17, I display the variation in the share of refractory clergy in 1791 at the district-of-birth and district-of-birth-of-parents levels, with and without fixed effects.

Table 5: Determinants of fertility at the individual level: accounting for unobserved pre-existing, geographic, cultural, and institutional differences

Note: This table displays the results of the individual-level regression of the log total number of children ever born on the population-weighted share of refractory clergy in 1791 at the district-of-birth level (except in specification 5, in which it is evaluated at the district-of-birth-of-parents level and corresponds to the average level for the two parents, which ensures that individuals with a missing parent are not dropped). All specifications include the full set of controls. The baseline specification corresponds to the last specification in Table 4. Two-way clustered standard errors (at the couple and district levels) are reported in all specifications but the last. In specification 5, standard errors are four-way clustered at the district-of-birth-of-parents and parents levels (in this specification, the number of districts reported in the table is for the first parent; for the sake of simplicity I don't report the fact that there are 1,148 second parents originating from 237 districts). Average marginal effects are reported. The results were generated using the Stata program provided by Correia, Guimarães and Zylkin (2020). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	<i>dep var:</i> log fertility				
	(1) Baseline specification	(2) Fixed Effects	(3) Time-varying FE	(4) Diff-in-diff	(5) ^{a,b} Second gen migrants
Refractory clergy (1791) ^a	0.233*** (0.075)	0.327*** (0.118)	0.363*** (0.125)	0.052 (0.171)	0.210** (0.096)
_____ × After 1760				0.357** (0.166)	
Marginal effect of religiosity on fertility					
Between 1680 and 1759				0.175	
Between 1760 and 1919	0.829***	1.161***	1.290***	1.718***	0.753**
Sample					
Observed between 1680 and 1919				Yes	
Observed between 1760 and 1919	Yes	Yes	Yes		Yes
Controls					
Baseline controls	Yes	Yes	Yes	Yes	Yes
Département of birth fixed effects		Yes	Yes	Yes	
Département of birth by decade fixed effects			Yes	Yes	
District of birth fixed effects					Yes
Observations	11,727	11,727	11,525	16,503	1,438
Clusters (couples ^b)	10,227	10,227	10,042	14,283	1,151
Clusters (districts ^b)	440	440	429	451	235
Pseudo R^2	0.06	0.08	0.11	0.13	0.14

^adistrict of birth of parents in (5), ^bmore details in table notes

percent level. Moreover, I find that the refractory clergy had a null and statistically insignificant effect on log fertility before 1760. Only after 1760 it is associated with increased fertility, consistent with the fact that religiosity in 1791 does not capture pre-existing differences.³² Finally, the last specification restricts the sample to second-generation migrants and includes district-of-birth fixed effects in order to account for unobserved geographic

³²Appendix Figure A18, Panel A displays the difference-in-differences result graphically. In Panel B, I estimate the effect with forty-year periods. In the first period, 1680–1720, when secularization had likely not started anywhere, the estimated effect of the refractory clergy is virtually null, slightly negative, and not statistically significant. Then, in the period that immediately precedes the aggregate decline in fertility, the effect increases slightly and becomes positive, which is consistent with a smooth and heterogeneous-across-space process of secularization and with some places experiencing dechristianization earlier. The effect remains statistically insignificant before 1760. After 1760, which marks the onset of dechristianization and of the decline in fertility at the aggregate level, the refractory clergy had a positive and statistically significant effect. The size of the effect increases at the time of the second wave of decline in fertility (during industrialization) and then decreases, consistent with a process of diffusion (Spolaore and Wacziarg, 2019) or of interaction between cultural and economic forces as documented by Squicciarini (2020).

and institutional factors that may confound the analysis. I find that the refractory clergy in the district of the parents has a persistent and significant effect on fertility that is not location-specific but rather related to beliefs and preferences. The results suggest that secularization accounts the early decline in fertility in eighteenth-century France.

6 CONCLUDING REMARKS

The remarkably early timing of the decline in fertility in France, more than a hundred years before the rest of Europe and in a period of stagnation, has long been a mystery. This paper documents aggregate-level and cross-sectional evidence to establish that secularization accounts for the early transition. In particular, I use a novel crowdsourced genealogical dataset to study individuals during the onset of the decline in fertility.

This paper seeks to address the role of ideas, preferences, and culture in shaping development by tracing the cultural origins of the demographic transition. I establish that the transition from tradition to modernity played a role in the transition from stagnation to growth. The results suggest that cultural change and preferences matter in the process of development.³³ For future research, it would be interesting to explore the roots of secularization and its short- and long-run effects on political outcomes and democratization, particularly during and following the French Revolution (Bois, 1960; Siegfried, 1913).

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³³In a sense, this echoes the work of Becker, Murphy and Tamura (1990) on the role of multiple equilibria and Galor and Moav (2002) on the role of preferences and human evolution.

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