Devotion and Development:

Religiosity, Education, and Economic Progress in 19th-Century France*

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Abstract

This paper uses a historical setting to study when religion can be a barrier to the diffusion of knowledge and economic development, and through which mechanism. I focus on 19th-century Catholicism and analyze a crucial phase of modern economic growth, the Second Industrial Revolution (1870-1914) in France. In this period, technology became skill-intensive, leading to the introduction of technical education in primary schools. At the same time, the Catholic Church was promoting a particularly anti-scientific program and opposed the adoption of a technical curriculum. Using data collected from primary and secondary sources, I exploit preexisting variation in the *intensity* of Catholicism (i.e., religiosity) among French districts. I show that, despite a stable spatial distribution of religiosity over time, the more religious districts had lower economic development *only* during the Second Industrial Revolution, but not before. Schooling appears to be the key mechanism: more religious areas saw a slower introduction of the technical curriculum and instead a push for religious education. Religious education, in turn, was negatively associated with industrial development about 10-15 years later, when school-aged children would enter the labor market, and this negative relationship was more pronounced in skill-intensive industrial sectors.

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1 Introduction

Religion has played a primary role in human societies for millennia and still does today for many people across the globe. Given its importance in the private and public sphere, a broad literature has identified different channels through which religion can affect economic development. Specifically, its relationship with scientific and technological progress has been particularly complex throughout history and religion still hampers the diffusion of knowledge and innovations in many regions today.[1] However, there is little empirical evidence on *when* this happens and through which *mechanism*. What is challenging is to measure religion and to find a context in which to study its interaction with the adoption of "useful knowledge."[2]

To address this challenge, this paper examines a historical setting and focuses on 19th-century Catholicism during a crucial phase of modern economic growth, the Second Industrial Revolution (1870-1914) in France. In this period, Western economies experienced, for the first time, a rapid and large-scale adoption of transformative, skill-intensive technologies.[3] Providing technical education to the masses in primary school became an essential component of the industrialization process (Galor and Moav, 2006). At the same time, the Catholic Church was promoting a conservative and anti-scientific program and acted as a barrier to the introduction of the technical curriculum, while pushing for religious content of schooling. This tension was particularly strong in France, where the economy saw a spectacular scientific and economic development, and the relationship between the Church and science had been exacerbated by the events of the 1789 French Revolution. Importantly, while 98% of the French population was Catholic there was large preexisting variation in the *intensity* of Catholicism (which I refer to as "religiosity").[4] In my empirical analysis, I exploit this variation to study the differential diffusion of technical education and industrial development among the different departments (districts).

Using a rich dataset assembled from several primary and secondary sources, I show that the more religious departments started to lag behind during the Second Industrial Revolution. I shed light on the underlying mechanism and suggest that the type of education (secular versus Catholic) was key, in that it determined whether the skills needed to operate the new industrial technology were adopted.

[1] For several examples on the clash between religious doctrines and innovative activities, see Bénabou, Ticchi, and Vindigni (2013). Other authors look at how religion affects development through other factors, such as work ethic (Weber, 1905) or trust (Putnam, 1993; Guiso, Sapienza, and Zingales, 2003).

[2] Following Mokyr (2002), I refer to "useful knowledge" as knowledge that is "economically useful," i.e., necessary for economic development. This could include knowledge embodied in technological innovations.

[3] The technology-skill complementarity emerged in the second phase of industrialization (Goldin and Katz, 1998; Galor and Moav, 2006). During the First Industrial Revolution (1750-1850), instead, the upper tail of the skill distribution was crucial for industrial development while worker skills mattered less (Mokyr, 2005; Squicciarini and Voigtländer, 2015).

[4] A higher religiosity accentuates the effects of belonging to a particular religious affiliation and leads to stricter observance of religious rules (Lehrer, 2011).

My main measure of Catholic intensity is the share of refractory clergy in 1791. This represents the share of French clergy that did not swear the oath of allegiance to the *Civil Constitution* promoted by the revolutionary government, but instead confirmed loyalty to the Catholic Church.[5] The share of refractory clergy reflected religiosity at the local level, since a clergyman's decision to accept or reject the oath was largely affected by the religious attitude of the local community (Tackett, 1986). To further validate this measure of religiosity, I use six other indicators, capturing different dimensions of Catholic intensity (not related to a political episode), and I provide evidence of a stable spatial distribution of religiosity over time.

I then study the relationship between religiosity and several industrial and economic outcomes during the First and the Second Industrial Revolutions. This relationship is negative and significant only during the Second Industrial Revolution, but not before – suggesting that preexisting variation in religiosity started to matter only when skill-intensive technologies were introduced (see Figure 1, for instance).[6]

Furthermore, I shed light on the mechanism that can explain this relationship and analyze the role of religious versus secular education in the diffusion of skills. In the late 19th century, the role of human capital in the industrialization process changed dramatically: contrary to the First Industrial Revolution – when the upper tail of the skill distribution was crucial for industrial development and worker skills mattered less (Mokyr, 2005; Squicciarini and Voigtländer, 2015) – the more sophisticated industrial machineries of the Second Industrial Revolution increasingly required a technically skilled workforce to be operated, installed, and maintained (Galor and Moav, 2006). As a consequence, the French State took an active role in primary education, promoting a more technical curriculum to form a skilled labor force. Importantly, while educational policies were adopted at the national level, religiosity played a key role in their local implementation. I find that the share of Catholic schools increased in the more religious areas, when the secular and religious education systems started to differ. Historical record suggests that this was driven by parents' preference for religious education for their children – when their Catholic identity was being threatened by the introduction of secular and technical subjects (Harrigan, 2001). These results provide one of the first empirical pieces of evidence to a large theoretical literature on cultural transmission and backlash of identity (see, for instance, Bisin and Verdier, 2001; Carvalho, 2013; Fouka, 2016).[7]

Then, using detailed panel data on education and industrialization from 1861 to 1911, I show that

[5]The *Civil Constitution of the Clergy* was one of the most controversial laws passed by the National Constituent Assembly. It entailed drastic reforms to the Church structure. For more details, see Section 3.1.

[6]These cross sectional results are supported by a difference-in-differences analysis showing that the more religious departments had significantly lower industrial employment in the post-1870 period.

[7]In a different setting, i.e., German immigration in 20th-century United States, Fouka (2016) also provides empirical evidence on backlash of identity as a response to assimilation policies.

the share of Catholic schools was negatively and significantly associated with employment in industry and wages in manufacturing about a decade later. Specifically, "moving" from the 10th to the 90th percentile of the share of Catholic schools distribution leads to a 7% decrease in the share of industrial employment (relative to a mean of 25% with a standard deviation of 10%). Thus, the type of school and the content of education (whose choice likely depended on local religiosity) seems to be crucial for the diffusion of "useful knowledge," for the formation of a skilled labor force, and for industrial and economic development.

I run several robustness checks: I use different lags for the share of Catholic schools and find that the relationship between the type of education and economic outcomes was stronger between 10 and 15 years later, i.e., when schoolchildren entered the labor market. Using the share of Catholic schools as my outcome variable, I show that economic development did not predict the type of education a decade later. Both findings help me exclude concerns of reverse causality. Moreover, my results are robust to the inclusion of potentially confounding factors that are not captured by department and year fixed effects.

Then, using data by industrial sector and workers' cohort, I find that the "religiously educated" cohorts were less likely to be employed in "innovative" sectors, probably because they lacked the skills needed to operate the more complex industrial technologies.[8] Thus, even if I cannot rule out potential unobserved heterogeneity, these findings suggest that I am capturing the effect of the type of education on economic outcomes.

Finally, I do not argue that schooling was the only mechanism explaining the negative relationship between religiosity and economic development during the Second Industrial Revolution. Historical evidence suggests that the anti-scientific and anti-modern program of the Church reached several aspects of people's lives: for instance, local clergymen strongly opposed the introduction of vaccinations and birth control, as well as the use of electricity in Churches (Minois, 1991). While I provide some evidence for this and show that the more religious departments had a lower rate of vaccinations and higher fertility,[9] I also find that a large part of the relationship between religiosity and economic development is explained by education and acquisition of human capital.[10]

Importantly, my results do not show that the relationship between religiosity and economic outcomes is inherently negative. Rather, it varies over time, depending on the interaction between reli-

[8]For more details on the distinction between "innovative" and "traditional" sectors, see Section B.1

[9]This could represent a broader aspect of conservatism. In Appendix A, I show that while religiosity is related to different measures of conservatism, conservatism is not associated with lower economic development after 1870 – suggesting that the negative relationship between religiosity and economic development is due to the anti-scientific dimension of Catholicism, rather than to conservatism as such.

[10]The Sobel-Goodman mediation test, for instance, shows that more than 40% of the relationship between religiosity and industrial employment is mediated by the *growth* in the share of Catholic schools over the 1851-1901 period.

gious norms and the knowledge needed to industrialize and grow in each specific stage of economic development. In this paper, I am focusing on a period in which Catholicism embraced a particularly anti-scientific attitude (1789-1914):[11] even within this period, religiosity is not associated with economic development in the first half of the 19th century, i.e., during the First Industrial Revolution, when the upper tail of the skill distribution was crucial for the industrialization process. The more Catholic departments started to lag behind *only* during the Second Industrial Revolution, when religion became a friction for the diffusion of the skills needed to be economically successful.

When interpreting my findings, one concern could be that the spatial distribution of religiosity may be related to other factors that also affect economic development. In the empirical analysis, I take into account several potentially confounding characteristics (such as earlier economic development, the presence of the nobility and of the entrepreneurial minority, language heterogeneity, population density, and urban population) and show that these do not affect my results. Moreover, the panel analysis and a large body of historical evidence shed light on the mechanism through which religiosity can affect development and further suggest that my findings are unlikely to be driven by other confounding factors.

By analyzing the role of religiosity in the diffusion of knowledge, this paper contributes to a large literature on the relation between religion and economic outcomes, starting with the pioneering work of Max Weber (1905). Specifically, it relates to those studies examining how religion may hamper or favor economic development through the human capital channel.[12] However, most authors analyze the effects of belonging to a particular religious affiliation. For instance, Becker and Woessmann (2009) and Botticini and Eckstein (2012) examine Protestantism and Judaism, respectively. In both cases, the authors argue that the better economic outcomes achieved by Protestants and Jews, compared to those of Catholics, were due to investment in human capital; specifically, to investment in literacy.[13] I make several contributions to this literature. First, I show that the relationship between religiosity and economic outcomes can vary over time, depending on the interaction between religious norms and the economically useful knowledge in each specific stage of development.[14] Moreover, while most studies

[11] During the 17th and 18th centuries, for instance, there was no clear opposition of Catholicism toward science: several clergymen were eminent scientists and contributed to the Enlightenment. For details, see Section 2.2.

[12] For an overview of the literature on the economics of religion, see Iannaccone (1998).

[13] Even though the main objective of literacy was religious (rather than economic), it could still have positive spillovers on economic activities by allowing correspondence, written contracts, computations, and book-keeping (Mokyr, 2016). Interestingly, Cantoni (2015) finds no effects of Protestantism on economic growth, and Boppart, Falkinger, Grossmann, Woitek, and Wüthrich (2013) show that the beneficial effects of Protestantism over Catholicism on educational production depend on the sociocultural conditions, becoming weaker or disappearing in a non conservative milieu.

[14] Historically, Mokyr (2011) documents the changing relationship between religion and economic outcomes. He suggests that the Jewish, usually an economically successful minority, were underrepresented during the First Industrial Revolution, since, in this period, Judaism opposed the diffusion of "useful knowledge." Theoretically, Bénabou et al. (2013) look at the interplay between religious beliefs and scientific discoveries over time. The only empirical work on the changing

point to literacy (quantity of education) as the mechanism through which religion affects human capital formation and, in turn, economic progress, I show that religiosity can also affect the content (quality) of education, as well as openness to innovative activities. Finally, I exploit variation in the *intensity* of religion, in contrast to the spread of religion as such.[15]

This paper also contributes to studies that examine the role of worker skills for economic development (see, for instance, Galor, 2011) and suggests a channel for the differential formation of human capital across regions. Religiosity can hinder the accumulation of human capital and be a barrier for economic development when technology becomes skill-intensive. Furthermore, while studies focusing on the Second Industrial Revolution use school rate or literacy as a measure for worker skills (Galor and Moav, 2006; Becker, Hornung, and Woessmann, 2011), I show that distinguishing between quantity (school rate) and content of education can also explain economic outcomes in this earlier period – in line with research on modern data (see, for instance, Hanushek and Kimko, 2000).[16]

Finally, this study relates to a larger literature examining the interaction between culture and economic development, through channels such as trust, generalized morality, family ties, and long-term relatedness between populations (Guiso, Sapienza, and Zingales, 2006; Tabellini, 2008, 2010; Alesina and Giuliano, 2010; Spolaore and Wacziarg, 2012). I add to this literature by focusing on one dimension of culture – religion – and by suggesting accumulation of human capital as the channel explaining the relationship between cultural and economic factors.[17]

The remainder of the article is organized as follows: Section 2 explains the historical background. The data are described in Section 3. Section 4 presents the empirical results. Section 5 concludes.

2 Historical Background

2.1 The Second Industrial Revolution in France

French economic growth began to accelerate in the mid-18th century and by the mid-19th century, France was "a centre of invention and diffusion for modern technologies" (Crouzet, 2003, p.234). During the Second Industrial Revolution – usually dated from 1870 to 1914 – the French economy experienced a spectacular scientific and economic development, industrial production grew rapidly

interaction between religion and scientific outcomes is Chaney (2015), showing how an institutional change in the Islamic world in the 12th century lead to a decline in scientific production. However, it analyzes the pre- and post- institutional change (without exploiting variation in religiosity) and focuses on scientific production only.

[15]Contrary to cross-country studies examining the relationship between religiosity and economic development (see, for instance, Barro and McCleary, 2003), my results are unlikely to be confounded by institutional heterogeneity since France was a very centralized state.

[16]The effect of school curricula on economic development and on students' political attitudes is also examined in Cantoni and Yuchtman (2013) and Cantoni, Chen, Yang, Yuchtman, and Zhang (2017) respectively.

[17]Many studies have analyzed the role of culture versus institutions and tried to disentangle the two. I follow Alesina and Giuliano (2015) and refer to culture as a set of beliefs and values, and to institutions as formal institutions only.

and constantly and, with the *belle époque* (1890-1914), France became an economic leader.

The Second Industrial Revolution differed from the earlier phase of industrialization (in the late 18th and early 19th centuries) in two main respects. First, the interaction between science and technology accelerated. The localized progresses of the First Industrial Revolution spread to many more sectors and products and pathbreaking inventions were introduced (Mokyr, 1999).[18] While some of these inventions – such as pharmaceutic products and the electricity network – were completely new, others were advances on existing technology. Railroads, for instance, were substantially improved and new sources of power (the Diesel engine and the electrical locomotives) started to be used. In both cases, the whole population (including the middle and working classes) was exposed, like never before, to technological and scientific progress (Mokyr, 1999): railroads, telegraph networks, gas, and water supply – that in an embryonic stage were already in place before 1870 – were drastically expanded.[19] Similarly, electrical power, synthetic materials, and pharmaceutical products entered the daily life of a large number of people.[20] Thus, "the Second Industrial Revolution turned the ... technological system from an exception to a commonplace" (Mokyr, 1999, p.2).

The second difference with the earlier period of industrialization concerns the role of human capital. During the First Industrial Revolution the upper tail of the skill distribution was crucial for the industrial takeoff, while worker skills had a limited role in the production process; these were mostly "tacit skills," transmitted in the master-apprentice relationship (Mitch, 1993; Allen, 2003; Mokyr, 2005; Squicciarini and Voigtländer, 2015). In the last third of the 19th century, however, formal knowledge (including math and science) began to matter. The more complex and sophisticated industrial machineries increasingly needed skilled workers to be operated: for example, the dynamo technology and the subsequent electrification of industry led to the introduction of new instruments, such as conveyors, traveling cranes, and other devices that required more skilled labor (Goldin and Katz, 1998; Caselli, 1999).[21] Moreover, technical skills became particularly important for the installation and maintenance of these machineries: electricians, machinists, and technicians needed to be able to read and to understand instructions, and to have basics of algebra, geometry, as well as mechanical drawing, and dexterity.

[18]The chemical sector, for instance, saw the adoption of several new products, such as fertilizers, synthetic materials (including industrial rubber and synthetic plastic), artificial dyes, disinfectants and antiseptics.

[19]In 1870, French national railways covered about 17,000km. By 1913, they reached almost 41,000km (an increase of 133%). In Britain, over the same period, railways expanded from 22,000km to 32,000km (an increase of 46%).

[20]France was the "leading country" in medicinal research. During the 19th century, public medicinal laboratories were founded to manufacture and distribute vaccines (Achilladelis and Antonakis, 2001). The Institut Pasteur is an exemplary case: founded in 1887, it contributed significantly to the extension of vaccinations against rabies and smallpox among the population.

[21]The introduction of assembly lines (and thus the de-skilling of the production process) in some of the successful sectors of the Second Industrial Revolution is a later phenomenon. For instance, until 1910, division of labor was minimal in the automobile industry (Caselli, 1999).

2.2 Catholicism and science

The French Revolution (1789) marked a turning point for the relation between Catholicism and science. In the previous decades, the Catholic Church had a complex but generally positive attitude toward scientific and technical progress, which was seen as part of a harmonious divine plan made by God for the human race. Several clergymen were eminent members of the Enlightenment: the Abbé Jean-Antoine Nollet, involved in the earliest public experiments with electricity, was also the mentor of famous scientists, such as Lavoisier and Monge; similarly, François Rozier, "a clergyman whose vocation was the enlightenment" was the publisher of the *Observations sur la Physique, sur l'Histoire Naturelle, et sur les Arts* (Mokyr, 2005).[22] At the same time, Popes Benedict XIV (1740-1758) and Clement XIV (1769-1774) were known as "friends of science" (Minois, 1991).[23]

With the French Revolution and the anti-clerical and anti-conservative program promoted by the revolutionary government (expressed in the *Civil Constitution of the Clergy* as well as in the persecution of clergymen during the Reign of Terror), came an open war between the supporters of the traditional order, embodied in the Catholic Church, and the supporters of the new order, representing secular and scientific thinking. This was exacerbated by the French invasion of Italy (carried out under the flag of the Enlightenment) and by the complex relationship between Napoleon and Pope Pius VII. The reaction of the Church was brutal and, in the second decade of the 19th century, Rome embraced an extremely anti-modern and anti-scientific attitude: all French laws and norms were abolished, the use of electricity and vaccinations prohibited, 700 new cases of heresy were introduced, and the imprisonment and execution of liberals increased sharply. Science became the scapegoat for the revolutionary events and was accused of being false and misleading. Neutrality was not an option in this context: religion and science were now lined up on opposite sides of a battlefield – for reasons beyond their intrinsic natures (Minois, 1991).

The conservative program of the Church in Rome quickly spread in all Catholic regions of Europe, and especially in France. With the Bourbon Restoration (1814-1830), this became evident in many aspects of people's lives. For example, while substantial progress was made in medicine, local clergymen strongly opposed any medical advice or intervention.[24] They considered the catastrophic cholera

[22] Even before the Enlightenment, there are exemplary cases of clergymen devoted to science, such as the Minim order monk Marin Mersenne (1588-1648), an important mathematician who made influential contributions to acoustics, or the ordained priest Pierre Gassendi (1592-1655), a mathematician and astronomer who was the first to document Mercury's transit before the sun. More generally, the Society of Jesus was largely involved in science (Ashworth, 1986) and has been defined as "the most important contributor to...experimental physics in the seventeenth century" (Heilbron, 1979, p.2).

[23] Benedict XIV was interested in medicine and studied cases of hysteria and epilepsy. He strongly promoted scientific research at the University of Rome and he was so popular in the intellectual community all over Europe that Voltaire wrote the *Mahomet* as a homage to his openness to science. A similar attitude was embraced by Clement XIV, who, in one of his letters, regretted not having had enough time to study physics.

[24] Disease and suffering were seen as part of God's plan; human beings were not to interfere, but simply to accept their destiny.

epidemic in 1832 as God's punishment for the 1830 revolution, organizing religious processions as a remedy. They strongly opposed the efforts of public authorities trying to introduce vaccinations and those of doctors recommending birth control (especially among the lower classes as a way to fight poverty). Similarly, religious instruction replaced scientific and technical education: the study of science was banned from seminaries, the production of religious books increased sharply (from 300 to 600 per year), and the clergy recovered its hegemony in primary education (Minois, 1991; Jacob, 2014).

This conservative attitude of the Church continued until the First World War and the years between 1880 and 1914 were the most difficult period for the relation between science and Catholicism.[25] The adoption of the new technologies of the Second Industrial Revolution was widely debated in the clerical world: the newspaper *L'Ami du Clergé* (founded in 1878) would also advice the local clergy on which technological innovations could be used in Churches and by the population, if Rome had not yet expressed a clear opinion on this.[26] Over these decades, the Catholic battle against science and modernity also took on political connotations: when progressive parties came into power (especially during the Third Republic, 1870-1914) the Church confronted the French government on major societal and economic issues, especially concerning education.[27]

Finally, since the Church's anti-scientific program was promoted at the central level, it is unlikely that "institutional" religious differences explain the differential diffusion of knowledge and economic development within France, as in the cases analyzed by Davids (2013) and Rubin (2017). Thus, the variation in the intensity of Catholicism is likely to capture variation in the intensity of religious attitudes and beliefs, which, in turn, determines the degree to which the Catholic anti-scientific agenda and the resistance toward adopting "useful knowledge" were observed.[28]

[25]By the last decades of the 19th century, almost every aspects of life was influenced by some religious norms, which often led to paradoxical formalism: for instance, the length of fasting before the communion had to be precisely computed, the type of butter that could be eaten during the days of Penitence had to be carefully chosen, and only olive oil could be used for the lamps in the Churches (Minois, 1991).

[26]The bicycle, for instance, was considered a "dangerous instrument of female emancipation" and electric lamps could not be placed on the altar, but were allowed in other parts of the Church as long as they did not have "theatrical effects." Similarly, *L'Ami du Clergé* defined birth control practices as "abominable" and the result of a "selfish and materialist civilization" (Minois, 1991).

[27]The two main exceptions are the Bonaparte empires (in 1799-1814 and 1851-70). Their policies were quite open to scientific development, but also to Catholicism. During the Third Republic, however, the struggle between science and religion was associated with the struggle between Republicanism and Monarchism. Table A.2 shows that religiosity is negatively associated with voting for progressive political parties.

[28]Some authors study the interaction between religious beliefs and institutional changes. For instance, Belloc, Drago, and Galbiati (2016) show that, in the context of Medieval Italy, shocks to religious beliefs retarded institutional transition to self-government in cities where political and religious powers were the same person.

2.3 The role of schooling for diffusion of knowledge and economic development

Education was the most controversial issue in the debate between religion and science. The Church saw schooling (especially primary education) as a way "to rebuild the moral fibre of the lower classes, leaving behind them the accident [of the Revolution],...and [as a way] to restore the principles of stability and subordination, which had been the mark of Catholic and monarchic France" (Furet and Ozouf, 1977, p.121). During the Bourbon period, the teaching congregations proliferated and promoted an education system where morality, "religion and love of the King" had to be properly inculcated in the population (Jacob, 2014).

The situation started to change with the July Monarchy and the Loi Guizot of 1833, when the State took an active role in schooling and aimed at expanding and improving mass education. It introduced a national curriculum, that included not only religious instruction, but also notions of arithmetic, line drawing, and geography. Importantly, all teachers (secular and Catholic) were now required to have a *brevet de capacité* and every department had to maintain an *école normale* to "form teachers capable of applying innovations made in curriculum and methods... [and able to] fashion more and more enlightened, and harder working, men" (Furet and Ozouf, 1977, p.142-3).

Educational policies were adopted nationwide and enforced by a strong administrative system, also thanks to the increased geographic and economic integration. However, when there was scope for flexibility, ideology played a central role in their local implementaion (Grew and Harrigan, 1991). This is especially evident in the choice of Catholic versus secular education in the second half of the 19th century. With the Loi Falloux of 1851, Catholic public schools were encouraged: Catholic teachers were now exempted from the *brevet*, since a simple *lettre d'obédience* from any religious order was sufficient to qualify as teacher. Catholic schools had better physical facilities, larger schools (with more classrooms), and higher summer attendance. However, "the intellectual level of French priesthood was mediocre... and they often [turned] their backs on the modern world. In education, this was expressed in the denunciation of science as materialist, and the maintenance of the old idea of a classical-Christian utopia for the consumption of schoolchildren" (Anderson, 1975, p.116). Indeed, Catholic education was centered around the Bible and religious texts – girls' schools were particularly strict on issues concerning marriage and divorce – and very little emphasis was put on counting (Grew and Harrigan, 1991; Harrigan, 2001).[29] Also, in terms of methods, Catholic schools promoted a "partial education," focused on "reading only" (Furet and Ozouf, 1977).[30] The risk was that children in

[29]Even for the case of Prussia, Becker and Woessmann (2008) document that the Catholic Church was putting particularly low effort into girls' education and that, in the 19th century, the gender gap in terms of school enrollment was much higher in Catholic than in Protestant counties. Moreover, women (even if less represented than men in the formal labor force) are crucial for the education of their children and transmit their values to them.

[30]Importantly, reading versus writing and arithmetic represented two different cultures (Gildea, 1983): one was "associated with literacy and religious culture, the other one with manual arts and commercial practice" (Ariés, 1962, p.

Catholic schools were "paralyzed by the boredom of Catechism, religious instruction, and reading" ...and that education was simply a "passport to the First Communion" (Gildea, 1983).

On the other hand, all secular teachers were still required to have a *brevet de capacité* and many of them were professionally trained in the *écoles normales*. Interestingly, the preference for clerical teachers was, first of all, a religious one (Grew and Harrigan, 1991, p.221). In 1858, the Ministry of Education concluded that "[Catholic] families were particularly interested in the development of moral and religious values by schools and believed that only religious schools could provide those values" (Harrigan, 2001, p.60).[31]

The late 1860s and the advent of the Third Republic represented a transition period during which the differences between Catholic and secular education became more pronounced. Once universal education had been achieved, the government's new objective was to increase the quality and professionalization of the education system (Grew and Harrigan, 1991). The new reforms aimed at creating a more educated and skilled workforce, now crucial for industrialization (as explained in Section 2.1). For instance, under the Minister of Public Education Victor Duruy (1863-69), the *écoles normales* became increasingly professional and serious.[32] Similarly, the standards for the *brevet* became more uniform and the granting of a *certificat d' études* to those who had passed a final examination became more widespread and recognized. This was accompanied by investments in better facilities and by the definitive shift of educational financing from the communal/departmental level to the national level (Gildea, 1983; Grew and Harrigan, 1991). On the other hand, Catholic primary schools were still largely run by local priests and nuns, endowed only with a *lettre d'obédiance*.[33]

Another important moment in the history of the French education system is represented by the 1881-82 Jules Ferry laws, which made public education free and compulsory, and introduced crucial changes to the curriculum. Basics of law and economics, science, agriculture, industrial and manual arts, drawing, music, and gymnastics were now compulsory in the primary school curriculum. On the other hand, despite the strong opposition from the conservatives, the teaching of religion was definitively abolished in public schools, which were considered key to spreading progress and modern values among the population.[34] However, the State did not interfere with private education. Importantly, as

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[31]Catholic schools were especially preferred for girls: nuns were believed to give a better education for future mothers and wives, while there was a general hostility towards unmarried women teachers (Harrigan, 2001).

[32]The 1851 distinction between obligatory and elective subjects disappeared and the curriculum was largely improved. It now included geometry, physics, chemistry, natural history, history, geography, basics of agriculture and industry (with visits to the factories), bookkeeping, gymnastics, and music.

[33]In these decades, the French State tried to undermine the role of the Church in education: many republicans considered the backwardness of education – under Church control – as one of the reasons for France's defeat in the Franco-Prussian war.

[34]Other educational reforms implemented by the Republican government concerned the substitution of clerical teachers with secular ones: from 1879, teaching positions vacated by a clerical teacher had to be filled by secular teachers and, from

Catholic public schools were laicized, new private Catholic schools were founded to satisfy the local demand for religious education.[35] Hence, while secular education became increasingly professional, Catholic schools represented "the clearest measure of resistance to secularization" and the "bastions of a Catholic subculture in opposition to the national system of public schools" (Grew and Harrigan, 1991, p.107, 221). This dual system remained unchanged until 1901-1904 – when with the *Lois Anti-congreganistes*, all members of religious orders were prohibited to teach also in private schools – and it strongly affected the differential diffusion of technical education and acquisition of human capital among the population.

Thus, in about 50 years the French education system achieved important objectives: among them, universal education, professionalization of the teaching corps, administrative and financial centralization, and the introduction of a standard and modern school curriculum (that remained in place, without major revisions, until the Second World War). On the other hand, the pace at which this process took place was extremely heterogenous among departments and it cannot be explained without discussing the confrontation between science and religion and the resistance that national laws encountered at the local level.

3 Data

My analysis is performed at the French department (district) level.[36] I assembled a rich dataset from several primary and secondary sources. These include seven indicators of religiosity from 1789 to the 1950s, a large variety of outcome and control variables before and during the Second Industrial Revolution, detailed panel data on schooling and industrialization from 1871 to 1911, and data on industrial employment by sector and workers' cohort in 1896.

3.1 Main indicator of religiosity: Share of refractory clergy

Christianity spread in France in the 2nd century A.D. and the religious foundations of the country were officially established on Christmas Day of 800 A.D., when Pope Leo III crowned Charlemagne Emperor of the Holy Roman Empire. As in other part of Europe, Protestantism reached the French

1886, all new appointments had to go to secular teachers (Grew and Harrigan, 1991).

[35] There were four types of school in 19th century France: secular public, secular private, Catholic public, and Catholic private. In 1881 Catholic schools were the 26% of the total and 45% of them were private schools. In 1901, despite the secularization of public education, Catholic schools were still 21% of the total, with private Catholic schools being founded to replace public Catholic schools. Only a few Catholic public schools (less than the 4% of the total number of schools) survived until 1901, but then were finally abolished with the 1901-1904 *Lois Anti-congreganistes*.

[36] Departments were created in 1789 by the National Constituent Assembly, the legislative body formed during the French Revolution. The idea was that the *chef-lieu* (main city) of every department had to be located at no more than 24 hours on horseback from any town in the same department. Since the borders of the French territory changed over time, my analysis excludes those departments that were not part of France during the whole period of study, leaving 82 departments. For more details, see Appendix B.

territory in the early 16th century. However, the Huguenots – the French Protestants – were severely persecuted and in 1685 Protestantism was officially declared illegal and confined to a small minority of the population. In 1861, 98% of the French population was Catholic, making it unlikely that religious heterogeneity confounds my results. At the same time, there was large variation in the intensity of Catholicism, which I exploit in my empirical analysis.

My main indicator of religiosity is the share of refractory clergy in 1791 (Tackett, 1986). Among the several reforms voted by the National Constituent Assembly, the 1790 *Civil Constitution of the Clergy* was one of the most controversial. This was an attempt to deeply restructure the French Church, both financially and organizationally. It included the abolition of the tithes, the nationalization of the Church lands, the conversion of clergymen into functionaries of the state, as well as a drastic reduction of the number of religious corps, and the election of bishops and parish priests by the citizens. Given the strong opposition and the delays encountered for its implementation, the National Assembly required the clergy to take an oath of allegiance to the *Constitution*. Importantly, this was not simply a clergyman's personal decision, but rather a community-level choice. Indeed, "almost everywhere laypeople exerted pressure on the clergy to accept or reject the oath, with the oath ceremony providing the occasion for a de facto referendum on the general religious and secular policies of the Revolution" (Tackett, 1986, p.546). As a consequence, in January 1791, the French clergy split into *nonjurors* (refractory) and *jurors* (constitutional). I will use the share of refractory clergy – the share of clergy that did not swear the oath in support of the Constitution but remained loyal to the Catholic Church – as my main indicator of religiosity at the local level.[37] On average, 43% of the French clergy stayed loyal to the Catholic Church, with the highest percentage in the Morbihan department in Brittany (about 89%) and the lowest in the Var department in the Provence-Alpes-Côte d'Azur region (about 6%). Importantly, this indicator of religiosity is measured before my outcome variables both in the pre- and post-1870 period (for details, see Section 3.2), thus avoiding concerns of reverse causality, i.e., that economic development affected religiosity at the local level. Moreover, to further validate this measure, in Section 4.1, I will use other indicators of religiosity, and provide evidence of a stable spatial distribution of Catholic intensity over time.

[37] There was no particularly strong punishment for not taking the oath. At first, *refractory* clergymen had to be replaced and could not hold religious services. However, the Law of Toleration (May 1791) re-allowed them to hold services, as long as they did not speak against the *Constitution*. Finally, during the Reign of Terror (1792-93), which promoted the complete dechristianization of the country and established the "cult of reason", first the refractory and then the constitutional clergy were persecuted. The formal status of the Catholic Church was reestablished in 1801 with the Concordat between Napoleon and Pope Pius VII.

3.2 Cross sectional analysis: Religiosity and economic development during the First and Second Industrial Revolutions

3.2.1 Outcome variables

In the cross-sectional analysis, I use several economic and industrial outcomes to study the interaction between religiosity and economic development before and after 1870. For the pre-1870 period, I look at the share of people in industry in 1866 (French census) as an indicator of industrial development. Then, as measures of innovativeness at the local level, I use the share of workers in innovative sectors[38] and the number of steam engines per 1,000 people in 1839-1847 (Chanut, Heffer, Mairesse, and Postel-Vinay, 2000). Finally, following a rich literature in economic history (DeLong and Shleifer, 1993; Dittmar, 2011; Squicciarini and Voigtländer, 2015), I use city population growth between 1750 and 1850 as a proxy for economic growth (Bairoch, Batou, and Chèvre, 1988). For the period of the Second Industrial Revolution, I use measures as similar as possible to those used for the pre-1870 period, in order to better compare the level of development before and after 1870. These include the share of industrial employment in 1901 (French census), the share of workers in innovative sectors in 1896 (Enquéte Industrielle), the number of industrial machineries per 1,000 people in 1901, and the growth of industrial employment from 1871 to 1901 (French census).[39]

3.2.2 Control variables

When regressing my economic and industrial outcomes on religiosity, I control for a variety of baseline controls and potentially confounding characteristics, both before and during the Second Industrial Revolution. The baseline controls include total department population, literacy rate (measured as the percentage of men and women able to sign their wedding certificates), and school rate (measured as the ratio of the number of children attending primary schools to the number of school-aged children (5-15 years)). These data are from the Statistique Générale de la France. The other baseline controls are a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, capturing geographic characteristics of the departments. Finally, as measures for early access to formal knowledge, I include the (log) number of universities founded before 1750 (Jedin, Latourette, and Martin, 1970; Darby and Fullard, 1970), and the (log) number of printing presses existing between 1450 and 1500 (Febvre and Martin, 1958; Clair, 1976) .

In a second step, I include a set of potentially confounding factors (additional controls). I control for the presence of knowledge elites, measured as the density of subscribers to the Encyclopédie of Diderot and d'Alembert (Squicciarini and Voigtländer, 2015). This captures the importance of the upper tail of the skill distribution that played an important role in economic development during the

[38] For more details on the classification of sectors into "innovative" and "traditional", see Section B.1

[39] Since data on city population growth are not available after 1850, I use growth in the share of industrial employment.

First Industrial Revolution (Mokyr, 2005; Squicciarini and Voigtländer, 2015) and that could potentially foster industrial development also in the late 19th century, as well as promote secular values and scientific knowledge among the rest of the population. I include the share of the Huguenot population in 1861 (Mours, 1958), which – although only 1.7% of the French population – was heavily involved in industry, trade, and finance.[40] I use the number of noble families in each department from the Almanach de Saxe Gotha, the most important classification of European royalty and nobility. One concern could be that the nobility, owning most of the land, could hinder industrial progress and use religion to keep the population obedient while opposing the implementation of schooling reforms (see, for instance, Galor, Moav, and Vollrath, 2009). However, historically, this does not seem to have been the case in France. First, after the French Revolution, landholding took on a small-scale character[41] and land owners had little influence on the rural community.[42] Furthermore, given the centralization of the French state, local seigneurs had little flexibility in implementing government policies at the local level. Following Abramson and Boix (2013) and Squicciarini and Voigtländer (2015), I also control for early industrial activities: these data provide the number of mines, forges, iron trading locations, and textile manufactures prior to 1500 for each department. Then, since France was a centralized State, contrary to cross-country studies, my results are unlikely to be confounded by institutional heterogeneity. However, to proxy for local differences in the reach of central institutions, I include a dummy for departments located in *pays d'élection*, i.e., regions where the king exerted particularly strong power in fiscal and financial matters (Le Bras, 1986). Finally, I include a dummy for non-French speaking departments[43] – to take into account cultural and language differences – and I control for population density and urban population.

3.2.3 Balancedness

In Table 1, I regress my main explanatory variable, the share of refractory clergy, on my baseline and additional controls (one by one) to check whether these are correlated with religiosity. Few variables are significantly associated with the share of refractory clergy. Among the baseline controls (col.

[40] Importantly, Boppart, Falkinger, and Grossmann (2014) find that Protestants in 19th-century Switzerland outperformed Catholics, not only in reading (often considered a consequence of their motivation to read the Bible), but also in other cognitive skills, such as numeracy, more closely related to industrialization.

[41] The land redistribution during the French Revolution "reinforced the small-scale character of landholding in France and, by extension, the tenacious, ideologically informed sense of property ownership that would hinder attempts to achieve *remembrement* [land consolidation] in the nineteenth and early twentieth centuries" (Jones, 2012, p.113)

[42] As explained by Forster (1967, p.84-85), "Surely there was less contact between the rural community and the noble *rentier* or the noble owner...and less contact meant less local influence for the nobility." He also argues that "the bonds of subordination ...throughout the entire society had been loosened [and].. by 1825 the erosion of the hierarchical society upon which hereditary aristocracy rested was far advanced."

[43] In my dataset, these include Corse, Finistere, Pyrenees Orientales, and Basses Pyrenees.

1), total department population is significantly correlated with religiosity.[44] Similarly, the coefficient on Atlantic/Mediterranean departments is positive and significant, probably reflecting the higher religiosity of Brittany, Lower Normandy, and Aquitaine.[45] On the other hand, school rate, the number of universities, and the number of printing presses are not significantly correlated with the share of refractory clergy.

In column 2, I show the coefficients of the individual regressions of the share of refractory clergy on the potentially confounding factors described above. The coefficient of the density of knowledge elites is insignificant and almost zero, suggesting that the enlightenment of a minority is not correlated with the level of religiosity of the rest of the population. It is therefore unlikely that the presence of knowledge elites is confounding my results. Similarly, the intensity of Catholicism is not significantly correlated with the presence of the Huguenots.[46] Moreover, there is no significant relationship between religiosity and the local density of noble families. The correlation between the share of refractory clergy and pre-industrial activity is small, positive, and insignificant, making it unlikely that my results are confounded by the presence of early industrial centers. There is a negative and significant correlation between the reach of central institutions, measured by the *Pays d'Elections* dummy, and the intensity of Catholicism. This suggests that religion played a more important role in those departments that were more independent of the king.[47] Finally, population density, urban population, and the dummy for departments in non-French speaking areas are insignificantly correlated with Catholic intensity. In sum, Table 1 suggests that there only are a few department-level characteristics that vary with religiosity. Importantly, my results are robust to the inclusion of both the baseline and the additional controls.

3.3 Panel analysis: Education and economic development

In the panel analysis I shed light on a likely mechanism through which religiosity interacts with economic development and I study the relationship between the type of education (secular versus Catholic) and industrial development in the post-1870 period. My outcome variables are the share of industrial employment from 1871 to 1911 (French censuses) as a measure for industrial development and wages in manufacturing from 1891 to 1906 (Statistique Général de la France, 1907) as a proxy for produc-

[44] Department population, population density, and school rate are measured in 1871 since this is generally considered the beginning of the Second Industrial Revolution. Using these variables in other years does not change the results.

[45] This is not a problem in my case: since globalization reached its peak before the First World War, departments located on the Atlantic Ocean or on the Mediterranean Sea should have been economically more successful during this period. Moreover, excluding these regions does not affect my results.

[46] On the other hand, Huguenot density is a good predictor for the presence of knowledge elites and thus positively associated with economic development during the First Industrial Revolution. This is in line with the idea of the Huguenots being an economically successful minority (Squicciarini and Voigtländer, 2015).

[47] However, the results of my regressions are robust to the inclusion of the *Pays d'Elections* dummy and the coefficients on religiosity are very similar in magnitude to those in the baseline specification (see Table 5 and A.6).

tivity. Both variables are reported every five years. Then, using data by industrial sector and workers' cohorts from the 1896 Enquéte industrielle, I compute, for each cohort, the share of workers employed in innovative sectors.

My main explanatory variable is the share of Catholic schools. In the baseline specification, I control for department-level population, school rate, the number of students per school, and the total number of schools. All schooling variables are from the Statistique Générale de la France and generally reported every five years from 1851 to 1901. Then, I include potentially confounding factors that are not captured by the department and year fixed effects. First, I control for the spreading of the phyloxxera that between 1863 and 1890 destroyed 40% of French vineyards and represented one of the most dramatic and devastating agricultural shocks in France (Banerjee, Duflo, Postel-Vinay, and Watts, 2010). Second, I include government extraordinary subsidies (per capita) to the different departments from 1871 to 1906. These data are from the *Bulletin des lois de la République française* and are a measure for the different amount of State resources going to the departments. To control for internal migration, I include the number of immigrants per 100 inhabitants.[48] Finally, I use the I_g Princeton index[49] as a measure of fertility (Murphy, 2015) and I control for the share of urban population (Statistique Générale de la France).

4 Empirical Results

First, using different indicators for Catholic intensity, I provide evidence of a persistent spatial distribution of religiosity over time. Then, I show that the more religious departments started to lag behind only after 1870, when the Second Industrial Revolution started. Finally, I shed light on the mechanism and suggest that the type of education was key: I find that the share of Catholic schools was negatively associated with industrial development about a decade later and that "religiously educated" cohorts were less likely to be employed in innovative sectors.

4.1 Local persistence of religiosity

I use alternative indicators of religiosity to show that departments with a higher share of refractory clergy in 1791 were more religious already before the 1789 French Revolution and until the 21st century.

4.1.1 Persistence of religiosity before and during the French Revolution: the Cahiers de Doléances

Since the French Revolution occurred in 1789 – only two years before the 1791 clerical oath – and brought drastic changes to French society and institutions, one concern could be that it also impacted

[48] Since foreign immigration to France was very limited (Daudin, Franck, and Rapoport, 2016), these only include immigrants from other French departments.

[49] This measures the ratio of births that married women in a given population actually have to the number they would have if subject to the maximal age-specific fertility schedule. This is a less coarse measure than the crude birth rate.

local religiosity. I use data from the 1789 *cahiers de doléances* (Hyslop, 1934) to provide evidence of a locally stable distribution of Catholic intensity before and during the French Revolution.

At the eve of the Revolution, Louis XVI, confronted with a general discontent of the population, decided to call (for the first time after 1614) the Estates General, i.e., the French representative assembly. The representatives of each Estate (clergy, nobility, and third estate) in every *baillage* (electoral district) endorsed a *cahier*. This was a list of grievances and suggestions on several aspects of the social, economic, and political situation of the country. Importantly, "the *cahier* embodied the will of the community that endorsed it" (Shapiro, Tackett, Dawson, and Markoff, 1998, p.105). Hyslop (1934) grouped the *cahiers'* contents in 49 categories and, for each of them, she included a dummy on whether the *cahier* of each of the three estates in a given *bailliage* discussed the respective category. I identified four categories reflecting "anti-religious" attitudes. Specifically, these are: a) "*cahiers* demanding the democratization of the clergy," b) "*cahiers* expressly hostile to Papal influence in the French Church," c) "*cahiers* showing secularism," d) "*cahiers* showing pronounced etatisme as regards the Church." Focusing on the *cahiers* of the third estate, I compute the share of "anti-religious" categories over the overall topics covered in the *cahier* and use it as a measure of pre-1789 (anti-)religiosity.[50] Table 2 shows a negative and significant relationship between the share of "anti-religious" categories in the 1789 *cahiers* and the share of refractory clergy in 1791, suggesting that the departments that were more religious before the French Revolution were also more religious afterwards.[51]

4.1.2 Persistence of religiosity until the 21st century

I then look at later indicators of Catholic intensity. First, I use data on the share of readers of the newspaper *La Croix*, the Catholic newspaper *par excellence*, in 1893 (Cholvy and Hilaire, 2000). Godfrin and Godfrin (1965) argue that the title and the crucifix on the first page was a way to gather the whole Catholic community, and that its habitual readers were people supporting the Church unconditionally and interested in being updated on the life of the their religious community.[52] Then, I use data on the share of Catholic schools in 1901 and the number of priests per capita in 1901 (both from the Annuaire Statistique de la France). Finally, I have information on religiosity in the mid-21st century; specifically, I look at Church attendance, measured as the share of people attending the Sunday Mess (Isambert and Terrenoire, 1980), and at the number of priests' ordinations per capita (Godfrin and Godfrin, 1965).[53] Figure 2, for instance, shows that departments with higher religiosity in 1791 had

[50] I focus on the *cahiers* of the third estate, since they represented 98% of the French population, thus capturing the religiosity of the majority.

[51] As a placebo, Table A.4 in Appendix uses the share of "anti-religious" categories in the *cahiers* of the clergy and nobility. These are not significantly correlated with the share of refractory clergy in 1791, suggesting that the religiosity of these minorities is different from the religiosity of the rest of the population.

[52] The share of *La Croix* readers is measured as an index going from 1 to 4.

[53] Priests' ordinations per capita is measured as an index going from 1 to 6.

higher Sunday Church attendance still in the 1950s. Table 3 shows the regression results for the different religiosity indicators. All of them are positively and significantly associated with the share of refractory clergy, providing evidence of a stable spatial distribution of intensity of Catholicism until the 21st century – in line with a large literature on persistence of cultural traits (see, for instance, Putnam, 1993). Finally, these findings further suggest that the share of refractory clergy reflects religiosity at the local level, since it is positively associated with other dimensions of Catholic intensity (not related to any political episode).[54]

4.2 Religiosity negatively associated to economic development after 1870, but not before

4.2.1 Cross-sectional analysis: Negative association between religiosity and development after 1870

I relate religiosity to a variety of outcome variables before and during the Second Industrial Revolution. I estimate equations of the form:

$$y_i = \beta \cdot R_i + \gamma \mathbf{X}_i + \varepsilon_i \,, \tag{1}$$

where R_i represents religiosity in location n; $\mathbf{X_i}$ is a vector of control variables, and ε_i is the error term. I use several outcomes y_i (described in Section 3.2) as proxies for economic development. Following my discussion in Section 2, I expect religiosity to hamper the diffusion of technical and scientific knowledge, and therefore economic development, during the Second Industrial Revolution – I thus expect $\beta < 0$ after 1870, but not before.

Table 4 shows the OLS results for the pre-1870 period. First, I use department-level data and I show that the share of refractory clergy is not significantly associated with the share of people in industry in 1866 (col. 1), the share of workers in innovative sectors in 1839-47 (col. 2), and the (log) number of steam engine per 1,000 between 1839-47 (col. 3). Next, column 4 uses city population growth between 1750 and 1850 as a proxy for economic growth and shows a very similar pattern. Among the other controls, school rate is generally significantly and positively associated with the outcome variables (cols 1-3).[55] Similarly, departments located on the Mediterranean Sea or on the Atlantic Ocean seem to have higher industrial and economic development. Table A.5 in Appendix shows that the results hold when including the confounding factors listed in column 2 of Table 1. Altogether,

[54] Importantly, while one concern could be that the share of refractory clergy captures political attitudes toward the Revolution, the other measures of religiosity do not take on any political connotation, but they would provide very similar results in my empirical analysis. However, I prefer using the share of refractory clergy as my main indicator of religiosity since it is measured before my outcomes variables, both in the pre-1870 and in the post-1870 periods. Moreover, for more details on the relationship between religiosity and political attitude, see Section A.1 in Appendix.

[55] As argued in Squicciarini and Voigtländer (2015), in the period of the First Industrial Revolution (1750-1850), higher worker skills are positively associated with economic outcomes in the cross-section, but not with growth. Thus, the negative (despite not significant) coefficient in col. 4 is not astonishing and suggests the declining importance of skilled labor (replaced by unskilled labor) during the First Industrial Revolution (Goldin and Katz, 1998; de Pleijt and Weisdorf, 2014; Squicciarini and Voigtländer, 2015).

these findings show that religiosity was not associated with economic development before the Second Industrial Revolution.

Table 5 looks at the relationship between religiosity and economic development in the post-1870 period. The coefficient on the share of refractory clergy is now negatively and significantly correlated with the share of industrial employment in 1901 (col. 1), the share of workers in innovative sectors in 1893 (col. 2), the number of machineries per 1,000 in 1901 (col. 3), and the growth in the share of industrial employment between 1871 and 1901 (col. 4). As in the pre-1870 period, school rate is generally positively and significantly correlated with the different outcome variables. At the bottom of Table 5, I also report the standardized beta coefficients, showing that a one standard deviation increase in religiosity is associated, for instance, with a 0.19 standard deviations decrease in share of industrial employment and with a 0.24 standard deviations decrease in the share of workers in innovative sectors. Specifically, "moving" from the 10th to the 90th percentile of the religiosity distribution leads to a 6% decrease in the share of industrial employment in 1901 (relative to a mean of 30% with a standard deviation of 10%) and to a 11% decrease in the share of workers in innovative sectors in 1896 (relative to a mean of 40% and a standard deviation of 16%). The standardized beta coefficients for school rate are comparable to those in the pre-1870 period (see Table 4) suggesting that the "quantity" of education was similarly important during the First and the Second Industrial Revolutions. Table A.6 in the Appendix shows that, in all the specifications, the coefficient on the share of refractory clergy remains significant and very similar in magnitude when including the confounding factors listed in column 2 of Table 1. These results, thus, suggest that the relationship between religiosity and industrialization became negative when worker skills started to matter for the industrialization process.[56]

4.2.2 Additional specifications

In Section A.2 of the Appendix, I perform (and discuss in more details) a number of additional checks. Table A.7 also controls for the share of clergy in the population in 1791. Importantly, Table A.8 controls for the initial level of development, by including the pre-1870 outcome variables as controls in the post-1870 regressions.[57] The regressions in Table A.9 include the share of people with secondary education in 1876.[58] In all specifications, the inclusion of these potentially confounding characteristics does not affect the magnitude and significance of my coefficients. This sensitivity analysis suggests

[56] While I am focusing on intensity of religion, other studies analyze the interaction between industrialization and different religious groups. For instance, in the context of Egypt, Saleh (2015) shows that the first wave of state industrialization (based on the textile industry) was de-skilling for Muslim and up-skilling for Christians, while the second wave of industrialization – based on the transportation industry – was up-skilling for both groups.

[57] This addresses the concern that higher initial development leads to lower religiosity and, consequently, to higher development afterwards. It also relates to the secularization hypothesis, suggesting that as societies develop, religion becomes less important in people's lives (see, for instance, McCleary and Barro, 2006; Barro and McCleary, 2006).

[58] This variable is not included in the main specifications, since I prefer using a consistent set of controls in the pre- and post- 1870 periods, while data on secondary education are available only after 1870.

that any remaining omitted variable bias due to unobservables should be modest as well. This is confirmed in Table A.10 where I formally analyze the role of unobservables using the Altonji, Elder, and Taber (2005) methodology. I show that selection on unobservables would have to be at least 3.5 times stronger than selection on observables to explain away the relationship between the share of refractory clergy and my outcome variables, making it unlikely that unobserved factors are confounding my results. Finally, I use Conley standard errors with a cut-off window of 100 kms to account for spatial auto-correlation (Conley, 1999) and my results hold (see Table A.11).

4.2.3 Difference-in-differences: Lower industrial employment in more religious areas after 1870

Since data on the share of industrial employment are available from 1871 to 1911 period from the same source, I can perform a difference-in-differences analysis, considering the year 1871 as the pre-treatment period. I estimate equation of the form:

$$y_{i,t} = \alpha_i + \alpha_t + \beta R_i \cdot Post1871 + \varepsilon_{it} \tag{2}$$

Table 6 shows the results. Column 1 includes year fixed effect only, column 2 adds department fixed effect, and column 3 weights regression by department-level population. In all specifications, the coefficient on the interaction between the share of refractory clergy and the *Post1871* indicator is negative and significant, suggesting that the more religious departments start to significantly lag behind during the period of the Second Industrial Revolution. In other words, preexisting variation in religiosity started to matter only when skill-intensive technologies were introduced.[59] Specifically, "moving" from the 10th to the 90th percentile of the religiosity distribution leads to about 4% lower share in industrial employment in the 1871-1911 period (relative to a mean share of 25% with a standard deviation of 10%).

4.3 Mechanism: Religiosity, Catholic education, and economic development

I now shed light on the mechanism that could drive the negative relationship between Catholic intensity and industrial and economic development during the Second Industrial Revolution. I suggest that primary education played a central role and show that: 1) the more religious departments had a higher share and a higher growth in the share of Catholic schools – especially when the two education systems (Catholic and secular) started to diverge; 2) locations with higher shares of Catholic schools had lower industrial and economic development about a decade later; 3) "religiously educated" cohorts were less likely to be employed in innovative sectors, probably because they did not have the skills needed to operate the new technologies.

[59] This is similar to Acemoglu, Johnson, and Robinson (2002) who show, in the context of European colonies, that preexisting institutional differences mattered when investment-based technologies became available.

4.3.1 Preference for Catholic education in more religious areas

As explained in Section 2, the 1851 Loi Falloux facilitated all clergymen to qualify as teachers. In the subsequent years, the share of Catholic schools increased in the whole country (from about 17% in 1851 to 25% in 1866 – see Figure A.1) and the differences between religious and secular education emerged.[60] Then, in the late 1860s, with the increasing professionalization of secular schools, the difference between the two education systems became more pronounced.

Table 7 uses data on type of schools (Catholic versus secular) from 1851 to 1901 and splits the period in two sub-periods: 1851-1866 and 1866-1901. Columns 1-3 show that departments with a higher share of refractory clergy in 1791 had a higher share of Catholic schools, especially after 1850. Then, columns 4-6 show that the more religious departments also experienced a higher growth in the share of Catholic schools, controlling for the initial share of Catholic schools. This is particularly evident in the 1866-1901 period: with a one standard deviation increase in the share of refractory clergy, the share of Catholic schools in 1901 (col. 3) increases of 0.403 standard deviations and the growth in the share of Catholic schools (in the 1866-1901 period) increases of 0.429 (col. 5) standard deviations. Interestingly, despite the strong state intervention and investments in secular education, the share of Catholic schools changed little in the country – from about 25% in 1866 to almost 22% in 1901 (see Figure A.1).[61] However, there was a large department-level variation, with some departments experiencing an increase in the share of Catholic schools (the highest was a 80% increase in the Lozère department) and others experiencing a decrease (the highest was a 70% decrease in the Hautes-Alpes department).[62] This is also evident in Figure 3 that plots the per-period coefficients of religiosity on the share of Catholic schools (left panel), and the share of refractory clergy against the growth in the share of Catholic schools in the 1866-1901 period (right panel). Finally, Table A.12 in Appendix shows very similar results when using the share of Catholic students[63] and Table A.13 shows that the results hold when Catholic schools (and students) are specified in levels.

Thus, these results are in line with the historical evidence documented in Section 2, suggesting a strong preference of religious parents for Catholic education for their children – especially when the secular education system started to spread around France, threatening the existence of Catholic schooling. Also, they provide empirical evidence to a large theoretical literature on cultural transmission and

[60] Catholic education was based on religious texts and on the "reading only" approach, and a large majority of Catholic teachers did not have any specific training. On the other hand, secular teaching corps needed a *brevet* to qualify as teachers, and several of them were trained in the *ecoles normales*. See Section 2.3 for details.

[61] This argument is supported by Franck and Johnson (2016), who show how the massive increase in State intervention and public spending on secular education did not affect overall enrollment in Catholic schooling in late 19th-century France.

[62] The Lozère department, located in the Languedoc-Roussillon-Midi-Pyrénées region, is in the 95% percentile of the religiosity distribution. The Hautes-Alpes department, located in the Provence-Alpes-Côte d'Azur region, is instead in the 5% percentile of the religiosity distribution.

[63] Since data on Catholic and secular students are not available for some years, I prefer using data on schools.

intensification of cultural identities (see, for instance, Bisin and Verdier, 2001; Bénabou and Tirole, 2006; Tabellini, 2008; Carvalho, 2013; Fouka, 2016).

4.3.2 Catholic education negatively associated to economic development about a decade later

I now use data on schooling and industrialization to study the relationship between Catholic education and economic development over time. Given the panel setup of my database, I can estimate panel models with fixed effects, thus avoiding identification from unobserved time-invariant department characteristics and nationwide common trends. Specifically, I estimate equations of the form:

$$y_{i,t} = \alpha_i + \alpha_t + \beta CS_{i,t-10} + \gamma \mathbf{X}_{i,t-10} + \varepsilon_{it} \tag{3}$$

where y_{it} is employment in industry or wages in manufacturing, while α_i and α_t denote respectively department and time fixed effects. The main explanatory variable is the share of Catholic schools, $CS_{i,t-10}$ in $t-10$. The vector $\mathbf{X}_{i,t-10}$ includes enrollment rate in primary schools, the (log) number of students per school, the (log) number of total schools in $t-10$, and department-level population in t. I use ten years lagged schooling variables since children in primary schools, aged between 5 and 15, entered the labor force about ten years later (when they were aged between 15 and 25).

Table 8 reports the results for the share of industrial employment between 1871 and 1911.[64] Column 1 only includes department and year fixed effects. Column 2 also controls for school rate and department level population; column 3 adds the (log) number of students per school and the (log) number of total schools. All specifications show that the share of Catholic schools is strongly and negatively associated with industrial employment 10 years later. This is in line with a causal interpretation where the increase in the share of Catholic schools is followed by a decrease in the share of employment in industry. By contrast, changes in the school rate do not seem to play a role.[65] Moreover, there is a positive relationship between total department population and the share of industrial employment. The results are robust when weighting the regression by population (col. 4), and when using a first-differenced model that regresses the change in industrial employment on the change in the different explanatory variables (col. 5). Column 6 uses the share of students enrolled in Catholic schools (rather than the share of Catholic schools) and the results hold. Importantly, the coefficient on the share of Catholic schools remains strongly significant in all specifications. At the bottom of Table 8, I report the standardized beta-coefficients showing that a one standard deviation increase in the share of Catholic schools is related to about 0.23 (col. 3) standard deviations decrease in the share of industrial employment. To gauge more the corresponding magnitude, "moving" from the 10th to

[64] In the main specifications, I have 82 departments and 8 points in time. Data on industrial employment are missing for the year 1896.

[65] This could be due to the fact that primary school enrollment was already very high in the period of study.

the 90th percentile of the distribution of the share of Catholic schools would lead to a 7% decrease in the share of industrial employment (relative to a mean of 25% with a standard deviation of 10%).

Table 9 uses (log) wages in manufacturing from 1891 to 1906 as dependent variable and it shows a very similar pattern – also when weighting the regression by department population (col. 2) and when using a first-differenced model (col. 3). The standardized beta coefficients suggest that one standard deviation increase in the share of Catholic schools is associated with 0.44 (col. 1) standard deviations decrease in (log) wages. Specifically, "moving" from the 10th to the 90th percentile of the distribution of the share of Catholic schools would lead to a 0.17 log points lower wages (relative to a mean of 1.3 with a standard deviation of 0.16).[66]

4.3.3 Additional specifications

Table 10 and Table 11 address concerns of potential omitted variables bias and reverse causality, respectively.

First, while department and year fixed effects control for omitted variable bias from unobserved time-invariant department characteristics and time-specific factors, there could still be bias from omitted variables, whose department-specific change over time is correlated with changes in the share of Catholic schools and industrial employment. Table 10 controls for observable characteristics that would not be captured by the department and year fixed effects. Column 1 includes a dummy for the year when the phylloxera spread in a certain department. The phylloxera, a pest of grapevines, destroyed about one third of French vineyards between 1875 and 1889 and caused a decline in wine production by about 70% (Meloni and Swinnen, 2014). If people migrated from the countryside to urban areas, the spreading of the phylloxera could have favored a switch from the agricultural to the industrial sector and a decrease in the share of Catholic schools. Fertility could be another confounding factor if a higher "quantity" of children in the more Catholic areas was associated with lower industrial employment – because of lower investment in "quality" of children, not related to the type of education.[67] Controlling for the spreading of the phylloxera and for fertility does not affect my results (cols. 1-2).[68]

[66] Importantly, one could wonder whether the different effect of Catholic versus secular education on industrial development is given by the study of a religious curriculum in Catholic schools or by the introduction of technical education in secular schools. While I do not observe a counterfactual (i.e. schools with neither religious nor technical teaching), my results, supported by historical evidence, suggest that the second hypothesis is more likely: religiosity played a hindering role on development by hampering and delaying the spreading of technical education that had become crucial for industrialization in the late 19th-century.

[67] The trade off between quantity and quality trade of children is an important element explaining the transition to modern economic growth (see, for instance Galor, 2005, 2011). Becker, Cinnirella, and Woessmann (2010) use an instrumental variable approach to investigate both directions of causality and find evidence of a mutual causation between fertility and education in 19th-century Prussia.

[68] The phylloxera dummy and the fertility index are measured at $t - 10$ (since they are more likely to have an effect on industrial employment with some lag). My findings hold when these variables are measured at time t.

Another concern could be that, especially after 1870, the Republican government strongly promoted secular education and, at the same time, provided more funding to secular-oriented departments to support industrial activities. Column 3 shows that, even if government subsidies per capita are positively and significantly associated with industrial employment, the coefficient on the share of Catholic schools remains strongly significant. Then, my findings are robust to the inclusion of changes in immigration and urban population, which could affect education choices as well as industrial employment (cols. 4-5).[69] Finally, the results hold when controlling for all potentially confounding factors together (col. 6). Importantly, in all regressions the coefficient on "Share Catholic Schools$_{t-10}$" is highly significant and very similar in magnitude to the baseline results of Table 8.

Second, while using lagged explanatory variables suggests that I capture the effect from type of education to industrialization, Table 11 performs another exercise to exclude concerns of reverse causality. It uses the share of Catholic schools as dependent variable and shows that lagged industrial employment (col. 1) and lagged wages in manufacturing (col. 2) do not predict the share of Catholic schools one decade later, supporting a causal interpretation of my findings.[70]

Moreover, I report more robustness checks in Tables A.14, A.15, and A.16 in Appendix. First, Table A.14 uses different lags for the schooling variables and shows that the coefficient on the share of Catholic schools is quantitatively larger and more significant when the share of Catholic schools is measured in $t-10$, $t-15$ or avg($t-10$, $t-15$). Interestingly, the coefficient is smaller in magnitude and insignificant when my dependent and explanatory variables are both measured at time t (col. 1), suggesting again that the type of education affected (through the diffusion of technical skills) industrial development once students entered the labor market. Then, Table A.15 uses school rate (cols. 1-2) and the share of students obtaining the *certificat d'études primaires*[71] (cols. 3-4) as dependent variables. It shows that there are no significant differences in "quantity" of education or completion of primary schools between Catholic and secular schools, suggesting that the type, rather than the quantity, of education mattered. Finally, Table A.16 distinguishes between male and female schools (and industrial employment) and shows that the results by gender are very similar to those in the main specification (Table 8).

[69] One concern could be that an enlightened (secular) minority migrated away from the more Catholic to the less Catholic areas and fostered industrialization in the destination departments.

[70] Franck and Galor (2016) find a positive effect of industrialization on human capital formation. However, they look at "quantity" of human capital (such as school rate, literacy, number of teachers) in the period before the Second Industrial Revolution. This would still be in line with my findings since I focus on a later period and I study the effect of "type" of education on industrialization – when school rates had already reached very high levels.

[71] This was a diploma awarded to students upon completion of primary school.

4.3.4 *Religiously educated cohorts less likely to work in innovative sectors*

In this section, I use data from the 1896 *Enquéte industrielle* that contains detailed information on the number of workers by industrial sector and cohort. For each cohort, I compute the share of workers in innovative sectors and I relate it to the share of Catholic schools at the time when that specific cohort was attending primary school. Given the nature of the data, I can include department and cohort fixed effects. Specifically, I estimate equations of the form:

$$y_{i,c} = \alpha_i + \alpha_c + \beta CS_{i,c} + \gamma \mathbf{X}_{i,c} + \varepsilon_{it} \tag{4}$$

where y_{ic} is the share of a workers' cohort in innovative sectors, while α_i and α_c denote respectively department and cohort fixed effects. The main explanatory variable is the share of Catholic schools, in a given department, when cohort c was attending primary schools. The vector $\mathbf{X}_{i,c}$ includes enrollment rate in primary schools, the (log) number of students per school, the (log) number of total schools, and department-level population.

Table 12 shows the results. The higher the share of Catholic schools when a cohort was in primary school, the lower the share of workers in that cohort employed in innovative industrial sectors. In terms of magnitude, a one standard deviation increase in the share of Catholic schools is associated with a 0.22 standard deviations decrease in the share of workers in innovative sectors. The results hold when including the schooling controls and suggest that "religiously educated" cohorts were less likely to be employed in innovative sectors probably because they could not operate the more modern, skill-intensive industrial technology.[72]

4.3.5 *The importance of schooling in explaining the relationship between religiosity and development*

Altogether, my findings suggest that the type of education (determined by local religiosity) was key in the formation of a skilled labor force and in fostering industrial and economic development.[73] But was education the only mechanism explaining this negative relationship between religiosity and economic outcomes during the Second Industrial Revolution? While it represented the most sensitive and controversial issue in the debate between Catholicism and science, the anti-modern and anti-scientific program of the Church was also manifested in other aspects of people's lives; examples are the opposition toward vaccinations and birth control, and the prohibition of the use of electricity in Churches

[72] This is in line with Yuchtman (2017), who shows that in early 20th-century China, the traditional and modern educational tracks produced different types of human capital and that this was important for the adoption of new technologies and for the development of a modern economy.

[73] Importantly, education con also affect religiosity. Becker, Nagler, and Woessman (2017), for instance, find that during Germany's secularization period, increases in education were related to reduced Church attendance, thus supporting the secularization hypothesis.

(for details, see Section 2.2).

Table 13 provides some evidence for this. Columns 1 and 2 use the share of vaccinated children in 1871 as dependent variable. The coefficient on the share of refractory clergy is negative and significant, even when controlling for fertility (col. 2). In terms of magnitude, a one standard deviation increase in religiosity is associated with 0.28 standard deviations decrease in share of vaccinated children. Since vaccinations were equally provided to the different departments by the central government, a lower share of vaccinated children in the more religious areas is likely to be driven by a lower demand for vaccinations.[74] Moreover, columns 3-4 show a positive correlation between religiosity and fertility – a one standard deviation increase in religiosity is associated with 0.346 standard deviations increase in fertility in 1901. Thus, these findings suggest that religiosity acted as a barrier for the general diffusion of technological innovations and progressive thinking – in line with Bénabou, Ticchi, and Vindigni (2015) who, using data from the World Values Survey, find that greater religiosity is significantly associated with less favorable views on innovation.[75]

Finally, to shed more light on the role of education in linking religiosity with economic development, I use the baseline specifications of Table 5 and regress my economic and industrial outcomes on both religiosity and the growth in the share of Catholic schools. Table 14 shows the results. The coefficient on religiosity becomes much smaller and insignificant (in cols. 2 and 8), while the coefficient on the growth in the share of Catholic schools is negative and strongly significant in all specifications.[76] Moreover, the standardized beta coefficients of the growth in the share of Catholic schools are generally higher than the standardized beta coefficients of religiosity. The last row also reports the results of the Sobel-Goodman mediation test. The ratios show the proportion of the total effect of religiosity on the different outcome variables transmitted *via* the growth in the share of Catholic schools: for instance, about 40% of the relationship between religiosity and industrial employment (or machineries per 1,000) is mediated by the growth in the share of Catholic schools over the 1851-1901 period. This suggests, in line with historical evidence and with my previous results, that an important part of the relationship between religiosity and economic development is explained by education and acquisition of human capital.

[74] On average, 83% of children would be vaccinated, but in departments like Sarthe (Pays de la Loire) or Finistere (Brittany) this percentage was 28% and 33% respectively.

[75] Guiso et al. (2003) find that religiosity is positively associated with "good" economic attitudes, i.e., economic attitudes conducive to higher per capita income and growth. However, they do not specifically examine attitudes toward scientific and technological development.

[76] The growth in the share of Catholic schools is computed for the period 1851-1901 in cols. 2 and 6, for the period 1851-1896 in col. 4, and for the period 1871-1901 in col. 8.

5 Conclusion

The interaction between religion and the adoption of scientific and technological progress has been particularly complex throughout history and still is today. However, there is hardly any empirical evidence on when religion hampers knowledge diffusion and therefore economic development, and through which mechanism. In this paper, I exploit variation in the *intensity* of Catholicism (i.e., religiosity) within France and examine the period of the Second Industrial Revolution (1870-1914).

I find that the relationship between religiosity and economic development can vary over time depending on the interaction between religious norms and the "useful knowledge" needed to industrialize and grow in each stage of development. While – using several indicators for Catholic intensity from 1789 to the mid- 21st century – I provide evidence of a stable spatial distribution of religiosity over time, I show that it started to be negatively associated with economic outcomes only during the Second Industrial Revolution, i.e., when religion became a barrier for the acquisition of "economically useful" knowledge. The anti-scientific program promoted by the Church was manifested in several aspects of people's lives; specifically, in the preference for Catholic education. I find that the share of Catholic schools increased in the more religious areas in the second half of the 19th century, when a technical curriculum was introduced in secular schools and the two education systems started to differ. Religious education, in turn, was negatively associated with industrial development about a decade later, when school-aged children would enter the labor market, and this negative relationship was particularly pronounced in skill-intensive industrial sectors.

These findings have important implications for economic development today, since many developing countries – where religion plays a primary role in the personal and public sphere – are also experiencing technological progress on a large scale, similar to the process of development in Western Europe during the Second Industrial Revolution. Three main implications emerge. First, the relationship between religion and economic development can vary over time and becomes negative only when religion clashes with and hinders the adoption of "useful knowledge." Second, the *intensity* of religion is key in that it determines the importance given to religious norms, and the degree of resistance to new ideas and innovative activities, if these clash with religious values. Finally, the mechanism through which religion can affect economic development is by affecting the contents of education, and thus accumulation of human capital among the population.

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FIGURES

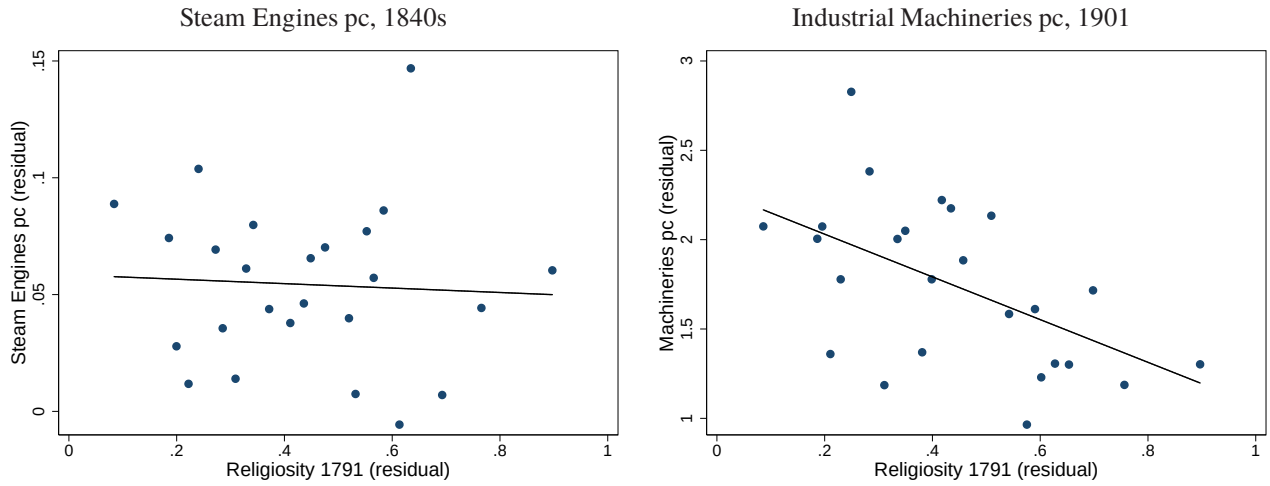

Figure 1: Religiosity and Technology Adoption

Notes: The figures plot the share of refractory clergy against the (log) number of steam engines per capita in the 1840s (left panel) and against the (log) number of industrial machineries in 1901 (right panel) – after including the baseline controls listed in Table 1 (col.1) and using binned scatterplots with 25 equal-sized bins.

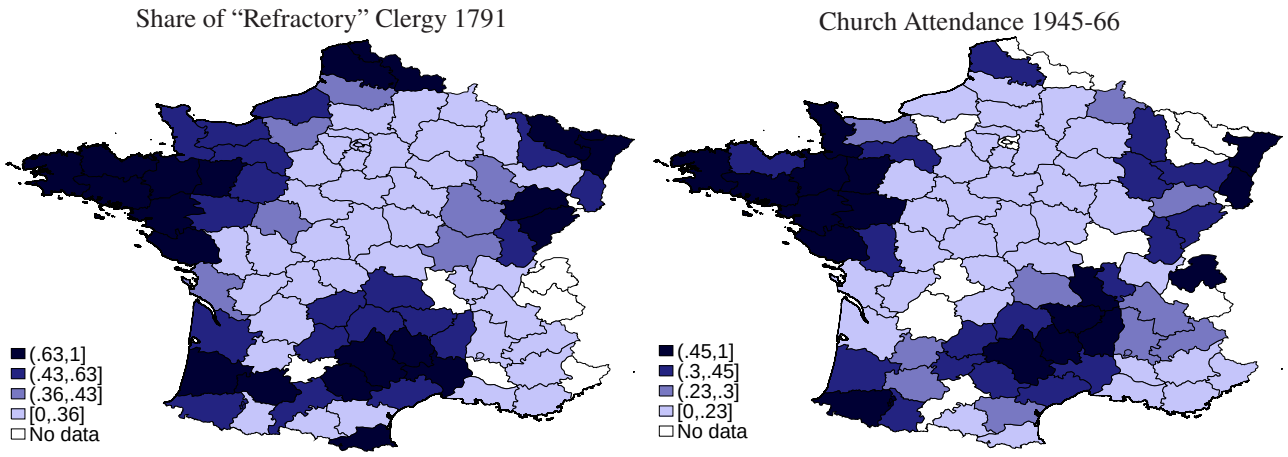

Figure 2: Religiosity in 1791 and in the mid-21st century

Notes: The left panel shows the spatial distribution of the share of refractory clergy in 1791. The right panel shows Church attendance in 1945-66. Both variables are described in detail in Section B.2.

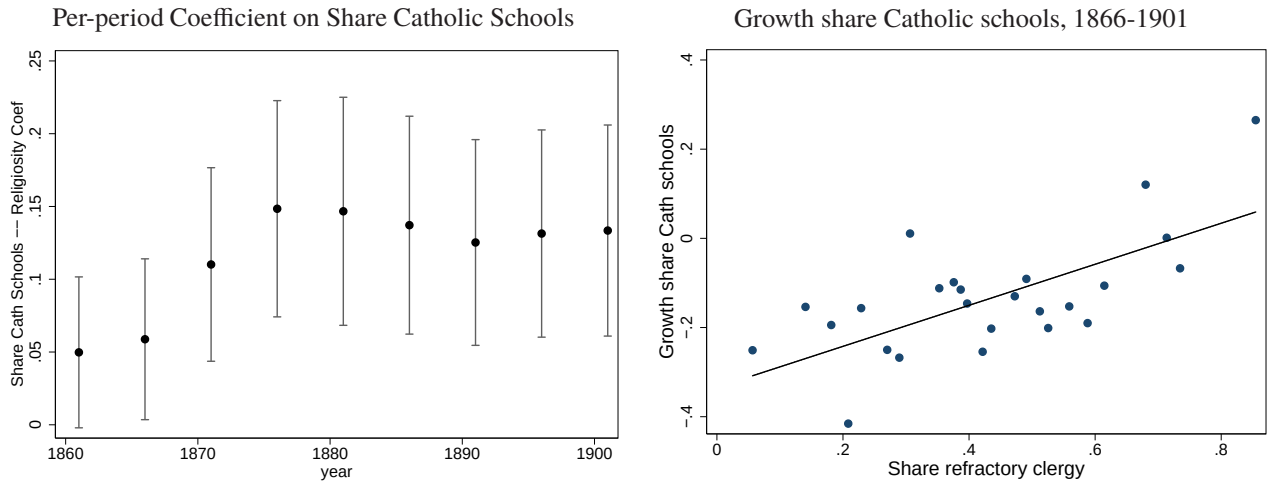

Figure 3: Religiosity and Catholic Schools

Notes: The left panel plots the per-period coefficient of religiosity on the share of Catholic schools. The bars represent 95 percent confidence intervals. The omitted year is 1851. The right panel plots the share of refractory clergy against the growth in the share of Catholic schools in the 1866-1901 period (using a binned scatterplot with 25 equal-sized bins).

TABLES

Table 1: Correlations between share of refractory clergy and control variables

Baseline Controls	(1)	Additional Controls	(2)
(ln) Population 1871	0.168**	Knowledge Elites pc	-0.002
	(0.075)		(0.034)
School Rate 1871	-0.183	Huguenots pc 1861	0.638
	(0.195)		(0.478)
Atlantic/Medit. Dept.	0.196***	Nobles pc 1850	-0.226
	(0.056)		(0.174)
Universities	0.101	Pre-Industrial Activities	0.053
	(0.076)		(0.046)
Printing Presses	0.035	Pays d'Election	-0.143**
	(0.070)		(0.058)
		Dept. non-French	0.124
			(0.146)
		Pop. Density 1871	0.152
			(0.107)
		Share Urb. 1831	-0.037
			(0.250)

Notes: The table shows the coefficients of individual regressions of share of refractory clergy on a variety of department characteristics. *Population 1871* represents (log) total department population in 1871. *School Rate* measures the ratio of students to school-age population (5 to 15 years) in 1871. *Atlantic/Medit Dept* is a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea. *Universities* is the (log) number of universities present before 1750. *Printing Presses* represents the (log) number of printing presses established before 1500. *Knowledge Elites pc* is the density of subscribers to the *Encyclopedie* in 1777-1780. *Huguenots pc* represents(log) number of Huguenots per capita in 1861 and *Nobles pc 1850* reflects the (log) number of noble families per capita. *Pre-Industrial activities* is an index of pre-industrial activities in France that includes the number of mines, forges, iron trading locations, and textile manufactures before 1500. *Pays d' Election* is a dummy for departments where the king exerted particularly strong power (especially in terms of fiscal and financial matters); *Dept. non-French* is a dummy for departments located in non-French speaking areas; *Population Density* is the ratio of department population to total area, *Share Urban* is the ratio of urban population to total population. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 2: Persistence of religiosity – before and during the French Revolution (1789-1791)

Dep. variable: Share of refractory clergy		
	(1)	(2)
Share Anti-Relig. *Cahiers*	-1.659***	-1.396***
	(0.458)	(0.521)
Controls		✓
R^2	0.21	0.29
Observations	73	70
Magnitude: Share anti-relig. *cahiers*		
stand. beta coeff.	-0.356	-0.303

Notes: All regressions are run at the department level. Controls include average literacy in 1786, a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population in 1800 and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 3: Persistence of religiosity (1791-1950s)

Dependent var.	Share *LaCroix* Readers 1893		Priests pc 1901		Share Catholic Schools 1901		Priests Ordination 1951-60		Church Attendance 1945-66	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share Refract. Clergy	1.086**	1.362***	0.482***	0.576***	0.135***	0.142***	3.810***	4.236***	0.449***	0.448***
	(0.493)	(0.498)	(0.150)	(0.172)	(0.045)	(0.047)	(0.708)	(0.754)	(0.071)	(0.075)
Controls		✓		✓		✓		✓		✓
R^2	0.14	0.21	0.81	0.82	0.36	0.46	0.27	0.32	0.42	0.42
Observations	79	79	68	68	79	79	73	73	72	72
Magnitude: Share refractory clergy										
stand. beta coeff.	0.240	0.301	0.198	0.236	0.327	0.344	0.529	0.588	0.653	0.651

Notes: All regressions are run at the department level. Controls include school rate in 1891 (col.1-2) and in 1901 (cols 3-10), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population in 1891 (col.1-2) and in 1901 (cols 3-10), and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 4: No relationship between religiosity and industrialization (pre-1870)

Dependent var.	Share Ind. Emp. 1866	Share Workers Mod. Sect. 1840s	Steam Eng. pc 1840s	City Growth 1750-1850
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.034	0.141	-0.011	0.131
	(0.035)	(0.128)	(0.039)	(0.135)
School Rate	0.173***	0.131	0.057**	-0.129
	(0.041)	(0.132)	(0.023)	(0.142)
Paris	0.067	0.193**	-0.072*	0.771***
	(0.041)	(0.097)	(0.036)	(0.263)
Population	0.120***	-0.059	0.087**	-0.169**
	(0.022)	(0.070)	(0.036)	(0.077)
Atlantic/Medit. Dept.	0.003	0.155***	0.033*	0.511**
	(0.018)	(0.058)	(0.018)	(0.220)
Nr. Universities	-0.044*	-0.180**	-0.013	-0.011
	(0.025)	(0.070)	(0.029)	(0.086)
Nr. Printing Presses 1500	0.028	0.062	0.038	0.242**
	(0.024)	(0.072)	(0.023)	(0.092)
R^2	0.53	0.16	0.32	0.15
Observations	79	78	78	125
Magnitude: Standardized beta coefficients				
Share refractory clergy	-0.082	0.143	-0.032	0.093
School rate	0.393	0.126	0.159	-0.077

Notes: All regressions are run at the department level. Cols. 1-3 use school rate in 1837 and col. 4 uses literacy in 1786. The share of refractory clergy is measured at the city level in col. 4. Robust standard errors (clustered at the department level in col. 4) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last rows report the standardized beta coefficients.

Table 5: Negative relationship between religiosity and industrialization (post-1870)

Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1871-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.085**	-0.164***	-1.133***	-0.554**
	(0.035)	(0.057)	(0.381)	(0.216)
School Rate	0.313***	0.331**	1.145	0.752***
	(0.112)	(0.151)	(1.251)	(0.225)
Paris	-0.123**	0.072	-3.031***	-0.174
	(0.055)	(0.081)	(0.598)	(0.421)
Population	0.161***	0.226***	1.235***	1.522**
	(0.024)	(0.036)	(0.247)	(0.581)
Atlantic/Medit. Dept.	-0.005	-0.037	-0.309	0.178
	(0.022)	(0.033)	(0.250)	(0.116)
Nr. Universities	-0.009	-0.002	-0.357	-0.004
	(0.025)	(0.040)	(0.235)	(0.132)
Nr. Printing Presses 1500	0.027	0.036	0.268	-0.085
	(0.029)	(0.040)	(0.288)	(0.114)
R^2	0.50	0.53	0.34	0.58
Observations	79	79	79	79
Magnitude: Standardized beta coefficients				
Share refractory clergy	-0.186	-0.241	-0.267	-0.250
School rate	0.257	0.200	0.100	0.245

Notes: All regressions are run at the department level. School rate is measured 10 years before the dependent variables (cols. 1-3) and in 1871 (col. 4). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last rows report the standardized beta coefficients.

Table 6: Dif-in-Dif: More religious departments have lower industrial employment during the 2nd IR

Dep. var.: Share Ind. Employment, 1871-1911			
	(1)	(2)	(3)
			weighted
ShareRef*$Post2^{nd}$IR	-0.078**	-0.061**	-0.060**
	(0.035)	(0.024)	(0.024)
Department FE		✓	✓
Year FE	✓	✓	✓
R^2	0.38	0.90	0.90
Observations	624	624	624
Magnitude: Share Ref.*Post			
stand. beta coeff.	-0.196	-0.152	-0.149

Notes: All regressions are run at the department level and control by (log) total population. Col. 3 weights regression by department population. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 7: Higher growth in share of Catholic school in more religious departments

Dependent var.	Share Cath. Schools			Growth Share Cath. Schools		
	1851	1866	1901	1851-1866	1866-1901	1850-1901
	(1)	(2)	(3)	(4)	(5)	(6)
Share Refract. Clergy	0.047	0.086*	0.166***	0.195	0.460***	0.857**
	(0.038)	(0.050)	(0.046)	(0.200)	(0.163)	(0.332)
Controls	✓	✓	✓	✓	✓	✓
Schooling Controls	✓	✓	✓	✓	✓	✓
R^2	0.24	0.34	0.48	0.40	0.37	0.52
Observations	79	79	79	79	79	79
Magnitude: Share refractory clergy						
stand. beta coeff.	0.132	0.189	0.403	0.101	0.429	0.305

Notes: All regressions are run at the department level. Controls include a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. Schooling controls include school rate, the (log) number of students per school, the (log) number of total schools (all measured in the initial period in Cols. 4-6). In addition, all specifications include (log) department population (measured in the initial period in Cols. 4-6) and a dummy for Paris (Seine department). Cols 4-6 also control for the initial share of Catholic schools. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 8: Catholic education negatively associated with industrial employment 10 years later

Dependent variable: Share Ind. Employment, 1871-1911

	(1)	(2)	(3)	(4)	(5)	(6)
				weighted	1st diff.	students
Share Cath. Schools$_{t-10}$	-0.176**	-0.236***	-0.214**	-0.178*	-0.198**	
	(0.084)	(0.079)	(0.083)	(0.098)	(0.090)	
School Rate$_{t-10}$		-0.052	0.001	0.013	-0.000	0.042
		(0.032)	(0.034)	(0.044)	(0.043)	(0.040)
Students per School$_{t-10}$			-0.050	-0.056	-0.025	-0.086*
			(0.039)	(0.048)	(0.046)	(0.045)
Total Schools$_{t-10}$			-0.040	-0.049	-0.016	-0.063
			(0.038)	(0.035)	(0.032)	(0.038)
Share Cath. Students$_{t-10}$						-0.182**
						(0.078)
Population$_t$		0.181**	0.223**	0.273***	0.229***	0.254**
		(0.075)	(0.096)	(0.093)	(0.074)	(0.097)
Department FE	✓	✓	✓	✓		✓
Year FE	✓	✓	✓	✓	✓	✓
R^2	0.88	0.89	0.89	0.92	0.33	0.90
Observations	656	656	656	656	410	574
Magnitude: Share Catholic schools						
stand. beta coeff.	-0.190	-0.255	-0.230	-0.166	-0.124	-0.225

Notes: All regressions are run at the department level. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 9: Catholic education negatively associated with wages in manufacturing 10 years later

Dependent variable: Wages in manufacturing, 1891-1906			
	(1)	(2)	(3)
		weighted	1st Difference
Share Cath. Schools$_{t-10}$	-0.663**	-0.685*	-0.767**
	(0.324)	(0.365)	(0.322)
School Rate$_{t-10}$	0.004	-0.019	-0.011
	(0.101)	(0.105)	(0.101)
Students per School$_{t-10}$	0.073	0.146	0.130
	(0.164)	(0.149)	(0.152)
Total Schools$_{t-10}$	0.130	0.156	0.076
	(0.126)	(0.121)	(0.113)
Population$_t$	0.081	-0.076	-0.029
	(0.262)	(0.243)	(0.235)
Department FE	✓	✓	
Year FE	✓	✓	✓
R^2	0.87	0.89	0.07
Observations	323	323	159
Magnitude: Share Catholic schools			
stand. beta coeff.	-0.435	-0.443	-0.220

Notes: All regressions are run at the department level. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 10: Catholic education negatively associated with industrial employment – confounding factors

Dependent variable: Share Ind. Employment, 1871-1911

	(1)	(2)	(3)	(4)	(5)	(6)
Share Catholic Schools$_{t-10}$	-0.214**	-0.214**	-0.193**	-0.210**	-0.206**	-0.190**
	(0.083)	(0.083)	(0.086)	(0.084)	(0.079)	(0.081)
Phylloxera Dummy$_{t-10}$	0.001					0.004
	(0.006)					(0.006)
Fertility$_{t-10}$		-0.003				-0.005
		(0.011)				(0.011)
Governm. Subsidies pc$_t$			0.114*			0.119**
			(0.058)			(0.059)
French Immigrants$_t$				0.001		0.001
				(0.001)		(0.001)
Share Urban Pop.$_t$					0.072	0.055
					(0.194)	(0.202)
Schooling Controls	✓	✓	✓	✓	✓	✓
Department FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
R^2	0.89	0.89	0.88	0.88	0.89	0.89
Observations	656	656	573	574	656	573

Notes: All regressions are run at the department level and control for population in year t. Schooling controls include school rate, the (log) number of students per school, the (log) number of total schools in $t-10$. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 11: Reverse causality: Industrial employment and wages do not predict share of Catholic schools

Dep. variable: Share Catholic schools		
	(1)	(2)
Share Ind. Employment$_{t-10}$	0.022	
	(0.044)	
Wages in Manufacturing$_{t-10}$		0.001
		(0.040)
Schooling Controls	✓	✓
Department FE	✓	✓
Year FE	✓	✓
R^2	0.94	0.96
Observations	572	243

Notes: All regressions are run at the department level. Schooling controls include school rate, the (log) number of students per school, the (log) number of total schools in $t-10$. In addition, all specifications include (log) department population in t. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 12: "Religiously educated" cohorts less likely to be employed in innovative sectors

Dep: Share of workers in modern sectors		
	(1)	(2)
Share Cath. Schools	-0.304**	-0.514***
	(0.123)	(0.132)
Schooling Controls		✓
Department FE	✓	✓
Cohort FE	✓	✓
R^2	0.96	0.96
Observations	257	257
Magnitude: Share refractory clergy		
stand. beta coeff.	-0.211	-0.358

Notes: All regressions are run at the department level. Schooling controls include the (log) number of students per school, and the (log) number of total schools. In addition, all specifications control for school rate, total department population and the share of population active in industry. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 13: Lower adoption of technological progress and modern ideas in more religious departments

Dependent var.	Share vaccinated		Fertility	
	children 1871		1871	1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.261**	-0.274**	0.561**	0.717***
	(0.130)	(0.136)	(0.272)	(0.263)
Fertility		0.027		
		(0.071)		
Controls	✓	✓	✓	✓
R^2	0.24	0.24	0.22	0.27
Observations	62	62	79	79
Magnitude: Share refractory clergy				
stand. beta coeff.	-0.270	-0.284	0.253	0.346

Notes: All regressions are run at the department level. Controls include school rate (measured 20 before the respective dependent variables), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 14: The importance of schooling in explaining the relationhip between religiosity and development

Dependent var.	Share Ind. Emp. 1901		Share Workers Mod. Sect. 1896		Machineries pc 1901		Growth Share Ind. Empl 1871-1901	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share Refract. Clergy	-0.085**	-0.051	-0.164***	-0.130*	-1.133***	-0.635*	-0.554**	-0.269
	(0.035)	(0.045)	(0.057)	(0.070)	(0.381)	(0.350)	(0.216)	(0.235)
Gr. Share Cath. Schools		-0.040*		-0.045*		-0.459**		-0.599***
		(0.020)		(0.026)		(0.225)		(0.175)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.50	0.53	0.53	0.55	0.34	0.40	0.58	0.65
Observations	79	79	79	79	79	79	79	79
Magnitude: Standardized beta coefficients								
Share refractory clergy	-0.186	-0.112	-0.241	-0.191	-0.267	-0.149	-0.250	-0.122
Gr. Share Cath. Schools		-0.245		-0.174		-0.304		-0.290
Prop. of total effect of religiosity mediated by growth in share of Catholic schools								
Sobel-Goodman mediation test		0.417		0.223		0.400		0.564

Notes: All regressions are run at the department level. Growth in the share of Catholic schools is measured in 1851-1901 (cols. 2, 6), 1851-1896 (col. 4) and in 1871-1901 (col. 8). Controls include school rate (measured 10 years before the dependent variables in cols 1-6 and in 1871 in cols 7-8), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, the (log) number of printing presses established before 1500, (log) department population and a dummy for Paris (Seine department). In addition, all specifications include the initial share of Catholic schools. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The standardized beta coefficients are reported at the bottom of the Table. Moreover, the last row reports the results of the Sobel-Goodman mediation test. This shows whether a mediator (Gr. Share Cath. Schools) carries the influence of an explanatory variable (religiosity) to the different outcomes.

Online Appendix

Devotion and Development:
Religiosity, Education, and Economic Progress in 19th Century France

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A Additional specifications

In this section, I run a series of robustness checks.

A.1 Religiosity and conservatism

I consider the conservative attitude of Catholicism as a measure of resistance to the adoption of technical and scientific knowledge. However, this conservative religious approach could be correlated with a broader conservative attitude. Using data from the *cahiers de doleances*, I construct the share of "conservative" categories in the *cahiers* of the third estate and use it as a proxy for a general dimension of conservatism at the local level.[1] These include: 1) "*cahiers* appealing to French tradition;" 2) "*cahiers* making reservation on the renunciation of privileges;" 3) "*cahiers* concerned for a regeneration of the *moeurs*;" 4) "*cahiers* asking for restriction of the press;" 5) "*cahiers* in favor of maintaining the gilds;" 6) "*cahiers* in favor of maintaining feudal justice gilds;" 7) "*cahiers* showing conservative nationalism." Table A.1 shows a negative and significant correlation between the share of "anti-religious" contents and the share of "conservative" contents in the *cahiers* of the third estate.[2] The coefficient on the share of "conservative" contents remain negative and significant when including the baseline controls listed in Table 1, suggesting that religiosity was related to a broader conservatism attitude.

[1] This is computed analogous to the share of "anti-religious" contents (see section 4.1).
[2] All regressions control for the (log) number of topics mentioned in each *cahier*.

Table A.1: Religiosity positively associated to conservatism

Dep. variable: Share Anti-Relig *Cahiers*

	(1)	(2)
Share Conserv. *Cahiers*	-0.372**	-0.307*
	(0.163)	(0.159)
Controls		✓
R^2	0.12	0.17
Observations	71	71

Notes: All regressions are run at the department level. Controls include a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, the (log) number of printing presses established before 1500. In addition, all specifications include log department population in 1800, average literacy in 1786, the (log) number of topics in the *cahier*, and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Moreover, as mentioned in Section 2, the struggle between religion and science also took on political connotations, especially during the period of the Third Republic. I now use several election outcomes to empirically analyze the relationship between religiosity and political behavior: first, I look at the 1849 legislative elections for the parliament[3]. I use an index (going from 1 to 11) representing the votes to the Democratic Socialist party (Bouillon, 1956).[4] Then, I use the share of the votes to the Republican parties in 1876, i.e. during the period of the Third Republic (Avenel, 1894).[5] Finally, I construct the principal component of both outcomes, "PCA progressive voting." Table A.2 shows the results. In all cases, there is a negative relationship between religiosity and the share of votes for progressive parties (cols.1-6). To rule out that these findings are driven by the fact that the share of refractory clergy captures political attitudes toward the French Revolution, cols. 7-8 use the share of "anti-religious" *cahiers* as an indicator of religiosity. The results hold suggesting that religiosity was also associated to political conservatism.

Finally, in Table A.3 I use the baseline specifications of Table 5, and regress my economic and industrial outcomes on both religiosity and conservatism. The coefficient of religiosity is still negative and significant in all specifications, while conservatism is not significantly associated with economic development. This suggests that the anti-scientific dimension of Catholicism (not necessarily captured by a conservative attitude as such) is likely to explain the negative relationship between religiosity and economic development after 1870. This is also in line with the fact that, notwithstanding the Catholic Church had embraced a strong anti-scientific and anti-progressive approach already from 1789, the more religious departments started to lag behind only when technological progress had to be spread among the population to be "economically useful."

[3]The suffrage was attained in 1848 and extended to all resident male citizens.

[4]In 1849, the Democratic Socialist party lost the elections with about 30% of the votes – The *Parti de l'Ordre* obtained instead the majority of the votes (about 50%).

[5]The Republican parties included the *Modérés et Libéraux*, the *Radicaux socialistes*, the *Radicaux*, the *Socialistes*, and the *Ralliés*. This was opposed to the reactionary coalition which included the *Monarchistes* and the *Revisionistes*.

Table A.2: Religiosity negatively associated to progressive voting

Dep. variable: votes to progressive parties

	1849 (Index)		1876 (Share)		PCA Progressive voting			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share Refract. Clergy	-3.703*	-4.673**	-0.220***	-0.196***	-1.968***	-2.085***		
	(1.905)	(1.796)	(0.074)	(0.070)	(0.631)	(0.550)		
Share Anti-Relig. *Cahiers*							5.241**	4.882*
							(2.589)	(2.651)
Controls		✓		✓		✓		✓
R^2	0.08	0.20	0.16	0.35	0.19	0.30	0.15	0.23
Observations	77	77	79	79	77	77	72	72

Notes: All regressions are run at the department level. Controls include school rate, a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Columns 4, 6, and 8 also control for the election turnout in 1876. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.3: Negative relationship between religiosity and industrialization (post-1870) – controlling for conservatism

Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1871-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.102**	-0.202***	-1.507***	-0.451*
	(0.043)	(0.069)	(0.403)	(0.250)
Share Conserv. *Cahiers*	-0.068	-0.211	-3.596	1.421
	(0.233)	(0.386)	(2.218)	(1.020)
Controls	✓	✓	✓	✓
R^2	0.50	0.54	0.37	0.59
Observations	72	72	72	72

Notes: All regressions are run at the department level. Controls include school rate (measured 10 years before the respective dependent variables in cols. 1-3 and in 1871 in col. 4), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. Col. 4 also controls for the initial share of industrial employment. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Cahiers of the clergy and of the nobility

My analysis focuses on the *cahiers* of the third estate since they represented the majority of the population, thus providing a good proxy for local religiosity. However, the *cahiers de Doléances* allow me to distinguish among the "opinions" of the three different estates. As a placebo, Table A.4 uses the share of "anti-religious" contents in the *cahiers* of the clergy and of the nobility. As expected, these are not significantly correlated with religiosity in 1791, suggesting that the religiosity of these minorities is not systematically associated with the religiosity of the rest of the population.

Table A.4: Religiosity of the nobility and the clergy

Dep. variable: Share Refract. Clergy

	Nobility		Clergy	
	(1)	(2)	(3)	(4)
Share Anti-Relig *Cahiers*	-0.084	-0.164	-0.871	-0.959
	(0.564)	(0.563)	(0.551)	(0.590)
Controls		✓		✓
R^2	0.04	0.17	0.11	0.20
Observations	64	61	65	64

Notes: All regressions are run at the department level. Controls include average literacy in 1786, a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, the (log) number of printing presses established before 1500. In addition, all specifications include log department population in 1800 and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

A.2 Religiosity and industrialization pre- and post-1870

Table A.5 and A.6 perform the same regressions of Table 4 and 5 respectively, but include a set of potentially confounding factors (listed in Table 1, col. 2). All my previous results hold and the share of refractory clergy is negatively and significantly associated to economic development during the period of the Second Industrial Revolution, but not before. Importantly, the coefficients on share of refractory clergy are very similar in magnitude to those reported in the baseline specifications.[6] In Table A.6, among the other explanatory variables, "Pre-Industrial Activities" is significantly and positively associated to my outcome variables (cols. 1-3) and the density of knowledge elites is generally positively and significantly associated to the number of industrial machineries per capita in 1901. This suggests the importance of an enlightened minority for the adoption of new technologies.

My main indicator of religiosity, the share of refractory clergy, is defined as the clergy that stayed loyal to the Catholic Church over the total number of clergy. However, it does not take into account the number of clergymen in the population. Table A.7 controls for the share of clergy in the population in 1791 (using data on total department population in 1800 from the Statistique Générale de la France). My results hold and the coefficients on share of refractory clergy in the post-1870 period are still significant and similar in magnitude to those reported in the baseline specifications.

As explained above, one concern could be that early economic development is affecting religiosity, as well as economic outcomes during the Second Industrial Revolution. Table A.8 controls for the initial level of development, by including the pre-1870 outcome variables as controls in the post-1870 regressions. As expected, the initial level of development is positively and generally significantly correlated with economic outcomes during the Second Industrial Revolution (cols. 1-3).[7] At the same time, the coefficient on the share of refractory clergy is still negative and significant in all my specifications, suggesting that the results are not confounded by early economic development.

Table A.9 includes the share of people with secondary education. The concern could be that highly educated people (representing only the 0.46% of the male population) were involved in industrialization and, at the same time, they favored the spreading of secular values among the population.[8] The share of secondary educated people in 1876 is positively and significantly associated with my outcome variables, but the results for the share of refractory clergy are robust to the inclusion of this variable.[9]

[6] So far, I use a dummy for the Seine department (Paris) and a dummy for departments located in *pays d'élection* to control for the importance of Paris and for the reach of central institutions. Importantly, the results hold also when including "distance from Paris" as control.

[7] The negative coefficient on "Initial Development" in col. 4 is not surprising: since the dependent variable is the growth in the share of industrial employment, it provides some evidence for conditional convergence.

[8] This is a similar argument as the one made for the presence of knowledge elites. However, since knowledge elites are measured in the mid-18th century, I now include a 19th-century proxy for upper tail human capital.

[9] I don't control for the share of secondary educated people in the baseline specifications since this information is only available for the post-1870 period – in Table A.5 and A.6 I prefer using a standard set of controls.

After taking into account potentially confounding observable characteristics, to analyze whether unobservables are driving my results, I use the Altonji, Elder, and Taber (2005) approach. Rather than relying on exogenous variation, Altonji et al. (2005) suggest an alternative method that takes the relationship between the endogenous variable and the observables as a basis to make interference on the relationship between this same endogenous variable and the unobservables. More precisely, under the assumption that unobservables and observables share similar characteristics, selection on observables can be used to assess potential bias from unobservables. In my case, this implies that the variation in the outcome variables related to the observables has the same relationship with religiosity as the part of variation reflecting unobservables. More formally, I calculate how much stronger selection on unobservables, relative to observables, should be to explain away the full observed relationship between religiosity and my outcome variables. I run two regressions and compute the ratio constructed by Altonji et al. (2005) and adapted to continuous cases by Bellows and Miguel (2009). First, I estimate the coefficient on the share of refractory clergy only controlling for the baseline controls and denote the corresponding coefficient β^A. In the second regression, I add the additional controls as listed in Table 1 (col.2) and denote the coefficient on the share of refractory clergy by β^B. The Altonji et al. ratio is given by $\beta^B/(\beta^A - \beta^B)$. The larger β^B the stronger is the effect left after controlling for observables – and the more would unobservables have to explain in order to reduce the coefficient to zero. As for the denominator, the smaller is the difference between β^A and β^B the less is the estimated coefficient influenced by observables, and the stronger would selection on unobservables have to be to explain away the effect. Table A.10 shows the results. Importantly, since the R-squared rise with the inclusion of more controls, the included controls are informative (Oster, 2013). In general, the Altonji et al. ratios suggest that selection on unobservables would have to be at least 3.47 times stronger than selection on observables to explain away the relationship between religiosity and the various outcome variables – suggesting that unobservables are unlikely to drive my results.

Finally, Table A.11 uses Conley standard errors with a cut-off window of 100 kms to account for spatial auto-correlation and the results hold (Conley, 1999).[10]

[10]These results are robust to the use of different cut-offs for the Conley standard errors.

Table A.5: Religiosity not associated with industrialization (pre-1870) – additional controls

Dependent var.	Share Ind. Emp. 1866	Share Workers Mod. Sect. 1840s	Steam Eng. pc 1840s	City Growth 1750-1850
	(1)	(2)	(3)	(4)
Share Refract. Clergy	0.002	0.038	0.006	0.031
	(0.025)	(0.116)	(0.041)	(0.132)
Knowledge Elites pc	0.005	0.006	-0.008	0.125***
	(0.010)	(0.037)	(0.009)	(0.044)
Huguenots pc 1815	0.011	1.133	0.063	0.074
	(0.069)	(0.698)	(0.097)	(0.631)
Pre-Industrial Activities	0.033**	0.083*	0.018	0.238
	(0.014)	(0.048)	(0.014)	(0.366)
Nobles pc 1800	0.006	0.113	0.023	0.223**
	(0.033)	(0.126)	(0.037)	(0.111)
Pays d'Election	0.021	0.056	-0.024	-0.107
	(0.013)	(0.054)	(0.020)	(0.091)
Dept. non French	0.011	0.143	-0.048*	0.352***
	(0.026)	(0.088)	(0.028)	(0.094)
Pop. Density	0.076***	0.443**	0.078	
	(0.021)	(0.170)	(0.123)	
Urban Pop. 1831	0.050**	-0.117*	0.043**	
	(0.019)	(0.067)	(0.018)	
Controls	✓	✓	✓	✓
R^2	0.75	0.35	0.51	0.31
Observations	74	73	73	121

Notes: All regressions are run at the department level. The share of refractory clergy is measured at the city level in col. 4. Controls include school rate in 1837 (cols. 1-3) or literacy in 1786 (col. 4), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. The presence of the nobility is measured in 1800 in cols. 1-3 and in 1750 in col. 4. Pop. Density is measured in 1866 in col. 1 and in 1831 in cols. 2-3. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors (clustered at the department level in col. 4) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.6: Religiosity negatively associated with industrialization (post-1870) – additional controls

Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1871-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.070**	-0.125**	-1.041***	-0.545**
	(0.033)	(0.048)	(0.370)	(0.214)
Knowledge Elites pc	0.014	0.018	0.292**	-0.011
	(0.014)	(0.018)	(0.143)	(0.065)
Huguenots pc 1861	0.034	-0.115	-1.384	-0.641
	(0.109)	(0.220)	(1.351)	(0.783)
Pre-Industrial Activities	0.044***	0.055***	0.419**	0.132*
	(0.013)	(0.019)	(0.189)	(0.076)
Nobles pc 1850	0.032	0.022	1.513	0.563
	(0.058)	(0.095)	(0.972)	(0.365)
Pays d'Election	0.010	0.039*	0.106	-0.055
	(0.014)	(0.022)	(0.177)	(0.098)
Dept. non French	0.024	0.021	-0.461	0.273
	(0.042)	(0.058)	(0.490)	(0.294)
Pop. Density	0.061**	0.110***	-0.312	0.292**
	(0.023)	(0.035)	(0.320)	(0.140)
Urban Pop. 1831	0.066***	0.107***	-0.077	0.193
	(0.023)	(0.033)	(0.326)	(0.118)
Controls	✓	✓	✓	✓
R^2	0.70	0.73	0.48	0.70
Observations	75	75	75	75

Notes: All regressions are run at the department level. Controls include school rate (measured 10 years before the dependent variables in cols. 1-3 and in 1871 in col. 4), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. Pop. Density is measured in the respective years. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table A.7: Religiosity and industrialization (post-1870) – controlling for clergy pc in 1791

PANEL A: pre-1870				
Dependent var.	Share Ind. Emp. 1866	Share Workers Mod. Sect. 1840s	Steam Eng. pc 1840s	City Growth 1750-1850
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.034	0.133	-0.011	0.080
	(0.035)	(0.126)	(0.040)	(0.131)
Clergy pc 1791	0.135	0.836*	0.044	0.006
	(0.143)	(0.460)	(0.120)	(0.005)
Controls	✓	✓	✓	✓
R^2	0.53	0.19	0.32	0.17
Observations	79	78	78	123
PANEL B: post-1870				
Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1871-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.082**	-0.160***	-1.116***	-0.514**
	(0.037)	(0.060)	(0.376)	(0.202)
Clergy pc 1791	0.168	0.301	1.097	1.514**
	(0.144)	(0.226)	(1.855)	(0.733)
Controls	✓	✓	✓	✓
R^2	0.50	0.54	0.34	0.60
Observations	79	79	79	79

Notes: All regressions are run at the department level. Controls in Panel A are those listed in Table 4 and Controls in Panel B are those listed in Table 5. Robust standard errors (clustered at the department level in col. 4 of Panel A) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.8: Religiosity and industrialization (post-1870) – controlling for initial level of economic development

Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1871-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.111***	-0.196***	-1.317***	-0.554**
	(0.028)	(0.059)	(0.347)	(0.216)
Earlier Development	0.640***	0.085	3.816**	-3.673***
	(0.081)	(0.057)	(1.636)	(0.460)
Controls	✓	✓	✓	✓
R^2	0.75	0.54	0.39	0.58
Observations	79	78	78	79

Notes: All regressions are run at the department level. "Earlier Development" represents the share of industrial employment in 1871 (cols. 1 and 4), the share of workers in modern sectors in 1840s (col. 2), and the (log) number of steam engines per capita (col. 3). Controls include school rate (measured 10 years before the respective dependent variables in cols. 1-3 and in 1871 in col. 4), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.9: Religiosity and industrialization (post-1870) – controlling for share of secondary education

Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1871-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.072**	-0.142***	-1.100***	-0.525**
	(0.034)	(0.053)	(0.377)	(0.199)
Share Secondary Educ. 1876	0.076**	0.133***	0.200	0.276
	(0.030)	(0.049)	(0.310)	(0.263)
Controls	✓	✓	✓	✓
R^2	0.53	0.58	0.34	0.60
Observations	79	79	79	79

Notes: All regressions are run at the department level. Controls include school rate (measured 10 years before the respective dependent variables in cols. 1-3 and in 1871 in col. 4), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.10: Altonji and the role of unobservables

Dependent var.	Share Ind. Emp. 1901		Share Workers Mod. Sect. 1896		Machineries pc 1901		Growth Share Ind. Empl 1871-1901	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	R^2	ratio	R^2	ratio	R^2	ratio	R^2	ratio
Controls	0.50		0.53		0.34		0.58	
Additional Controls	0.70	4.73	0.73	3.47	0.48	11.3	0.70	58.6

Notes: The table uses the Altonji, Elder, and Taber (2005) methodology and reports the relative strength of selection on unobservables necessary to completely explain away the effect of share of refractory clergy on the different outcome variables. 'Controls' and 'Additional Controls' are those listed in Table 1 (col. 1 and col. 2, respectively).

Table A.11: Religiosity and industrialization (post-1870) – controlling for spatial autocorrelation

Dependent var.	Share Ind. Emp. 1901	Share Workers Mod. Sect. 1896	Machineries pc 1901	Growth Share Ind. Empl 1866-1901
	(1)	(2)	(3)	(4)
Share Refract. Clergy	-0.085	-0.164	-1.133	-0.554
	(0.035)	(0.057)	(0.381)	(0.216)
	[0.034]	[0.057]	[0.373]	[0.197]
Controls	✓	✓	✓	✓
Observations	79	79	79	79

Notes: All regressions are run at the department level. Controls include school rate (measured 10 years before the respective dependent variables in cols. 1-3 and in 1866 in col. 4), a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. In addition, all specifications include (log) department population and a dummy for Paris (Seine department). Robust standard errors are in ( ) and Conley standard errors in [ ]. These are computed using the geographic location of main city and assuming a cut-off window of 100 kms.

A.3 Education, religiosity, and industrialization

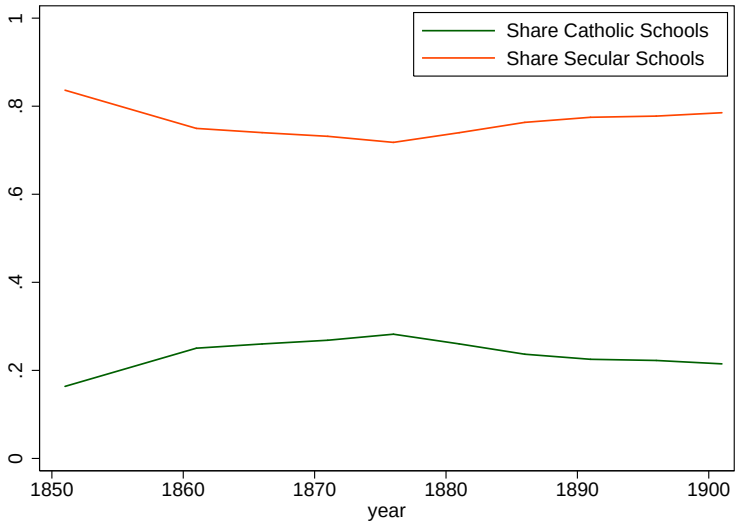

Figure A.1: Share of Catholic and secular schools, 1851-1901

Notes: The figure shows the average share of Catholic schools (green line) and secular schools (orange line) in France from 1851 to 1901.

Table A.12 uses the share of Catholic students, rather than the share of Catholic schools. Similarly to Table 7, columns 1-3 show that departments with a higher share of refractory clergy in 1791 had a higher share of Catholic students, especially after 1850, i.e. when the differences among Catholic and secular education emerged. Importantly, columns 4-6 show that in the more religious departments there is also a higher growth in the share of Catholic students. Table A.13 shows that the results hold when Catholic schools (columns 1-3) and Catholic students (columns 4-6) are specified in levels.

I now perform more robustness checks in my panel setting, where I study the role of the type of education (Catholic versus secular) for industrial development in the 1871-1911 period. In the baseline specification (Table 8), I regress the share of industrial employment in year t on the share of Catholic schools in year $t-10$. Table A.14 uses different lags for the explanatory variables. Specifically, while the share of industrial employment is always measured at time t, the Share of Catholic schools is measured in t (col.1), $t-5$ (col. 2), $t-15$ (col. 3), and an average between $t-10$ and $t-15$ (col. 4). The coefficient on the share of Catholic schools is quantitatively larger and more significant when the share of Catholic schools is measured in $t-15$ or in Avg($t-10$, $t-15$). Interestingly the coefficient is smaller in magnitude and insignificant (col. 1) when the dependent and explanatory variables are both measured at time t – suggesting that the type of education affected (through diffusion of technical

skills) industrial development once students entered the labor market.[11]

Then, to check whether there are differences in investment in "quantity" of human capital between Catholic and secular education, Table A.15 uses school rate (cols. 1-2) and the share of students obtaining the *certificat d'études primaires* (cols. 3-4) as dependent variables. It shows that there are no significant differences in "quantity" of education or completion of primary school between Catholic and secular schools. Finally, Table A.16 uses, as dependent variable, the share of male (col. 1) and female (col. 2) population employed in industry separately and, as explanatory variables, the share of male (col. 1) and female (col. 2) Catholic schools. In both specifications, the coefficients on the share of Catholic schools is negative and significant, suggesting that the negative relationship between industrial employment and Catholic education holds for both genders.

Table A.12: Religiosity and Catholic students

Dependent var.	Share Cath. Students			Growth Share Cath. Students		
	1850	1866	1901	1850-1866	1866-1901	1850-1901
	(1)	(2)	(3)	(4)	(5)	(6)
Share Refract. Clergy	0.057	0.111*	0.244***	0.225	0.378***	0.636***
	(0.055)	(0.057)	(0.050)	(0.211)	(0.106)	(0.146)
Controls	✓	✓	✓	✓	✓	✓
Schooling Controls	✓	✓	✓	✓	✓	✓
R^2	0.24	0.33	0.46	0.27	0.25	0.32
Observations	79	79	79	79	79	79

Notes: All regressions are run at the department level. Controls include a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. Schooling controls include school rate, the (log) number of students per school, the (log) number of total schools (all measured in the initial period in Cols. 4-6). In addition, all specifications include (log) department population (measured in the initial period in Cols. 4-6) and a dummy for Paris (Seine department). Cols 4-6 also control for the initial share of Catholic students. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

[11] As a further robustness, I construct an average of Avg($t-10, t-15, t-20, t-25$) for the share of Catholic schools. This would represent the majority of cohorts employed in the labor market in year t, i.e. workers aged from 15 to 40. The coefficient on the share of Catholic schools is still negative and significant, supporting the previous findings.

Table A.13: Religiosity and Catholic schools/students (levels)

Dependent var.	(Log) Cath. Schools			(Log) Cath. Students		
	1866	1901	1901	1866	1901	1901
	(1)	(2)	(3)	(4)	(5)	(6)
Share Refract. Clergy	0.149	0.546***	0.659***	0.166	0.642***	0.776***
	(0.092)	(0.169)	(0.210)	(0.109)	(0.174)	(0.203)
Initial Level 1850	0.673***		0.463***	0.664***		0.620***
	(0.052)		(0.087)	(0.057)		(0.089)
Initial Level 1866		0.705***			0.773***	
		(0.092)			(0.089)	
Controls	✓	✓	✓	✓	✓	✓
Schooling Controls	✓	✓	✓	✓	✓	✓
R^2	0.90	0.85	0.76	0.93	0.91	0.86
Observations	79	79	79	79	79	79

Notes: All regressions are run at the department level. Controls include a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea, the (log) number of universities founded before 1750, and the (log) number of printing presses established before 1500. Schooling controls (all measured at the initial period) include school rate, the (log) number of students per school, and the (log) number of total schools . In addition, all specifications include (log) department population (measured in the initial period) and a dummy for Paris (Seine department). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.14: Catholic education and industrial employment – different lags

Dependent variable: Employment in Industry, 1871-1911

	(1)	(2)	(3)	(4)
	time t	time $t-5$	time $t-15$	Avg$(t-10, t-15)$
Share Cath. Schools	-0.069	-0.147*	-0.232***	-0.244***
	(0.110)	(0.087)	(0.071)	(0.082)
Schooling Controls	✓	✓	✓	✓
Department FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
R^2	0.87	0.88	0.91	0.91
Observations	491	573	573	573

Notes: All regressions are run at the department level. Schooling controls include school rate, the (log) number of students per school, the (log) number of total schools at the time indicated in the header. In addition, all specifications include (log) department population in t. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.15: Catholic schools and investment in HC

	School rate		Share students obtaining *certificat*	
	(1)	(2)	(3)	(4)
Share Catholic Schools$_{t-10}$	0.019	-0.047	0.015	0.015
	(0.178)	(0.101)	(0.011)	(0.011)
Schooling Controls		✓		✓
Department FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
R^2	0.75	0.86	0.86	0.86
Observations	737	736	491	490

Notes: All regressions are run at the department level. Schooling controls include the (log) number of students per school and the (log) number of total schools. Moreover, cols. 3-4 also control for school rate. In addition, all specifications include (log) department population. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.16: Catholic education and industrial employment – by gender

Dep. variable: Empl. in Industry, 1871-1911		
	(1)	(2)
	Male	Female
Share Cath. Schools$_{t-10}$	-0.164**	-0.175**
	(0.082)	(0.088)
Schooling Controls	✓	✓
Department FE	✓	✓
Year FE	✓	✓
R^2	0.90	0.79
Observations	656	656

Notes: All regressions are run at the department level. Schooling controls include school rate, the (log) number of students per school, the (log) number of total schools in $t-10$. In addition, all specifications include (log) department population in t. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

B Data: Description and Sources

B.1 Outcome Variables

My analysis is performed at the French department (district) level. Departments were created in 1789 by the National Constituent Assembly. Originally there were 83 departments. In 1815, with the end of the Napoleonic period, there were 86 departments. In 1860, also the departments of Alpes-Maritimes, Savoie and Haute-Savoie were annexed to the French territory. After the Franco-Prussian war, France lost the departments of Haut-Rhin and of Bas-Rhin (except for the Territoire de Belfort), as well as a very large area of the departments of Moselle and of Muerthe departments (the remaining part of Moselle and Meurthe were merged into Meurthe-et-Moselle). Hence, since the borders of the French territory changed over time, my analysis does not include Belfort, Meurthe, Moselle, (Meurthe-et-Moselle), Haut-Rhin, Bas-Rhin, Savoie and Haute-Savoie, leading to 82 departments.

Share of industrial employment

Data on the share of industrial employment (1871-1901) are from different French censuses (organized by the Statistique Générale de la France). They represent the people active in industry over the total active population. In 1871, for instance 23% of the active population was in the industrial sectors, while this percentage increased to 29% in 1911. These variable is available every five years from 1871 to 1911 (except for 1896).

Share of population in innovative sectors, 1839-47

These data are from Chanut, Heffer, Mairesse, and Postel-Vinay (2000) and represent the share of workers in innovative sectors over the total number of workers. The classification in innovative versus traditional sectors is based on Squicciarini and Voigtländer (2015). They use the share of "inventive output" from Nuvolari and Tartari (2011), available for 21 British industrial sectors. Then, they merge the 21 British sectors with the 13 French sectors in Chanut et al. (2000) and obtain 8 consistent sectors for which they compute their innovation index as the weighted average "share of inventive output" from the British data. Using this index, they classify French sectors into "modern" and "old", based on above- versus below-median innovation index.

Steam engines per 1,000 in 1839-1847

Data on steam engines are also from (Chanut et al., 2000). They provide this information at the arrondissement level. I aggregate it at the department level and compute the number of steam engines per 1,000. On average, there were 0.06 steam engine per 1,000 in the 1839-47 period.

City population growth, 1750-1850

Data on city population are from Bairoch, Batou, and Chèvre (1988). City population growth is computed as the log growth of city population between 1750 and 1850.

Share of workers in innovative sectors, 1896

The *Enquéte industrielle* provides data by industrial sector and workers' cohort for the 1896. I first use the share of workers in modern sectors (for all cohorts together). Then I also compute, the share of workers in modern sectors for each cohort. Cohorts are defined as workers between 15-24, 25-34, 35-44. Based on historical literature, I classify the transformation and transport sectors as "modern" – and the fishing, agriculture and mine sectors as "old".

Industrial machineries per 1,000 in 1901

Data on the number of industrial machineries per 1,000 in 1901 are from the Annuaire Statistique de la France. These include fixed steam engines, as well as locomotives and steamrollers. On average there were 1.8 industrial machineries per 1,000.

Share of children being vaccinated in 1871

I compute the share of children being vaccinated as the number of children being vaccinated over the total number of births. These data are from the 1871 *Rapport sur les vaccinations*.

Fertility rate

I use the I_g Princeton index as a measure of fertility. This measures the ratio of births that married women in a given population actually have to the number they would have if subject to the maximal age-specific fertility schedule. This is a less coarse measure than the crude birth rate. These data are from Murphy (2015).

Wages in manufacturing

Data on wages in manufacturing for the 1891-1906 period are from the Statistique Général de la France (1907). These information are recorded every five years.

B.2 Other indicators of religiosity

Cahiers de Doléances

For each balliage and estate, Hyslop (1934) provides a list of 49 contents categories mentioned in the *cahiers de doléances*. I identify four categories reflecting "anti-religious" attitudes. For each *bailliage*, I compute the share of "anti-religious" categories in the *cahiers* of the third estate. In the same way, I also compute the share of "anti-religious" categories in the *cahiers* of the clergy and of the nobility, as well as the share of "conservative" categories in the *cahiers* of the third estate.

Share of readers of the newspaper La Croix

This is an index going from 1 to 4 capturing the share of readers of the newspaper *La Croix* in 1896 (Cholvy and Hilaire, 2000).

Number of priests per capita in 1901

These data are from the Annuaire Statistique de la France. I divide the total number of priests over the department population in 1901.

Church attendance 1950s

Isambert and Terrenoire (1980) provide information on the share of people attending the Sunday Mess in the 1950s. On average 29% of the population is attending the Sunday Mess – with the highest percentage of 65% and 69% in the departments of Ille-et-Vilaine and Lozere respectively.

Priests' ordinations per capita

These data are from Godfrin and Godfrin (1965). This is an index going from 1 to 6 and capturing the priests' ordination per capita in the 1950s.

B.3 Control Variables

Baseline controls (cross-sectional analysis)

In the cross-sectional specification, the baseline controls include department-level population, literacy rates, and school rates. These data are from the Statistique Générale de la France. Other controls include a dummy for departments located on the Atlantic Ocean or on the Mediterranean Sea. Following Dittmar (2011), I also control for the (log) number of universities founded before 1750 (Jedin, Latourette, and Martin, 1970; Darby and Fullard, 1970) and for the (log) number of printing presses between 1450 and 1500 (Febvre and Martin, 1958; Clair, 1976).

Knowledge elites

Data on knowledge elites are from Squicciarini and Voigtländer (2015). These represent the density of subscriptions to the Éncyclopedie of Diderot and d'Alembert and are computed as the average subscriptions per capita across all cities in a given department.

Huguenot population

Data on Huguenots are from Mours (1958). I use information on the Huguenot population residing in 1815 and 1861 in each French department. In 1861, Huguenots were about the 1.7% of the total French population. There was large department-level variation with the Huguenots representing about 30% of the population in the Gard department and only the 0.003% in the Correze department.

Noble families

Data on the number of noble families is provided by the Almanach de Saxe Gotha.[12] More specifically, I use data on *marquises*. Entries also contain information on the departments of origin of these families, as well as the dates of creation and (if applicable) extinction of the dynasty. For each department, I compute the total number of *marquis* families existing in 1800 and in 1850. Altogether, there are more than 1,000 noble families in 1800 and about 770 in 1850. Using data on department-level population in 1800 and in 1850, I then compute the number of noble families per 10,000.

Pre-industrial activities

Following Abramson and Boix (2013) and Squicciarini and Voigtländer (2015), I use data on pre-industrial centers in France. These include the total number of mines, forges, iron trading locations, and textile manufactures. I use the local density of pre-industrial activities as computed by Squicciarini and Voigtländer (2015). About half of the departments have some type of pre-industrial activities, with the highest numbers in the departments of Isère, Nord, and Pas de Calais.

Pays d'élection

While France was a centralized state already before the French Revolution, in some regions, the *pays d'élection*, the king exerted particularly strong power in fiscal and financial matters (a representative of the royal administration was directly responsible for the assessment and collection of taxes). In contrast, the *pays d'état* and the *pays d'imposition* enjoyed higher autonomy in terms of taxation. I use a dummy for departments located in *pays d'élection*. This information is from Le Bras (1986).

Non-French speaking departments

I construct a dummy for departments located in non-French speaking areas using linguistic data from http://www.lexilogos.com/france_carte_dialectes.htm. There are three main groups of romance languages in France: *langue d'oc*, *langue d'oil* (the official French), and *langue franco-provencal*. I consider all three "French". By this definition, the following dialects are "non-French": Alsacien, Basque, Breton, Catalan, and Corsican.

Population density

Data on department population and on department surface are from the Statistique Générale de la France.

Baseline controls (panel analysis)

In the baseline specification, I control for department-level population, school rate, the number of students per school, and the total number of schools. All schooling variables are from the Statistique

[12] Available at http://en.wikipedia.org/wiki/List_of_French_marquisates#cite_note-1.

Générale de la France and generally reported every five years from 1851 to 1901. The school rate was, on average, about 51% in 1851 and 86% in 1901. The total number of schools instead increased from about 56,400 in 1851 to 80,800 in 1901. Similarly, the number of students per school increased from 52 to 62.

Phyloxxera dummy

Between 1863 and 1890, the phyloxxera destroyed 40% of French vineyards and represented one of the most dramatic and devastating agricultural shocks in France (Meloni and Swinnen, 2014; Banerjee, Duflo, Postel-Vinay, and Watts, 2010). I use data from Banerjee et al. (2010) and, for each department, I construct a dummy for the year this was hit by the disease. In my data 35 departments were hit by the phyloxxera at different times.

Extraordinary department subsidies pc

I use data from the *Bulletin des lois de la République française* on extraordinary subsidies that the different departments received from the central government from 1871 to 1906. In my dataset, 28 departments did not receive any extraordinary subsidies over this period. I then compute subsidies per capita by dividing the amount of extraordinary subsidies received by total population.

Immigration

I include the number of immigrants per 100 inhabitants from the Statistique Générale de la France. These only include immigrants from other French departments, since foreign immigration to France was very limited (Daudin, Franck, and Rapoport, 2016). In 1886, for instance, the highest share of internal migrants was in the Seine-et-Oise department (38 per 100 inhabitants) and the lowest was in the Lot department (0.5 per 100 inhabitants).

Share of urban population

Using data from the Statistique Générale de la France, I compute the share of urban population by dividing urban population by total population.

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Overview of the variables used in the paper (1/2)

Variable Name	**Variable Description**	**Source**
	Indicators of Religiosity	
Share refractory clergy	share of clergy not signing the oath in favor of the Civil Constitution in 1791	Tackett (1986)
Share of (anti-)religious cahiers	share of "anti-religious" contents in the *cahiers de doleances*	Hyslop (1934)
Share of readers of *La Croix*	index (from 1 to 4) for the share of readers of *La Croix in 1896*	(Cholvy and Hilaire, 2000)
Priests per capita in 1901	number of priests divided by department population	Annuaire Statistique de la France
Share of Catholic schools in 1901	Catholic schools divided by total number of schools	Annuaire Statistique de la France
Church attendance 1950s	share of people attending the Sunday Mess in the 1950s	Isambert and Terrenoire (1980)
Priests' ordinations per capita 1850s	index (from 1 to 6) for the priests ordination per capita	Godfrin and Godfrin (1965)
	Outcome Variables	
Share industrial employment	share of people active in industry over total people active	Statistique Générale de la France
Log city growth	log of city population growth over the indicated periods	Bairoch et al. (1988)
Share of workers in innovative sectors 1839-47	workers in innovative sectors divided by total number of workers	Chanut et al. (2000)
Steam engines per 1,000	number of steam engine per 1,000 in 1839-47	(Chanut et al., 2000)
Share of workers in innovative sectors 1896	workers in innovative sectors divided by total number of workers	Enquéte industrielle 1896
Machineries per 1,000	number of steam engine per 1,000 in 1901	Annuaire Statistique de la France
Share of vaccinated children	share of children being vaccinated over total number of births	Rapport sur les vaccinations
Fertility rate	I_g Princeton fertility index	(Murphy, 2015)
Wages in manufacturing	log (wages) in manufacturing in the 1891-1906 period	(Statistique Général de la France, 1907)

Overview of the variables used in the paper (2/2)

Variable Name	**Variable Description**	**Source**
	Baseline Controls	
Atlantic/Medic Dept.	dummy equal to 1 for departments located on the Atlantic Ocean or on the Mediterranean Sea	Dittmar (2011)
Universities	(log) number of universities before 1750	Jedin et al. (1970); Darby and Fullard (1970)
Printing press in 1500	(log) number of printing presses established before 1500	Febvre and Martin (1958); Clair (1976)
Paris	dummy equal to 1 for Paris (Seine department)	
Literacy	percentage of people able to sign their wedding certificate	Statistique Générale de la France
School Rate	ratio of students to school-age population	Statistique Générale de la France
Population	log total department population	Statistique Générale de la France
	Additional Controls	
Pays d'élection	dummy equal to 1 for departments located in *pays d'éléction*	Le Bras (1986)
Pre-Industrial Activities	log of 1+ pre-industrial centers per capita	Carus-Wilson (1966); Sprandel (1968)
Nobles pc	noble families per 1,000 in 1800 and 1850	Squicciarini and Voigtländer (2015)
Huguenots pc	huguenots per capita in 1815 and 1861	Mours (1958)
Knowledge elites	density of subscriptions to the Éncyclopedie of Diderot and d'Alembert	Squicciarini and Voigtländer (2015)
Non-French speaking departments	dummy equal to 1 for departments located in non-French speaking areas	http://www.lexilogos.com/france_carte_dialectes.htm
Population density	department population divided by department surface	Statistique Générale de la France
Students per school	(log) number of students per school	Statistique Générale de la France
Number of schools	(log) number of total schools	Statistique Générale de la France
Phyloxxera	dummy equal to 1 for the year in which a department was hit by the phyloxxera	Banerjee et al. (2010)
Department subsidies pc	government extraordinary subsidies pc to the departments	*Bulletin des lois de la République française*
Immigration	number of immigrants per 100 inhabitants	Statistique Générale de la France
Share of urban population	urban population divided by total population	Statistique Générale de la France
	Data used in the robustness checks	
Share of conservative cahiers	share of conservative contents in the *cahiers de doleances*	Hyslop (1934)
Share secondary education	Population with secondary education divided by total population	Statistique Générale de la France
Share votes Demo-Socialist party	Index (from 1 to 11) on the share of votes to the Democratic-Socialist party	Bouillon (1956)
Share votes Republican party	Share of votes to the Republican parties in 1876 and 1893	Avenel (1894)