

Squicciarini, Mara P.

Working Paper

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

CESifo Working Paper, No. 7768

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Squicciarini, Mara P. (2019) : Devotion and Development: Religiosity, Education, and Economic Progress in 19th-Century France, CESifo Working Paper, No. 7768, Center for Economic Studies and ifo Institute (CESifo), Munich

This Version is available at:

<https://hdl.handle.net/10419/201994>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

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

Mara P. Squicciarini

Impressum:

CESifo Working Papers

ISSN 2364-1428 (electronic version)

Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH

The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute

Poschingerstr. 5, 81679 Munich, Germany

Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de

Editor: Clemens Fuest

www.cesifo-group.org/wp

An electronic version of the paper may be downloaded

- from the SSRN website: www.SSRN.com
- from the RePEc website: www.RePEc.org
- from the CESifo website: www.CESifo-group.org/wp

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

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 antiscientific 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 and cantons. I show that, despite a stable spatial distribution of religiosity over time, more religious locations 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 to 15 years later, when school-aged children entered the labor market, and this negative relationship was more pronounced in skill-intensive industrial sectors.

JEL-Codes: J240, N130, Z120.

Keywords: human capital, religiosity, industrialization.

Mara P. Squicciarini
Bocconi University / Milan / Italy
mara.squicciarini@unibocconi.it

This version: 14th July 2019

I thank Ran Abramitzky, Andrea Ariu, Sascha Becker, Roland Bénabou, Jeanet Bentzen, Louis Cain, Davide Cantoni, Gaia Greta Dossi, Michela Giorcelli, Carola Frydman, Victor Gay (discussant), Noel Johnson (discussant), Réka Juhász, Eliana La Ferrara, Marti Mestieri, Joel Mokyr, Jo Swinnen, Guido Tabellini, Nico Voigtländer, and numerous seminar audiences at Aix-Marseille, Bocconi University, Bologna University, Bonn University, CAGE Conference, Collegio Carlo Alberto, Hiroshima University, IEA Conference, INSEAD, King's College, Leuven University, Louvain la Neuve University, Munich University, Oslo University, New York University, Northwestern University, Polytechnic University Marche, Sciences Po, Solvay Brussels School, Stanford University, St. Andrews University, Toulouse School of Economics, Warwick University, University of British Columbia, and University of Cambridge for helpful comments and suggestions. I thank Ashish Aggarwal, Elisabetta Campagna, Alberto Mola, and Antonello Squicciarini for excellent assistance throughout the construction of the dataset. I thank Guillaume Daudin, Raphael Franck, Cecilia García-Peñalosa, Noel Johnson, and Tommy Murphy for kindly sharing data. Financial support from the Balzan Foundation, the FWO, and the KULeuven Methusalem Project is gratefully acknowledged. All remaining mistakes are mine.

1 Introduction

Religion has played a primary role in human societies for millennia and continues to do so for billions of people around the globe. Given its importance in the private and public spheres, a broad literature – starting with the pioneering work of Max Weber (1905) – has pointed to different channels through which religion can affect economic development. Specifically, its relationship with scientific-technological progress has been particularly complex throughout history, and religion can still hamper the diffusion of knowledge and innovation in many regions today.¹ However, there is hardly any empirical evidence on when this happens and through which mechanism. It is challenging to measure religion and to find a context in which to study its interaction with the adoption of “useful knowledge.”²

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 started to adopt 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, antiscientific program and hindered the introduction of the technical curriculum, while pushing for religious education. This tension was particularly strong in France, which experienced spectacular scientific and economic development, and where 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 I exploit this variation to study the differential diffusion of technical education and industrial development in about 80 French departments (districts) and 230 French cantons (metropolitan areas).

To conduct the empirical analysis, I assembled a rich dataset from historical archives and secondary sources. My main measure of religiosity 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 their loyalty to the Catholic Church. Since a clergyman’s decision to accept or reject the oath was largely determined by the religious attitude

¹For several examples of the clash between religious doctrines and innovative activities, see Bénabou, Ticchi, and Vindigni (2015). Other authors have looked at how religion affects development through other factors, such as work ethic (Weber, 1905) and trust (Putnam, 1993; Guiso, Sapienza, and Zingales, 2003).

²Following Mokyr (2002), I refer to “useful knowledge” as knowledge that is “economically useful,” i.e., necessary for economic development.

³The technology-skill complementarity emerged in the second phase of industrialization (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).

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

of the local community, the share of refractory clergy reflected religiosity at the local level (Tackett, 1986). To further validate this measure, I use six other indicators for Catholic intensity (not related to a political episode) and provide evidence of a stable spatial distribution of religiosity over time.

I find that areas with higher religiosity had lower industrial and economic development *only* during the Second Industrial Revolution, but not before. I first provide cross-sectional evidence at the department and at the canton levels, using a host of outcome variables – Figure 1 provides an illustration of this relationship. These findings are supported by a difference-in-differences analysis, showing that the more religious departments had significantly lower industrial employment in the post-1870 period – suggesting that preexisting variation in religiosity started to matter when skill-intensive technologies were introduced.

What explains the negative relationship between religiosity and industrialization after 1870? In these decades, the contribution of human capital to industrialization 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 machinery of the Second Industrial Revolution required a technically skilled workforce to be operated, installed, and maintained (Galor and Moav, 2006). Consequently, the French state took an active role in primary education, promoting a more technical curriculum to form a skilled labor force.⁵ While educational policies were adopted at the national level, religiosity played a key role in their local implementation. Using department-level information from the *Annuaire Statistiques de la France* and newly assembled canton-level data from the French National Archives, I find that more religious locations experienced a slower adoption of the technical curriculum and a push for Catholic education. Historical records suggest that this was driven by parents’ preference for religious education for their children – when their Catholic identity was being threatened by the introduction of the secular, technical curriculum (Harrigan, 2001).

Next, I investigate the role of secular vs. Catholic education for the industrialization process. Using detailed panel data from 1871 to 1911, I show that the share of Catholic schools was negatively and significantly associated with employment in industry a decade later. Specifically, “moving” from the 10th to the 90th percentile of the share of Catholic schools distribution would decrease the share of industrial employment by 6 percentage points (relative to a mean of 26% with a standard deviation of 10%). This suggests that the type of primary education (Catholic vs. secular) – whose choice likely depended on parents’ religious preferences – was crucial for the diffusion of “useful knowledge,” for the formation of a skilled labor force, and for industrial and economic development.

When interpreting the above findings, three main concerns could arise. First, the spatial distri-

⁵This included, for instance, basics of arithmetic, geometry, and the metric system, as well as their practical applications to objects and tools. For more details, see Section 2.3.

bution of religiosity may be related to other factors also affecting economic development during the Second Industrial Revolution (but not before). I employ several strategies to mitigate this concern. The department-level analysis accounts for a large set of confounding characteristics, such as geographic factors, core-periphery patterns,⁶ as well as differences in average and upper-tail human capital. Then, it includes other potential determinants of industrialization, measured at the eve of the Second Industrial Revolution, such as the presence of individuals with a secondary-school education and of the Protestant minority (likely representing the entrepreneurial elites), the density of the railway system, and the status of the agricultural sector. Furthermore, the canton-level analysis adds a complete set of fixed effects and accounts for department-level unobservables. Finally, to address remaining concerns that religiosity could be endogenous to economic development, I use an instrumental variable strategy. Similar to the approach of Dittmar and Meisenzahl (2019), I consider plague outbreaks during a narrow period of time (i.e., the Protestant Reformation in France) as a source of exogenous variation in Catholic intensity and find support for a causal interpretation of the relationship between religiosity and economic development.⁷

The second concern regards the mechanism: Does religiosity affect economic development through the type of primary education? I have shown that when the two school systems started to differ, the more religious areas experienced a push for Catholic education and that, in turn, Catholic education is negatively associated with industrialization a decade later. However, the antiscientific and antimodern program of the Church may have also reached other aspects of people’s lives: for instance, local clergymen opposed the introduction of vaccinations and birth control (Minois, 1991). Thus, I do not claim that schooling was the *only* mechanism through which religiosity affected economic progress during the Second Industrial Revolution. Nevertheless, when I analyze the role of these alternative channels, I find that they are uncorrelated with industrial development. In addition, to further validate the role of primary education for industrial-economic progress, I show that my findings hold when accounting for other factors that could be associated to changes in Catholic/secular education and in industrial employment, such as government spending, agricultural shocks, changes in urban population, and immigration. Finally, using different lags for the share of Catholic schools, I find that the effect of education was strongest about 10 to 15 years later, while lagged industrialization does not predict the type of schooling later on. This specific time pattern speaks against concerns of reverse

⁶France was a centralized state in the 19th century, allowing for relatively little local variation in institutions. Thus, while my analysis should be less affected by the typical limitations of cross-country studies, I still control for distance from Paris and for regions – *pays d’élection* – where, historically, the king exerted particularly strong control. Moreover, in Appendix A.1, I perform more robustness checks and exclude from the analysis departments that were geographically or culturally “distant.” All results hold.

⁷My results suggest that the interaction between global religious competition (introduced by the Reformation) and local plague shocks fostered criticism against the prophetic approach of the Church and strong dissent from the Catholic doctrine. Appendix B discusses the exclusion restriction and provides details on the instrumental variable strategy.

causation and is consistent with an effect of the type of education on industrial employment. Thus, the empirical evidence, together with a rich historical record, makes it hard to imagine that schooling was not the *primary* mechanism explaining the negative relationship between religiosity and economic outcomes during the period of the Second Industrial Revolution.

The third concern regards the specific channel through which Catholic education may have hampered industrialization. I discuss detailed historical records documenting key differences in the curricula of secular and religious schools – with the former introducing “technical” subjects and becoming increasingly modern and professional, and the latter remaining “the bastions of a Catholic subculture” (Grew and Harrigan, 1991, p. 221). Then, using data by industrial sector and worker cohort, I find that “religiously educated” cohorts were less likely to be employed in skill-intensive sectors, probably because they lacked the knowledge needed to operate the more complex industrial machinery. In addition, I discuss and explore other critical educational dimensions that could distinguish Catholic and secular education and affect industrial employment. I show, for instance, that the two school systems did not differ in terms of student attendance and schools’ financial resources, further highlighting the key role of educational content for human capital accumulation. Importantly, the differences between secular and Catholic school curricula may not be confined only on the subjects studied, but could comprise broader attitudes that were (or were not) beneficial to the accumulation of “economically useful” human capital.⁸ Accordingly, my interpretation emphasizes a “broad” concept of the Catholic school curriculum – but one that is clearly distinct from what children learned in secular schools.

By analyzing the hindering role that religiosity can play for the diffusion of “useful knowledge” and economic development, this paper contributes to a growing literature studying when (and how) religious values hamper the spread of innovations and new ideas (Berman, 2000; Mokyr, 2011; Bénabou et al., 2015; Carvalho, 2013; Carvalho and Koyama, 2016; Carvalho, Koyama, and Sacks, 2017; Iyigun, Rubin, and Seror, 2018). For instance, Mokyr (2011) argues that traditional Judaism, incompatible with scientific and technological innovation, was responsible for the (almost complete) absence of Jewish inventors before 1850. In the Islamic context, Chaney (2015) documents a decline in scientific production in the 12th century and suggests that this was driven by institutional changes rewarding religious more than scientific knowledge. From a theoretical perspective, Berman (2000), Carvalho and Koyama (2016), and Carvalho et al. (2017) develop models that account for the resistance to modernization of some Jewish communities in the 19th century, for the rise of Ultra-Orthodoxy, and for the strong opposition to modern ideas and secular education. In a more general framework, Bénabou et al.

⁸For instance, Catholic education was generally characterized by 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). At the same time, it is not straightforward to assess whether the Catholic school curriculum was harmful or simply useless, but it was definitively different from the secular school curriculum.

(2015) analyze the interplay between religious beliefs and scientific-economic development. In their model, belief-eroding innovations reduce the stock of religious human capital. Whether or not these innovations will be blocked depends on political conflicts and coalition formation along religious and income dimensions.⁹ While most of the articles adopt historical and/or theoretical viewpoints, this paper is, to my knowledge, the first to provide micro-level evidence on how conservative religious values can hinder the spreading of useful knowledge and affect economic development.¹⁰

This article also relates to a broader literature analyzing the role of religion for economic progress.¹¹ In particular, it relates to those studies examining the relationship between religion and accumulation of human capital. 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.¹² I contribute to this literature in two main respects. First, rather than analyzing the spread of religion as such and comparing different religious affiliations, I exploit variation in the *intensity* of religion.¹³ Second, while most studies point to literacy (i.e., 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 educational content.

Finally, this paper contributes to the 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.¹⁴

The remainder of the article is organized as follows: Section 2 illustrates the historical background.

⁹Three different long-term outcomes may emerge: a “secularization” regime, with declining religiosity and unimpeded scientific progress; a “theocratic” regime, with knowledge stagnation and high religiosity; an “American” regime, generally combining stable religiosity and scientific progress.

¹⁰Chaney (2015) uses detailed data on books from different sources to study the change in scientific production in the periods pre- and post- institutional change. However, he does not exploit variation in religiosity and he focuses on scientific production only.

¹¹For an overview of the literature on the economics of religion, see Iannaccone (1998) and Iyer (2016).

¹²Even 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 Wthrich (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.

¹³Contrary 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 centralized state.

¹⁴Many studies have analyzed the role of culture vs. institutions and tried to disentangle the two. I follow Alesina and Giuliano (2015) in referring to culture as a set of beliefs and values, and to institutions as formal institutions only.

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: technology and the role of human capital

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 (Mokyr, 1999) – the French economy experienced several scientific advances, industrial production grew steadily and, with the *belle époque* (1890-1914), France became an economic and political leader in continental Europe (Crouzet, 2003).

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).¹⁵ While some of these inventions – such as pharmaceutical products and the electricity network – were completely new, others were advances in existing technology. Railroads, for instance, were substantially improved, and new sources of power (the diesel engine and electric locomotives) started to be used.¹⁶ In both cases, the whole population (including the working classes) started to be widely exposed to technological and scientific progress.

Second, the role of human capital changed. During the First Industrial Revolution, the upper tail of the skill distribution was crucial for the industrial takeoff by fostering the invention and adoption of new technologies. On the other hand, worker skills had a limited role in the production process; they were mostly “tacit skills,” still largely transmitted via the master-apprentice relationship (Mitch, 1993; Allen, 2003; Mokyr, 2005; Squicciarini and Voigtländer, 2015). In the last third of the 19th century, however, “the Second Industrial Revolution turned the [...] technological system from an exception to a commonplace” (Mokyr, 1999, p. 2). The many advances in sciences and technology had given rise to more complex and sophisticated industrial machinery. While this increasing mechanization of industry undercut many traditional tasks (and largely displaced artisans), machines could not run on their own – they required “operatives,” i.e., industrial workers (Katz and Margo, 2013). These

¹⁵The 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. Moreover, 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).

¹⁶In 1870, French national railways covered about 17,000 km. By 1913, they reached almost 41,000 km (an increase of 133%). In Britain, over the same period, the railway network expanded from 22,000 km to 32,000 km (an increase of 46%).

industrial workers performed fewer tasks than their predecessors, but the automatization of some tasks increased the returns to skill on the remaining ones, creating organizational economies of scale and shifting the advantage to those with mechanical skills (Wang and von Tunzelmann, 2000; Bessen, 2012). The importance of ordinary workers' human capital increased constantly over the course of the 19th century and went hand in hand with the growing complexity and sophistication of the industrial technology (Galor and Moav, 2006; Bessen, 2012).¹⁷ The technology-skill complementarity became particularly relevant when, in the 1880s, the dynamo entered manufacturing production and fostered the subsequent electrification of industry. Electrification was accompanied by the introduction of new instruments (such as conveyors, traveling cranes, and other handling devices that increasingly relied on mechanical skills to be operated) and by the shift to continuous-process and batch production methods (Goldin and Katz, 1998; Caselli, 1999).

Workers were not trained anymore in the (now decayed) apprenticeship system, but formal knowledge began to matter (Galor and Moav, 2006). This pushed the French government (like many other national governments throughout Europe) to invest in the universalization and professionalization of primary education. While much still had to be learned on the factory floor, having basics of material science, geometry, and the metric system, as well as their practical applications to objects and tools, could help workers perform their tasks (Chatoney, 2006).¹⁸ Thus, in the decades of the Second Industrial Revolution, "education reforms were designed primarily to satisfy the increasing skill requirements in the process of industrialization" (Galor and Moav, 2006, p. 88): the objective was to form a more skilled labor force that could foster the development of the industrial sector.

The historical evidence of 19th-century industrialization is in line with a large theoretical literature in economics, arguing that when technology becomes strongly labor-complementary, the abundance/scarcity of skilled labor favors/discourages technological advances (see, for instance, Acemoglu, 1998): an increase in skilled labor should lead to faster adoption of skill-complementary technologies and to faster industrial development.

2.2 Catholicism and science

The French Revolution (1789) marked a turning point in the relationship between Catholicism and science. In previous decades, the Catholic Church had a complex but generally positive attitude to-

¹⁷For instance, Bessen (2012) shows a strong complementarity between workers skills and the "better" weaving machines of the Second Industrial Revolution, which had become increasingly sophisticated (also thanks to innovations in other fields). Many other tasks had also been automated. At the same time, these changes in technology had made weavers' tasks much more difficult. However, by 1901, weavers' had become more skilled than weavers at the beginning of the 19th century.

¹⁸Moreover, technical skills became important also for the installation and maintenance of the machines: electricians, machinists, and technicians needed to be able to read and understand instructions, to know the basics of algebra, geometry, and mechanical drawing, and to evince dexterity (Goldin and Katz, 1998).

ward scientific and technological progress, which were seen as part of God's harmonious plan for the human race. Several clergymen were eminent members of the Enlightenment: the Abbé Jean-Antoine Nollet, who was involved in the earliest public experiments with electricity, also mentored famous scientists, such as Lavoisier and Monge; similarly, François Rozier, "a clergyman whose vocation was the enlightenment," was the publisher of *Observations sur la Physique, sur l'Histoire Naturelle, et sur les Arts* (Mokyr, 2005).¹⁹ At the same time, Popes Benedict XIV (1740-1758) and Clement XIV (1769-1774) were known as "friends of science" (Minois, 1991).²⁰

Shortly after the French Revolution (and the anti-conservative program promoted by the revolutionary government), a culture war broke out between supporters of the traditional order, embodied in the Catholic Church, and supporters of the new order, who espoused 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 1820s, Rome embraced an extremely antimodern and antiscientific attitude: all French laws and norms were abolished, science became the scapegoat for the revolutionary events and was accused of being false and misleading. The conservative program of the Church in Rome quickly spread to all Catholic regions in Europe, especially in France. During the Bourbon Restoration (1815-1830), the effects were felt in many aspects of people's lives. For example, while substantial progress was made in medicine, local clergymen opposed any modern medical advice or intervention, rejected the efforts of public authorities who tried to introduce vaccinations, and rebuffed doctors who recommended birth control. Importantly, religious texts replaced the scientific and technical instruction that many clergy members had acquired in the pre-revolutionary period: the study of science was banned from seminaries, and the production of religious books increased sharply (from 300 to 600 per year) (Minois, 1991; Jacob, 2014).

This antiscientific attitude of the Church continued until the First World War and the years between 1880 and 1914 were the most complex ones. Over these decades, the Catholic battle against science and modernity also took on political connotations: when progressive parties came into power (e.g., during the Third Republic, 1870-1914) the Church confronted the French government on major societal issues, especially concerning education. Since the Church's program was promoted at the central level, it is unlikely that local "institutional" religious differences explain the differential diffusion of

¹⁹Even before the Enlightenment, there are exemplary cases of clergymen devoted to science, such as the Minim monk Marin Mersenne (1588-1648), a mathematician who made influential contributions to acoustics, and 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).

²⁰Benedict XIV promoted scientific research at the University of Rome, and he was so popular in the intellectual community that Voltaire wrote the *Mahomet* as 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.

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 beliefs, which, in turn, determines the degree to which the Catholic antiscientific agenda and the resistance toward adopting “useful knowledge” were observed.²¹

2.3 Schooling in 19th-century France

In this section, I first describe the key 19th-century French schooling reforms, highlighting how religiosity shaped their implementation at the local level. Figure A.2 in Appendix provides a timeline. Then, I document the evolution of educational content in Catholic and secular schools and how these may have contributed to industrialization.²²

2.3.1 Religiosity and Catholic vs. secular education

Education was the most controversial issue in the ongoing battle between religion and science. The Church saw schooling (and 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 (1815-1830), the clergy recovered its hegemony over primary schooling and promoted an education system where morality, “religion and love of the King” had to be properly inculcated in the population (Jacob, 2014).

Then, during the July Monarchy (1833-1848), the state took an active role in expanding and improving primary education. Primary education was addressed to children aged 6-13, with the objective of having seven years of schooling. However, since some students started early, some started late, and some dropped out and then returned, the 5-15 cohort better reflects the ages at which children effectively attended (Grew and Harrigan, 1991).²³ The 1833 Loi Guizot introduced a national curriculum for primary school students. Meanwhile, all teachers (both secular and Catholic) were now required to have a *brevet de capacité* (i.e., a certificate awarded after passing a qualification exam), and every department had to maintain an *école normale* to “form teachers capable of applying innovations made

²¹Some 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 people.

²²While I am focusing on the role of Catholic vs. secular education for industrial development, 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 industrialization (based on the textile industry) was deskilling for Muslims and upskilling for Christians, while the second wave of industrialization – based on the transportation industry – was upskilling for both groups.

²³This is evident in many historical reports throughout the period of my analysis. For instance, even if the 1843 ministerial report explicitly indicated that school age was from 6 to 13 years, the 5-15 cohort continued to be used in official documents. And, still in 1881, Jules Ferry noted that the number of pupils in primary schools exceeded the 6-13 age cohort by more than 150,000 (Grew and Harrigan, 1991).

in curriculum and methods ... [and able to] fashion more and more enlightened, and harder working, men” (Furet and Ozouf, 1977, p. 142-143).

During the Second Republic (1848-1852), the Loi Falloux of 1851 encouraged Catholic public schools. There were four types of schools (secular public, Catholic public, secular private, Catholic private) in France, and the expansion of Catholic public schools was seen as a way to increase enrollment and build a national education system (Grew and Harrigan, 1991; Franck and Johnson, 2016). Catholic teachers became exempted from the *brevet*; a simple *lettre d’obédience* from any religious order was sufficient to qualify as a teacher. This law helped further spread Catholic education during the Second Empire (1852-1870) as well. “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). At the same time, all schools (public and private) required tuition fees; only the very poorest were exempted.

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 implementation (Grew and Harrigan, 1991). This is evident in the choice of Catholic vs. secular schools in the late 1860s and with the advent of the Third Republic (1870). These years represented a transition period during which the differences between Catholic and secular education became more pronounced (see next section for more details): now that the country was closing in on the goal of universal education,²⁴ the government’s next objective was to increase the quality and professionalization of the education system (Grew and Harrigan, 1991). Already under the Minister of Public Education Victor Duruy (1863-69), the *écoles normales* became increasingly professional and serious. Then, the Republican government implemented a series of reforms aimed at creating higher, more uniform standards to strengthen secular public education (Grew and Harrigan, 1991). To achieve these goals though, Republicans had to weaken the network of Catholic schools. A fundamental moment in this process is represented by the 1881-1882 Jules Ferry laws, which made public education secular, free, and mandatory, and introduced crucial changes to the curriculum.²⁵ These changes were accompanied by a definitive shift in educational financing, from the communal/departamental level to the state level, and by large nationwide investments in schoolteacher training (Gildea, 1983; Grew and Harrigan, 1991). However, the professionalization and seculariza-

²⁴In 1876, more than 75% of children aged 5 to 15 were attending a primary school.

²⁵Other Republican educational reforms included replacing clerical teachers with secular ones: from 1879, teaching positions vacated by clerical teachers had to be filled by secular teachers and, from 1886, all new appointments had to go to secular teachers (Grew and Harrigan, 1991).

tion of primary education became an ideological battle that triggered the Catholic reaction. As shown in Figure 3, the number of Catholic schools remained quite stable throughout this period. How could this happen if, after 1882, Catholic schools were being laicized? Since the state implemented its reforms only in public schools, without interfering with private education, new private Catholic schools started to be established in order to satisfy the local demand for religious education, which, until that point, was largely met in the public sector. Indeed, Figure 3 also shows that the number of private Catholic schools increased as their public counterparts were laicized.²⁶

Thus, the choice of Catholic parents for a religious education for their children became particularly important in the late 1860s, when the differences between the two education systems increased – as also shown in Figure 4 (right panel), plotting the per-period coefficients of the share of Catholic schools on religiosity. The Jules Ferry laws provide even more striking evidence for this: the rise of private Catholic education occurred despite greater public spending on and the gratuitousness of secular education – while families often had to pay fees to send their children to religious schools (where they could “preserve” their Catholic identity).

In these decades, while secular schools were becoming increasingly professional, Catholic schools remained “the clearest measure of resistance to secularization” and represented the “bastions of a Catholic subculture” (Grew and Harrigan, 1991, p. 107, 221). This dual system stayed unchanged until the 1901-1904 *Lois Anti-Congreganistes* (prohibiting all members of religious orders from teaching also in private schools²⁷), and it strongly affected the differential diffusion of technical education among the population. In about 50 years, the French education system achieved several important aims: universal education, professionalization of the teaching corps, administrative and financial centralization, and the introduction of a standard, secular, 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 within the country, and it cannot be explained without discussing the confrontation between science and religion, and the resistance that national laws encountered at the local level.

2.3.2 *Educational content in Catholic and secular schools, 1851-1901*

Over the second half of the 19th century, educational reforms affected the accumulation of “economically useful” human capital through two different, but connected, mechanisms: a direct one, repre-

²⁶In 1881, right before the Jules Ferry laws were enacted, Catholic schools made up 26% of the total, and 58% of them were public. Despite the secularization of public education, Catholic schools managed to survive through the emergence of private education and, in 1901, they still represented 21% of the total – but now only a few of them (less than the 4% of the total) were public. On the other hand, the vast majority of secular education was public: in 1881, 92% of secular schools were public, increasing to more than 96% in 1901. Figure A.4 reproduces Figure 3, using the share of Catholic and secular schools (rather than the number); the patterns are extremely similar.

²⁷Secular education had triumphed: by 1906, religious schools only represented 0.2% of the total number of schools.

sented by the primary school curriculum, and an indirect one, represented by teacher training.

The differences between Catholic and secular education emerged with the 1851 Loi Falloux. Even though this law weakened secular education in terms of “useful knowledge” (compared to the 1833 Guizot law), religious education was in worse straits. Secular and Catholic teachers now had different requirements to be qualified to teach. The former still had to obtain a *brevet de capacité*, and many of them were professionally trained in the *écoles normales*. Some “economically useful” subjects became optional in the *écoles normales* curriculum, but the training in these schools still guaranteed professional standards (Grew and Harrigan, 1991).²⁸ Student curriculum in secular schools changed in the same fashion. However, besides religious instruction, it also included French (reading and writing), calculus, and the metric system.²⁹ Meanwhile, as mentioned above, Catholic teachers became exempted from the *brevet*. A simple *lettre d’obédience* from a religious order was sufficient, implying that any religious (including those without any training) was virtually qualified to teach. Nuns and priests in primary schools proliferated. In general, 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). Catholic education was typically centered around the Bible and religious texts – girls’ schools were particularly strict on issues concerning marriage and divorce – and little emphasis was placed on counting (Grew and Harrigan, 1991; Harrigan, 2001). Also, in terms of methods, Catholic schools promoted a “partial education,” focused on a “reading-only” approach (Furet and Ozouf, 1977).³⁰ The risk was that children in 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).

Then, in 1863, the arrival of Victor Duruy at the ministry opened a new period for the professionalization of the primary school system, and the divergence between Catholic and secular schools increased. The difference between obligatory and optional subjects in the *écoles normales* was abolished, and the curriculum now included geometry, physics, chemistry, natural history, basics of agriculture and industry (with visits to the factories), bookkeeping, and gymnastics. The standards for the

²⁸Only seven subjects (e.g., moral and religious instruction, reading, writing, elements of French language, arithmetic and the metric system, religious music, and practical work) were still compulsory (Toussaint, 2007).

²⁹Other “technical” subjects (such as practical applications of arithmetic, elements in history and geography, elements of physics and natural history as applied to life notions of agriculture, industry and hygiene, as well as surveying, leveling, and linear drawing) were now made optional (Art. 23, *Loi relative à l’enseignement du 15 mars 1850*).

³⁰Reading vs. 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. 297).

brevet became more stringent, and the overall competences of secular teachers considerably increased. At the same time, history and geography were added to the primary-student curriculum (Art. 16, *Loi sur l'enseignement primaire du 10 avril 1867*). Conversely, Catholic primary schools were still largely run by local priests and nuns, who were endowed with only a *lettre d'obédiance*.

The late 1860s had set the stage for the Republican government's schooling reforms (1873-1902), which affected both teaching corps training and student curriculum. First, the *écoles normales* became increasingly serious and professional. "The state's heightened involvement brought greater prestige as well as regulations" (Grew and Harrigan, 1991, p. 152). By 1890, two-thirds of secular teachers had obtained not only the traditional *brevet* but also the *brevet supérieure*, and a whole year of their studies had been devoted to teaching practice. Despite increased professionalization of the secular teaching corps, Catholic education was largely unaffected. A law declared that all teachers must obtain a *brevet* by 1884, but a large majority of Catholic teachers had no training and often refused to obtain the *brevet*.³¹

The Jules Ferry laws also affected student curriculum. In particular, the distinction between compulsory and optional subjects was abolished. Religion instruction was replaced by moral and civic instruction, and the curriculum now included basics of law and economics, elements of natural sciences, physics, and mathematics; their applications to agriculture, hygiene, and industry; handwork and the use of tools dedicated to the main manual professions; elements of drawing, modeling and music; and gymnastics (Art. 1, *Loi sur l'enseignement primaire obligatoire du 28 mars 1882*).³² Overall, primary education needed to be "intuitive," i.e., based on the sense of evidence and demonstration, and "practical," i.e., focusing on the concrete applications (Ferry Jules, 1882). This resulted in a new teaching approach and, then, in the introduction of the "*leçons des choses*," i.e., "lessons of things." School subjects (such as physical and natural sciences, geometry) also had to be taught through their practical applications. The purpose of the "*leçons des choses*" was to "provide agility aptitudes, which are particularly necessary for the primary school children who will be mainly dedicated to manual professions" (Chatoney, 2006, p. 146). At the time, children would enter a profession after finishing primary school and "handworks had two essential virtues: to concretise the abstract notion of maths, and physics sciences and to make sensitive to materialised tasks that the children had to carry out at

³¹This was either because they ideologically opposed it or because they feared they would not pass. Since many religious lacked the *brevet*, Catholic schools largely relied on *adjoint* (assistant) teachers, rather than on *titulaire* (tenured) ones. In addition to the differences in formal training, Catholic teachers had many other duties (in charities and local hospitals) and could not fully focus on teaching.

³²The number of hours to be devoted to each subject was also specified. For instance, the teaching of sciences should have taken from one to one and a half hours per day. Specifically, three quarters of an hour or an hour for arithmetic and related exercises, the rest for the physical and natural sciences (with their applications), presented first in the form of "*leçons des choses*," and later studied methodically. The teaching of French (reading, grammar, orthography) should have taken about two hours per day (*Arrêté sur l'organisation pédagogique et le plan d'études des écoles primaires*).

home or at work during the every day life” (Chatoney, 2006, p. 146).

Importantly, one should not think that the hours spent at schools studying “economically useful” knowledge turned children into skilled workers. While much still had to be learned on the factory floor, the primary-school knowledge provided workers with important notions and “agility aptitudes” that could facilitate their tasks, especially in the skill-intensive manufacturing sectors. At the same time, it is not easy to assess whether religious education was harmful or simply useless, but it definitively represented the “other side of the medal.” Finally, the differences between the Catholic and secular school curricula could reflect broader attitudes that were (or not) beneficial to the accumulation of an “economically useful” human capital – and not be limited to the subjects studied. Thus, we should refer to a “broad” concept of the Catholic school curriculum, but one that is clearly different from what children used to learn in secular schools.

3 Data

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.

A large part of my analysis is performed at the French department (district) level. Departments were created in 1789 by the National Constituent Assembly, the legislative body formed during the French Revolution. Since French territorial borders changed over time, with some departments being annexed and others being lost, my analysis focuses on the 83 departments that were part of France during the whole period of study.³³ Then, I also assembled cross-sectional data at the canton (metropolitan area) level. Cantons, also created during the French Revolution, were typically composed of a main city and a few smaller towns or villages. These disaggregated data allow me to exploit within-department variation.

3.1 Main indicator of religiosity: Share of refractory clergy

Christianity began to 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 parts of Europe, Protestantism reached the French territory in the early 16th century. However, the Huguenots – the French Protestants – were severely persecuted and confined to a small minority of the population. In 1872, 98% of the French population was Catholic (*Recensement Général*), making it unlikely that religious heterogeneity confounds my results. At the same time, there was large variation in the intensity of Catholicism, which

³³For details on the creation and number of departments over time, see Appendix C.

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 on 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 abolishing tithes, nationalizing Church lands, and converting clergymen into functionaries of the state, as well as drastically reducing the number of religious corps, and having citizens elect bishops and parish priests. Given the strong opposition and the delays in 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: "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). Consequently, 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.³⁴ These data are available for the 83 departments being part of France during the whole period of study and for 499 cantons. On average, 42% of French clergy stayed loyal to the Catholic Church, with the highest percentage in the Morbihan department in Brittany (about 88%), and the lowest in the Var department in the Provence-Alpes-Côte d'Azur region (about 5.5%). This indicator of religiosity is measured before my outcome variables in both the pre- and post-1870 periods (for details, see Section 3.2). To further validate this measure, in Section 4.1, I use other indicators of religiosity, and provide evidence of a stable spatial distribution of Catholic intensity over time.

3.2 Outcome and control variables: cross-sectional analysis

3.2.1 Outcome variables

In the cross-sectional analysis at the department level, I use two main outcome variables to study the interaction between religiosity and economic development during the Second Industrial Revolution: the share of employment in industry in 1901 (*Recensement Général*) and the number of industrial machines per capita in 1891 (*Annuaire Statistique de la France*). As placebos, for the period of the First Industrial Revolution, I use the share of industrial employment in 1866 (*Recensement Général*)

³⁴Clergymen not taking the oath had to be replaced and could not hold religious services. This was not a particularly strong punishment, especially considering Revolution-era events. Moreover, the Law of Toleration (May 1791) even re-allowed them to hold religious services, as long as they did not speak against the *Constitution*. Only later, during the Reign of Terror (1792-93), which promoted the complete dechristianization of the country and established the "cult of reason," were stronger punishments implemented. However, the latter were not anticipated, and were addressed first to the refractory clergy but then also to the constitutional clergy. The formal status of the Catholic Church was reestablished in 1801 with the Concordat between Napoleon and Pope Pius VII.

and the number of steam engines per capita in 1839-1847 (Chanut, Heffer, Mairesse, and Postel-Vinay, 2000).³⁵

In a second step, I exploit more disaggregated information and I use information on household expenditure in 1901 as a proxy for household income (*Salaire et cout de la vie*).³⁶ For the pre-1870 period, I use value added in industry in the 1840s (Chanut et al., 2000).

3.2.2 Control variables

Here, I briefly describe my set of control variables. Online Appendix C.1 provides detailed descriptions and sources.

In a first step, I consider a series of baseline controls. These include total department population and different geographic characteristics, such as average temperature, average precipitation, and wheat suitability.³⁷ These factors could be related to religiosity and affect the type of economic activities, by making agricultural production more attractive than industry. Data on average temperature and precipitation are from Franck and Michalopoulos (2017), and data on wheat suitability are from Finley et al. (2017). Moreover, I include the number of early industrial activities (e.g., the number of mines, forges, iron-trading locations, and textile manufacturers prior to 1500) as a measure for an initial advantage for the subsequent industrialization process (Carus-Wilson, 1966; Sprandel, 1968). Next, I account for differences in the influence of central institutions. France was a centralized state, and, 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 the central government, I control for distance from Paris and I include a dummy for departments located in *pays d'élection*, i.e., regions where the king, before 1789, had exerted particularly strong power in fiscal and financial matters (Le Bras, 1986). Finally, I take into account preexisting differences in average and upper-tail human capital that could be related to religiosity and, at the same time, affect industrial development: I control for enrollment rate (*Statistique Générale de la France*) and for the presence of knowledge elites. The latter is measured as the density of subscribers to the *Encyclopédie* of Diderot and d'Alembert (Squicciarini and Voigtländer, 2015), and captures the presence of the upper tail of the skill distribution that was so crucial during the First Industrial Revolution (Mokyr, 2005; Squicciarini and Voigtländer, 2015) and

³⁵Since, in this period, economic growth was largely driven by advances and progresses in the industrial sector, my measures of industrial development can be considered also proxies for the economic development.

³⁶During the industrialization period, households spent a very large proportion of their income, so that household expenditure would largely reflect household income. Using data on 19th century Britain, Horrell (1996) shows that, on average, about 85% of household income was spent on necessities only, and 75% of this was spent on food.

³⁷Finley, Franck, and Johnson (2017) found that regions where more Church land was redistributed during the French Revolution, experienced higher agricultural productivity in the mid 19th century. This could potentially confound my results by making agricultural production more profitable than industrial activities in the Second Industrial Revolution. However, they also found that the positive effects of land redistribution on agricultural productivity declined over the course of the 19th century.

that could also foster industrial development in the late 19th century, in addition to promoting secular values among the population.

In a subsequent step, I consider a set of additional controls measured at the eve of or during the Second Industrial Revolution. First, I take into account the presence of specific population groups that could have been engaged in industrial activities and had a lower level of Catholicism. I control for the share of individuals with secondary education in 1876 – representing only the 0.73% of the male population (*Statistique Générale de la France*) – and I account for the share of Huguenots in 1861 (Mours, 1958), who – although just 1.8% of the French population – were heavily involved in industry, trade, and finance.³⁸ Then, I use information on average farm size from Finley et al. (2017). One concern could be that large landowners hindered industrial development and used religion to keep the population obedient while opposing the implementation of schooling reforms (see, for instance, Galor, Moav, and Vollrath, 2009). However, this does not seem to have been the case in 19th-century France, since, after the French Revolution, landholding took on a small-scale character and landowners had little influence on the rural community (Forster, 1967; Jones, 2012). To further account for the potentially confounding role of agricultural productivity, I control for the value of per capita agricultural production in 1892 (Bignon and García-Peñalosa, 2018). Finally, I include the density of the railway system in 1879 as a proxy for economic and cultural integration (*Annuaire Statistique de la France*).

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. Among the baseline controls (col. 1), the coefficient on total department population is positive and significant.³⁹ At the same time, average temperature and precipitation, wheat suitability, and preindustrial activities are not significantly correlated with the share of refractory clergy, making it unlikely that my findings are confounded by geographic characteristics or by early industrial centers. Further, no systematic relationship exists between the share of refractory clergy and distance from Paris. On the other hand, the *Pays d'Élections* dummy is negatively and significantly correlated with the intensity of Catholicism, suggesting that departments where the king had historically exerted particularly strong power

³⁸Boppart, Falkinger, and Grossmann (2014) found 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.

³⁹In this Table, department population and enrollment rate are measured in 1871 since this date is generally used to indicate the beginning of the Second Industrial Revolution. Measuring these two variables in other years would provide similar results. In the pre-1870 regressions, population and enrollment rate are measured in earlier periods, i.e., before my outcome variables.

were less religious.⁴⁰ Finally, there is no significant relationship between enrollment rate and religiosity, and the coefficient on the density of knowledge elites is insignificant and almost zero. The latter suggests 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 quantity of) average human capital and upper-tail human capital are confounding my results.

In column 2, I show the coefficients of the individual regressions of the share of refractory clergy on the additional factors described above. The share of individuals with secondary education, as well as the share of Huguenots in the population, are not significantly associated with the intensity of Catholicism. The latter implies that, in the late 19th century, the Huguenot minority was not systematically located in less Catholic areas. Then, I find a negative and significant relationship between religiosity and average farm size in 1862, suggesting that areas with larger farms were not more religious.⁴¹ Finally, value added in agricultural production and the density of railways are not significantly associated with the share of refractory clergy.

To sum up, Table 1 shows that only a few department-level characteristics vary systematically with religiosity. My results are robust to the inclusion of both the baseline and the additional controls.

3.3 Data on primary education

When studying the mechanism through which religiosity affects economic development, I focus on the role of primary education. I start by using schooling data at the department level for the 1851-1901 period (*Statistiques de l'Enseignement Primaire*). These are generally reported every five years. The main schooling outcomes are the share of Catholic schools and the growth in the share of Catholic schools. In robustness checks, I use the share of Catholic students, the growth in the share of Catholic students, and the (log) number of Catholic schools and students.⁴² As controls, I include enrollment rate, the number of students per school, and the total number of schools. These variables refer to both types of schools (Catholic and secular together), thus capturing differences in other educational dimensions (beyond the type of primary education).

In addition, I collected schooling data for about 2,430 cantons in 1873 and in 1894 (French National Archives). These data allow me to exploit within-department variation. Consistent with the department-level analysis, the main schooling outcomes are the share of Catholic schools and the growth in the share of Catholic schools. Since data on students are available for 1894, I perform robustness checks, using the share of Catholic students as my dependent variable. The archival data also

⁴⁰Importantly, the results of my regressions are robust to the inclusion of the *Pays d'Élections* dummy, and the coefficients on religiosity are similar in magnitude to those in the baseline specification (see cols. 1-2 vs. 3-4 in Table 5).

⁴¹Using the number of noble families per capita as an alternative measure for the presence of landowning elites would provide similar results, with a negative, albeit insignificant, coefficient.

⁴²I prefer using data on schools because information on Catholic vs. secular students are not available for 1871. Moreover, for 1856, data by type of education (i.e., Catholic vs. secular) are available neither for schools nor for students.

yield information on the quality of school buildings, which could be good (*bonne*), adequate (*passable*), or bad (*mauvaise*). For each canton, I compute the share of school buildings in bad condition as a proxy for the (lack of) schools' resources at the local level.

3.4 Outcome and control variables: panel analysis and cohort analysis

When analyzing the relationship between the type of education and industrialization, my outcome variable is the share of industrial employment (*Recensement Général*). This was reported every five years from 1871 to 1911.⁴³ Then, using data by industrial sector and worker cohort from the 1896 *Enquête industrielle*, I compute, for each cohort, the share of workers employed in skill-intensive sectors.⁴⁴ My main explanatory variable is the share of Catholic schools. In the baseline specification, I control for department-level population and for the schooling controls reported above.

In a second step, I include potentially confounding factors that are not captured by the department and year fixed effects. I account for the spread of phylloxera, a pest of grapevines, that represented one of the most dramatic and devastating agricultural shocks in French history (Banerjee, Duflo, Postel-Vinay, and Watts, 2010). Next, I control for fertility (Murphy, 2015) and for the share of children being vaccinated (*Rapport sur les vaccinations*). Both factors can reflect “better quality” human capital. I also account for the number of immigrants per capita and for the share of urban population (*Recensement Général*).⁴⁵ Finally, one could be concerned that the central government was encouraging industrial activities in those departments where secular education was on the rise. I use two different measures for government investment. First, I include information on extraordinary government subsidies (per capita) to the different departments from the *Bulletin des lois de la République française*. Second, given the massive expansion of the railway system, I control for changes in average travel costs via the railroad network. These data are from Daudin et al. (2016) and are reported every ten years.

4 Empirical Results

Using different indicators for Catholic intensity, I first provide evidence of a persistent spatial distribution of religiosity over time. Then, I show that more religious locations started to lag behind after 1870, when the Second Industrial Revolution began. 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

⁴³Data on the share of industrial employment are also reported for 1866. However, due to lack of information on the share of Catholic schools/students in 1856, my baseline specifications will focus on the 1871-1911 period.

⁴⁴I consider the transformation and transport sectors as “modern” – and the fishing, agriculture and mine sectors as “traditional”.

⁴⁵Since foreign immigration to France was very limited (Daudin, Franck, and Rapoport, 2016), data on immigrants refer to those coming from other French departments.

be employed in skill-intensive 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 already more religious before the French Revolution and continued to be so until the 20th century. First, I use data from the 1789 *cahiers de doléances* (Hyslop, 1934). On the eve of the Revolution, Louis XVI, confronted with a general discontent of the population, decided to call (for the first time since 1614) the Estates General, i.e., the French representative assembly. The representatives of each Estate (clergy, nobility, and third estate) in every *bailliage* (electoral district) endorsed a *cahier*. This was a list of grievances and suggestions about several aspects of French social, economic, and political life. 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 into 49 categories and, for each of them, 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 “antireligious” attitudes: (1) “*cahiers* demanding the democratization of the clergy,” (2) “*cahiers* expressly hostile to Papal influence in the French Church,” (3) “*cahiers* showing secularism,” and (4) “*cahiers* showing pronounced *etatisme* as regards the Church.” Focusing on the *cahiers* of the third estate, I compute the share of antireligious categories over the overall topics covered in the *cahiers* and use it as a measure of pre-1789 (anti-)religiosity.⁴⁶ Table 2 shows a negative and significant relationship between the share of antireligious 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 during it.⁴⁷

Then, I look at later indicators of religiosity. 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 front page served 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 their religious community.⁴⁸ I use information 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 data on religiosity in the mid-20th century; specifically, I look at Church attendance, measured as the share of people attending the Sunday Mass (Isambert and Terrenoire, 1980), and at the number of priest ordinations per capita (Godfrin and Godfrin, 1965).⁴⁹

⁴⁶I focus on the *cahiers* of the third estate, since they represented 98% of the French population.

⁴⁷Eight departments that reported data on the share of refractory clergy have no information in the *cahiers de doléances*. I end up with 75 observations in col.1. Since information on enrollment rates is available only for the 19th century, I control for literacy in 1786-1790 in col. 2 – including this variable leads to 70 observations.

⁴⁸The share of *La Croix* readers is measured as an index from 1 to 4.

⁴⁹Priest ordinations per capita is measured as an index from 1 to 6.

Figure 2 shows that departments with higher religiosity in 1791 had higher Sunday Church attendance still into 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 20th century – in line with the extensive literature on persistence of cultural traits (see, for instance, Putnam, 1993). 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 Catholicism (not related to any political episode).⁵⁰

4.2 Cross-sectional evidence: religiosity and economic during the First and Second Industrial Revolutions

4.2.1 Department-level analysis

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

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

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.⁵¹

Table 4 shows the OLS results for the Second Industrial Revolution (cols. 1-2) and, as a placebo, for the First Industrial Revolution (cols. 3-4). The share of refractory clergy is negatively and significantly correlated with the share of industrial employment in 1901 (col. 1) and with the number of industrial machines per capita in 1891 (col. 2). On the other hand, it is not significantly associated with the share of industrial employment in 1866 (col. 3) or with the number of steam engines per capita in the 1839-1847 period (col. 4).⁵² At the bottom of Table 4, I also report the standardized beta coefficients, showing that a one standard deviation increase in religiosity is associated with a 0.194 standard deviations decrease in the share of industrial employment and with a 0.249 standard deviations decrease in the number of industrial machines per capita. For instance, “moving” from the 10th to the 90th percentile of the religiosity distribution leads to 9 percentage points decrease in the share

⁵⁰I prefer using the share of refractory clergy as my main indicator of religiosity since it is measured before my outcome variables, in both the pre-1870 and in the post-1870 periods, and because it provides both department- and canton-level information.

⁵¹I chose 1870 as the cut-off year based on extensive historical literature (Mokyr, 1999). However, as one could imagine, changes to the industrial sector happened gradually. This is not an issue in my case, since my outcome variables are measured in 1891 and 1901, when the Second Industrial Revolution had been on its way for some decades.

⁵²Data on steam engines per capita in the 1840s are not available for the departments of Alpes-Maritimes and Corse.

of industrial employment in 1901.

Table 5 adds the baseline controls (listed in col. 1 of Table 1). Columns 1-2 include department population and geographic characteristics that could affect the type of economic activity.⁵³ Among them, the coefficient on average precipitation is negative and significant, suggesting that departments that receive more precipitation are generally less industrialized – probably because of higher agricultural productivity. Then, as one would expect, the number of early industrial activities is positively and significantly associated with industrialization during the Second Industrial Revolution. Columns 3-4 control for the reach of central institutions; they show negative (and significant in col. 4, 6, 8) coefficients for distance from Paris and for the *pays d’élection* dummy. In columns 5-6, I add my measures of average and upper-tail human capital. These are generally positively and significantly associated with my outcome variables. Finally, columns 7-8 weight regressions by population, accounting for the concern that my results are confounded by low-population departments. In all specifications, the coefficient on the share of refractory clergy remains significant and very similar in magnitude, suggesting that my findings are robust to the inclusion of these different control variables.

Table 6 adds the additional controls (listed in col. 2 of Table 1) measured at the eve of or during the Second Industrial Revolution. The share of Huguenots and the share of secondary educated individuals are positively associated with my measures of industrialization (cols. 1-2).⁵⁴ While Table 5 already takes into account the role of geographic factors for involvement in agricultural vs. industrial activities, I now control for the state of agriculture in the 19th century. Specifically, the coefficient on average farm size is positive and significant. At the same time, there is a negative and significant relationship between value of agricultural production per capita and my outcome variables, suggesting that industrialization was lower in departments with higher income from agriculture. Next, columns 5-6 add, as a further control, the density of the railway system in 1879; this is positively and significantly associated with my measures of industrialization. Columns 7-8 weight regressions by population. The results on religiosity hold in all specifications.

4.2.2 *Alternative explanations*

In Section A.1 of Appendix, I perform (and discuss in more detail) a number of additional checks.

One key concern could be that the antiscientific approach of Catholicism is capturing a broader conservative *état d’esprit*. Controlling for the presence of knowledge elites partly addresses this issue. However, knowledge elites represented an enlightened intellectual minority that did not necessarily

⁵³Data on average temperature and precipitation are not available for one department (Tarn-et-Garonne), while data on wheat suitability are not available for four departments (Alpes-Maritimes, Corse, Loire, and Tarn-et-Garonne). This explains why the number of observations is reduced from 83 (Table 4) to 79.

⁵⁴Data on the Huguenot population in 1861 are not available for the Haute-Saone department. This further reduces the number of observations from 79 to 78.

reflect the *état d'esprit* of the rest of the population. In Section A.1, I use data from the *cahiers de doléances* and identify seven categories reflecting “conservative” contents: (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 guilds,” (6) “*cahiers* in favor of maintaining feudal justice guilds,” and (7) “*cahiers* showing conservative nationalism.” I then construct the share of conservative categories in the *cahiers* of the third estate and use this as a proxy for conservatism at the local level.⁵⁵ Table A.1 shows a negative and significant correlation between the share of antireligious and the share of conservative contents in the *cahiers* of the third estate, thus suggesting that more religious departments were also more conservative.⁵⁶ In Table A.3, I regress my industrial outcomes on both religiosity and conservatism. The coefficient of religiosity is still negative and significant in all specifications, while my measure of conservatism is not significantly associated with industrialization. This likely suggests that the antiscientific dimension of Catholicism (and not a conservative attitude as such) is explaining the negative relationship between religiosity and economic development after 1870.

Table A.4 further deals with the concern that remoteness and distance (also in terms of linguistic and cultural background) are confounding my results. While I already take into account the difference in the reach of central institutions (by controlling for distance from Paris and for whether a department was located in *pays d'élections*), here I specifically focus on Brittany and on those departments that had traditionally spoken a language other than French. Excluding these areas from the analysis provides very similar results to those in the main specifications. Table A.6 controls for the initial level of development, by including the pre-1870 outcome variables as controls in the post-1870 regressions. This further addresses the concern that less religious departments were already more industrialized before 1870 and that the initial level of development, rather than religiosity, is affecting industrialization during the Second Industrial Revolution. Even if the pre-1870 industrial variables are strongly and positively associated with the post-1870 outcomes, the coefficients on religiosity are still significant and very similar in magnitude to those in Table 5. In addition to enrollment rate in secondary education, the type of secondary schools could also play an important role for economic development – as shown by Semrad (2015) for the case of Bavaria. In France, we can distinguish between “modern” secondary education (*enseignement special or modern*) and “traditional” secondary education (*enseignement classique*). Table A.7 in Appendix controls for the share of modern secondary education in 1880. This variable is positively (and significantly in cols. 2, 4, and 6) associated with

⁵⁵I computed this analogously to the share of antireligious contents (see section 4.1). I do not include the share of conservative contents in the *cahiers* as one of my baseline controls, since it would systematically reduce the number of observations.

⁵⁶I also analyze other dimensions of conservatism related to the political sphere. For details, see Section A.1.

the industrialization outcomes, but the results on religiosity are still robust.⁵⁷ Finally, I use Conley standard errors to account for spatial autocorrelation, and the results on religiosity hold (Table A.8). In all specifications, the inclusion of these potentially confounding characteristics does not affect the magnitude and significance of my coefficients. This sensitivity analysis suggests that any remaining omitted-variable bias due to unobservables should also be modest. This is confirmed when I formally analyze the role of unobservables using the Altonji, Elder, and Taber (2005) methodology and the Oster's (2017) correction of the Altonji et al. (2005) method (Table A.9). I show that selection on unobservables would have to be at least 5.42 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.

4.2.3 *Within-department analysis*

The findings so far clearly show that the department-level results are robust to the inclusion of several observable factors, and the Altonji et al. (2005) method suggests that selection on unobservables would have to be substantially stronger than selection on observables for my main findings to be overturned. To further rule out that unobserved department characteristics are confounding my results, Table 7 uses canton-level data and exploits within-department variation. The outcome variable is (log) household expenditure in 1901, and the main variable of interest is the share of refractory clergy. These data are available for 223 French cantons.⁵⁸

Column 1 first shows the results without any controls, and column 2 adds department fixed effects. The coefficient on the share of refractory clergy is negatively and significantly correlated with my outcome variable. Next, I include canton-level characteristics that could be related to religiosity and affect economic development. In a first step, I control for (log) canton population (col. 3). Then, I add dummies for those cantons having a port on the Mediterranean Sea or on the Atlantic Ocean (col. 4). This favorable geography has been associated with cities' economic growth in the modern period, and it could still represent an advantage for engaging in industrial activities as well as for facilitating the spread of more progressive ideas. The coefficient on the share of refractory clergy is negative and significant in all specifications. At the bottom of Table 7, I report the standardized beta coefficients, showing that a one standard deviation increase in religiosity is associated with a 0.294 standard deviations decrease in my outcome variable (col. 6).

Table A.10 in Appendix exploits within-department variation in the pre-1870 period, using ar-

⁵⁷As I show in Table 11, religiosity seems to be key in determining the type of primary education, but it does not affect the type of secondary education. Thus, it is unlikely that the presence of an educated, high-skilled minority is confounding my results.

⁵⁸As mentioned earlier, data on the share of refractory clergy are available for 499 cantons. Of these, 223 cantons also report information on expenditure in 1901. The 223 cantons in my analysis are located in 70 departments.

rondissement level data.⁵⁹ The dependent variable is (log) value added (Chanut et al., 2000), and the main variable of interest is the share of refractory clergy. These data are available for 252 French arrondissements. The regression results show that the coefficient on the share of refractory clergy is not significantly associated with my outcome variable in the pre-1870 period.

4.2.4 *Exogenous variation in religiosity*

The canton-level analysis, which supports the department-level evidence, further suggests that religiosity played a negative role on economic development during the Second Industrial Revolution. However, one could still wonder why some places were more religious than others and whether there is a source of exogenous variation in religiosity. Section B in Appendix uses plague outbreaks during a narrow period of time, i.e., the Protestant Reformation in France, as an instrumental variable – similar to the approach of Dittmar and Meisenzahl (2019).

As Dittmar and Meisenzahl (2019) argue, the Reformation – starting with the circulation of Martin Luther’s theses in 1517 – undermined the monopoly of Catholicism, introducing competition in the market for religion. This represented a “global shock” throughout central Europe, and it created an alternative to the Catholic ideology. Importantly, this new religious competition interacted with shocks at the local level. Focusing on German cities, Dittmar and Meisenzahl (2019) show that, once the new doctrine had created an opening for change, the occurrence of plagues discredited the incumbent elites, led to criticism toward the “status-quo,” and lowered the price of political action. Religious and political competition at the local level increased and drove the adoption of public goods institutions.⁶⁰

In France too, the Reformation provided an alternative to the Catholic ideology. The decades before the Reformation were characterized by widespread “eschatological anxiety” (Crouzet and Good, 2001): pamphlets predicting calamities circulated and natural disasters were considered God’s imminent vengeance upon a sinful society. In this context, the Church had established itself as a monopolistic “provider of salvation,” often pushing people to confess their sins and to organize daily processions of expiation to deal with the negative occurrences.⁶¹ The Protestant ideology was immediately welcomed in France, and the years leading up to the 1598 Edict of Nantes (when Henry IV finally granted rights to Protestants) saw the strongest religious competition in the country. Where plagues

⁵⁹ Arrondissements correspond to the subcounty level, and French departments were divided into 356 arrondissements in the mid-19th century. As far as I know, measures of economic development at the canton-level are not available for the pre-1870 period, so I use arrondissement-level data to exploit within-department variation during the First Industrial Revolution.

⁶⁰In the German context, religious competition also took political connotations. On the other hand, the authors show that, before the introduction of religious competition, plague shocks did not lead to institutional change.

⁶¹Analyzing the French religious context of the 16th century, Crouzet concludes that “popular Catholicism in France was steeped in mysticism and apocalypticism and fed by almanacs filled with reports of signs and portents and with astrological predictions of disasters and the end of the world.” See Appendix B for several examples of the reactions of the Church and the population after natural calamities and negative events.

occurred, the prophetic approach of Catholicism was further scrutinized: “The Reformation in France heightened attitudes about the forces of good and bad [...] and plagues became a battle hammering out Church positions” (Cohn, 2018, p. 155).

My hypothesis is that, in the years of strongest religious competition, the occurrence of plagues discredited the Catholic doctrine and shifted religious views toward Protestantism.⁶² Since plague outbreaks could reflect other factors (such as trade exposure) and be endogenous to economic development, I study outbreaks in the 1517-1598 period, conditional on long-run variation in plagues – thus identifying off variation in plagues during the period of strong religious competition. To test this hypothesis, I use information on the number and year of outbreaks in France from 1347 to 1786 (Biraben, 1975).⁶³ Table B.1 presents the results of the IV regressions: the first stage shows that the share of plagues in the 1517-1598 period is a strong predictor of religiosity in 1791, and the second stage shows a negative and significant coefficient on the share of refractory clergy. The results hold when adding dummies for those cantons having a port on the Mediterranean Sea or on the Atlantic Ocean (thus, specifically addressing the concern that openness is confounding my results), when including department fixed effects, and when weighting regressions by canton-level population. Then, I also show that there is no significant relationship between religiosity and outbreaks in placebo periods, pre-1517 and post-1598 (Table B.2). This suggests that the interaction between religious competition and local plague shocks (rather than plagues as such) triggered dissensus toward the Catholic Church and decreased Catholic religiosity.⁶⁴ To address whether the exclusion restriction is satisfied, I perform a series of falsifications tests. If plagues affected economic development through different channels, e.g., through their demographic consequences, outbreaks before and after the period of high religious competition should also have had a positive impact on economic development. I examine the reduced-form relationship between economic development and plagues in the 1517-1598 period and in the placebo periods. While there is a strong and positive relationship between my outcome variable and outbreaks in the 1517-1798, I estimate a statistically insignificant relationship for outbreaks occurring in the placebo periods (Table B.3). Finally, I further validate the argument that religious competition during the Protestant Reformation was key in determining later Catholic religiosity by using detailed

⁶²In France, contrary to the German context, higher local religious competition created tension with the Catholic Church, but it was not conducive to institutional change. This was likely due to the uncertain (often illegal) status of Protestantism in the country.

⁶³Data on plagues are at the city-level. These map one-to-one into cantons, except for two cases where I aggregate city-level information at the canton level.

⁶⁴Using detailed information on a list of French Protestant refugees in Genève from the *Livre des habitants de Genève* (Geissendort, 1957), I construct a measure for the presence of early Protestant groups. I find a positive relationship between outbreaks in the period of religious competition and the emergence of Protestantism. However, as shown in Table 1, given the strong persecutions against the Huguenots, Protestantism in the 19th century is not associated with Catholic religiosity. Appendix B discusses in detail why my results are unlikely to be confounded by the presence of Protestantism.

data on medieval convents as a measure of religiosity in the pre-Reformation period. I find that this early indicator of Catholicism is not correlated with my measure of religiosity in the post-Reformation period (Table B.4), suggesting that 19th-century Catholic religiosity can be traced back to the Reformation period.

Thus, the instrumental variable strategy provides support for a causal interpretation of the relationship between religiosity and economic development.

4.3 Difference-in-differences: religiosity and economic development during the First and Second Industrial Revolutions

Here, I use panel data on the share of industrial employment to analyze the relationship between religiosity and economic development in a difference-in-differences framework. Data on industrial employment are available for every five years from 1866 to 1911; I consider 1866 and 1871 as the pretreatment period. I estimate equation of the form:

$$y_{i,t} = \alpha_i + \alpha_t + \beta R_i \cdot Post1871 + \varepsilon_{it}. \quad (2)$$

Table 8 shows the results. Column 1 does not include any fixed effect, column 2 adds year fixed effects only, column 3 includes also department fixed effects, and column 4 weights the 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 more religious departments started to lag behind during the Second Industrial Revolution. In other words, preexisting variation in religiosity began to matter significantly more when skill-intensive technologies were introduced.

The difference-in-differences analysis examines the average effect of religiosity on the share of industrial employment during the Second Industrial Revolution. Next, I use a more flexible estimating equation that, rather than interacting the share of refractory clergy with the *Post1871* indicator, interacts the religiosity measure with each of the time-period dummies, using 1866 as the baseline time-period. The results can be intuitively seen in Figure A.1 plotting the per-period coefficients on the interaction terms over time. The figure shows that the negative relationship between religiosity and the outcome variable increases in magnitude during the Second Industrial Revolution, becoming particularly large in the late 1890s and in early 1900s.

Finally, one concern could be that other department characteristics (especially those associated with religiosity) also started to matter after 1870. Table A.11 in Appendix uses specification (2) and performs a difference-in-differences analysis, using (one by one) the baseline controls (measured before 1870) rather than the share of refractory clergy. Among them, only (log) population and the

Pays d' Elections dummy were significantly associated with the intensity of Catholicism (Table 1). In the difference-in-differences specification, the interaction between these variables and the *Post1871* indicator is not significantly associated with the share of industrial employment. Among the other controls, only the interaction between enrollment rate in 1851 and *Post1871* has a positive and significant coefficient, probably capturing the important role of early human capital for economic development during the Second Industrial Revolution.⁶⁵

4.4 Mechanism: Religiosity, Catholic education, and economic development

I now shed light on the mechanism that could explain the negative relationship between religiosity and industrial-economic development during the Second Industrial Revolution. I suggest that primary education played a central role, and I show that: (1) the more religious departments and cantons had a higher 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 less industrial development about a decade later; and (3) “religiously educated” cohorts were less likely to be employed in innovative sectors, probably because they lacked the skills needed to operate the new technologies.

4.4.1 Preference for Catholic education in more religious areas

As explained in Section 2, the 1851 Loi Falloux helped all clergymen to qualify as teachers. Differences between secular and religious education had already emerged by this time, but they became more pronounced in the late 1860s, with the former being increasingly professional and the latter strongly representing the “bastions of a Catholic subculture” (Grew and Harrigan, 1991, p. 221). Using data on primary education from 1851 to 1901, in Table 9, I study the relationship between religiosity and the type of schools (Catholic vs. secular) in the two subperiods of schooling reforms (1851-1866 and 1866-1901). All specifications account for department level differences in other educational dimensions, such as enrollment rate, the number of students per school, and the total number of schools. Columns 1-3 show that departments with a higher share of refractory clergy in 1791 had a higher share of Catholic schools in the second half of the 19th century. The coefficient on religiosity becomes larger in magnitude and significant at the end of the period, i.e., in 1901, when the preference for religious education became a clear expression of local religiosity (Grew and Harrigan, 1991). Then, I use as dependent variables the growth in the share of Catholic schools in the two subperiods (cols. 4-8). As one would expect, more religious departments experienced higher growth in the share of Catholic schools, especially between 1866 and 1901 (cols. 5-8). These results are robust to the inclusion of the baseline controls (cols. 8-9) and when weighting regressions by department population (cols. 6 and 8). Finally, at the bottom of Table 9, I report the standardized beta coefficients, suggesting that with a

⁶⁵Primary education became mandatory in 1882, thus leading to very small differences in enrollment rate during the Second Industrial Revolution. In both the cross-sectional and the panel analyses, I control for enrollment rate.

one standard deviation increase in the share of refractory clergy, the share of Catholic schools in 1901 increases of 0.338 standard deviations (col. 3), and the growth in the share of Catholic schools (in the 1866-1901 period) increases of 0.390 standard deviations (col. 5). Table A.12 replicates the specification of Table 9, using the share of Catholic students as outcome variable. The results hold: with a one standard deviation increase in the share of refractory clergy, the share of Catholic students in 1901 increases of 0.457 standard deviations (col. 3), and the growth in the share of Catholic students (in the 1866-1901 period) increases of 0.441 standard deviations (col. 5).⁶⁶ Then, in Table A.13 and Table A.14, I show that the results hold without the schooling controls and when using the (log) number of Catholic schools and students (rather than the shares).

Finally, I use data on religiosity and education for almost 450 cantons in 1873 and 1894. Figure 4 (left panel) plots the share of refractory clergy against the share of Catholic schools in 1873 and shows a strong positive relationship between the two variables. Then, Table 10 shows the regression results for the share of Catholic schools in 1873 (cols. 1-3) in 1894 (cols. 4-6), and for the growth in the share of Catholic schools from 1873 to 1894 (cols. 7-10).⁶⁷ Even if the canton-level data do not allow me to analyze the growth in Catholic schools in the two subperiods of educational reforms, the key advantage of these disaggregated information is that I can exploit within-department variation in religiosity. The canton-level analysis supports the findings of Table 9: the coefficient on religiosity is positive and significant in all specifications, even when including department fixed effects (cols. 2-3, 5-6, and 8-10) and when weighting regressions by canton-level population (cols. 3, 6, and 9-10). Data on students at the canton level are available for 1894. Table A.15 studies the relationship between religiosity and the share of students in Catholic schools, and Table A.16 distinguishes between female and male students. The results hold when considering all students together and when distinguishing between genders.

Thus, despite strong state intervention and investments in secular education, the share of Catholic schools changed little in the country – from about 26% in 1866 to about 22% in 1901 (see Figure A.4). This argument is supported by Franck and Johnson (2016) who find that the massive increase in state spending on secular education did not affect overall enrollment in Catholic schools. Table A.17 also provides evidence for this and shows that the share of Catholic schools is not correlated with state investment on education. At the same time, department-level variation was substantial, with some departments experiencing an increase in the share (and number) of Catholic schools (the highest was 80%, in the Lozère department) and others experiencing a decrease (the highest was 70%, in

⁶⁶Since data on Catholic vs. secular students are not available in 1871, to be consistent with the panel level analysis, I prefer using data on schools in the main specifications.

⁶⁷Data on Catholic vs. secular students are not available for 1873. Moreover, I have information on 435 cantons in 1873, on 444 cantons in 1894, and on 401 cantons for both years.

the Hautes-Alpes department).⁶⁸ This is also evident in Figure 4 (right panel), which plots the per-period coefficients of the share of Catholic schools on religiosity. These findings are in line with the historical evidence documented in Section 2, suggesting a strong preference by religious parents for Catholic education for their children – especially after the secular education system became more professional and secular, threatening the existence of Catholic schooling. They also contribute empirical evidence to the extensive theoretical literature on cultural transmission and backlash of cultural identities (see, for instance, Berman, 2000; Bisin and Verdier, 2001; Bénabou and Tirole, 2006; Tabellini, 2008; Carvalho, 2013; Carvalho et al., 2017; Iyigun et al., 2018; Fouka, 2019; Sakalli, 2019).⁶⁹

Finally, Table 11 shows the relationship between religiosity and other measures of human capital. Panel A focuses on the type (cols. 1-2) and quantity (cols. 3-4) of primary education. The dependent variables are the share of students in Catholic schools and the enrollment rate in primary schools. Panel B instead analyzes the type (cols. 1-2) and quantity (cols. 3-4) of secondary education, thus focusing on the share of students attending modern secondary schools (*enseignement special* or *modern* as opposed to the *enseignement classique*) and on share of individuals with secondary education.⁷⁰ Interestingly, the share of refractory clergy is negatively and significantly associated only with the type of primary education (cols. 1-2), supporting the historical record on the importance of religiosity for the choice of primary schools, more than for other measures of human capital. This is evident also from the standardized beta coefficients showing that a one standard deviation increase in religiosity is associated with a 0.427 standard deviations increase in the share of Catholic students, and with only a 0.040 standard deviations decrease in the share of students enrolled in modern secondary schools. The nonrelationship between religiosity and secondary education is likely because the latter was addressed to a minority and, the overall religiosity of the population is unlikely to affect its quantity (as already shown in Table 1) or its type. At the same time, there was little department-level variation in primary-school enrollment: at the beginning of the Second Industrial Revolution, enrollment was already high throughout the country, and the 1882 laws made primary school mandatory.

⁶⁸The Lozère department, in the Languedoc-Roussillon-Midi-Pyrénées region, is in the 95th percentile of the religiosity distribution. The Hautes-Alpes department, in the Provence-Alpes-Côte d’Azur region, is in the 5th percentile of the religiosity distribution.

⁶⁹To my knowledge, Fouka (2019) and Sakalli (2019) are the only other empirical studies showing a backlash of identity in response to assimilation policies. Fouka (2019) focuses on German immigration in 20th-century United States and Sakalli (2019) on secularization of education in Turkey. On the theoretical side, for instance, Berman (2000) shows that, in the 19th century, part of the Jewish population did not assimilate to the new ideas and markets, thus isolating themselves from the rest of the community and giving rise to Ultra-Orthodoxy. Using a form of social interaction models, the club good approach, he rationalizes the “extreme” choices made by Ultra-Orthodox Jews.

⁷⁰In the panel regressions, I prefer focusing on Catholic schools rather than on Catholic students (because data on students are not always available). However, since I have information only on students in modern secondary schools (but not on schools), to better compare primary and secondary education, in this cross-sectional analysis, I use the share of Catholic students in primary schools. Using information on the share of Catholic schools would yield very similar results, as shown in Table 9.

4.4.2 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. I can estimate panel models with fixed effects, accounting for unobserved time-invariant department characteristics and nationwide common trends. Specifically, I estimate equations of the form:

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

where y_{it} is the share of employment in industry, and α_i and α_t denote, respectively, department and time fixed effects. The main explanatory variable is the share of Catholic schools in $t - 10$, $CS_{i,t-10}$. 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 of lagged schooling variables, since children in primary schools, aged 5 to 15, entered the labor force about ten years later (when they were between 15 and 25).

Table 12 reports the results for the share of industrial employment between 1871 and 1911.⁷¹ Column 1 includes only department and year fixed effects. Column 2 also controls for department-level population; column 3 adds enrollment rate, 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. Since the share of secular schools is the “inverse” to the share of Catholic schools, these results imply a positive relationship between secular education and industrialization. Among the schooling controls, the (log) number of students per school is negatively (and significantly in cols 3 and 5) associated with the share of industrial employment. By contrast, changes in enrollment rate do not seem to play a role.⁷² Moreover, there is a positive relationship between total department population and share of industrial employment. The results are robust when weighting regressions by population (col. 4) and when using the share of students enrolled in Catholic schools rather than the share of Catholic schools (col. 5). The coefficient on the share of Catholic schools remains strongly significant in all specifications. At the bottom of Table 12, I report the standardized beta coefficients showing that a one standard deviation increase in the share of Catholic schools is related to 0.217 (col. 3) standard deviations decrease in the share of industrial employment. To better gauge the corresponding magnitude, “moving” from the 10th to the 90th percentile of the share of Catholic schools distribution would decrease the share of industrial employment by 6.2 percentage points (relative to a mean of 26% with a standard deviation of 10%).

⁷¹In the main specifications, I have information on 82 departments and 9 points in time.

⁷²This could be because primary-school enrollment was already very high in the period of study.

4.4.3 Additional specifications

Table 13 and Table 14 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 in industrial employment. Table 13 controls for observable characteristics that would not be captured by department and year fixed effects. Column 1 includes a dummy for the year when phylloxera spread in a department. Phylloxera destroyed about one third of French vineyards between 1875 and 1889 and caused wine production to decline by about 70% (Meloni and Swinnen, 2014). If people migrated from the countryside to urban areas, the spread of phylloxera could have favored a switch from the agricultural to the industrial sector and a decrease in the share of Catholic schools. Fertility and vaccinations could be other confounding factors if a higher quantity of children in more Catholic areas was associated with lower industrial employment – because of lower investment in quality of children, not related to the type of education.⁷³ Controlling for the spread of phylloxera, for fertility, and for vaccinations does not affect my results (cols. 1-2).⁷⁴ Next, I account for the potentially confounding role of changes in migration and urbanization that could affect educational choices as well as industrial employment. Columns 4 and 5 include these variables, and the results hold. Finally, public budget considerations are likely the most relevant confounder in my setting. A challenge for my interpretation could indeed be that increases in government investment (especially in secular-oriented departments) were the dominant factor fostering industrialization, while changes in the type of primary education were only a sideshow without economic relevance. I analyze two different types of government investments. First, I account for government subsidies per capita. While these are positively associated with the share of industrial employment, the results on the share of Catholic schools are still very strong. Second, in the decades marked by the massive expansion of the railway system, railroads could facilitate market access and industrial development. Column 7 controls for changes in travel costs via the rail network to any other department in France, and the results hold. In all regressions, the coefficient on the share of Catholic schools is highly significant and very similar in

⁷³The tradeoff between quantity and quality 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 mutual causation between fertility and education in 19th-century Prussia. In a recent paper, de la Croix and Perrin (2018), focusing on the French context, study the temporal and spatial variation in fertility and school enrollment using a structural estimation technique.

⁷⁴The phylloxera dummy, fertility, the share of vaccinated children, and the share of immigrants in the population are measured at $t - 10$ (since they are more likely to have an effect on industrial employment after some time). My findings hold when these variables are measured at time t .

magnitude to the baseline results of Table 12.⁷⁵ Table A.18 further deals with the potentially confounding role of travel costs; it accounts for changes in travel costs via railways to Paris, which could capture the influence of central institutions and the exposure to new ideas spreading from the capital, as well as for the density of and the expenditure for national roads that – even if they were not so massively expanded as railways – could also facilitate market access. All results hold. Finally, Table A.19 checks whether changes in Catholic education are correlated with changes in public spending; it finds that the share of Catholic schools does not systematically vary with any measures of government investment, supporting the argument that parents’ religious preferences (rather than public budget considerations) are determining changes in the type of primary schools.

While using lagged explanatory variables suggests that I capture the effect from the type of education to industrialization, in principle, economic development could also affect educational choices. Table 14 performs an exercise to mitigate concerns of reverse causality. Using the share of Catholic schools as dependent variable, I show that lagged industrial employment does not predict the share of Catholic schools one decade later.⁷⁶ Moreover, Table 15 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 $\text{avg}(t - 10, t - 15)$. The coefficient is smaller in magnitude and insignificant when the two variables of interest are measured at time t (col. 1). These time patterns are in line with an effect of education on industrialization, supporting a causal interpretation of my findings. Finally, Table A.20 distinguishes between male and female schools (and industrial employment) and shows that the results by gender are similar to those in the main specification.

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

The panel analysis suggests that Catholic education played a key role in explaining the negative relationship between religiosity and economic development during the Second Industrial Revolution. But, what is the specific channel through which Catholic education may have hampered industrialization? As discussed in Section 2, the historical record shows key differences between the curricula in Catholic and secular schools. One concern could be that the two types of primary education differed in other critical dimensions, such as student attendance and schools’ resources.⁷⁷

Table A.21 uses as a dependent variable the share of students attending primary schools during

⁷⁵Since some of the control variables are not available for the same years, I cannot run regressions where all are included.

⁷⁶Franck and Galor (2016) find a positive effect of industrialization on human capital formation. However, they look at quantity of human capital (such as enrollment rate, literacy, number of teachers) in the period before the Second Industrial Revolution. This does not contrast with my finding, since I focus on a later period and I study the effect of type of education on industrialization when enrollment rates had already reached very high levels.

⁷⁷Table 11 already showed that no significant differences exist in the enrollment rates between Catholic and secular schools.

summer months in 1876. The results show that the share of Catholic schools is not associated with student attendance, even when including the schooling controls (col. 2). In addition, newly digitized data from the French National Archives provide detailed information on the quality of school buildings for more than 2,400 cantons in 1873. In Table A.22, I use the share of buildings in bad condition as a proxy for schools' financial resources. Columns 1-4 analyze the full sample, and columns 5-8 focus only on those cantons for which data on religiosity are also available. The negative (and significant in col. 3) coefficient suggests that Catholic schools did not systematically have fewer resources and, if anything, they had a smaller share of buildings in bad condition. This is in line with the historical record documenting that Catholic schools often had better physical facilities and larger schools (with more classrooms), and it points to the role of curriculum as the key difference between the two types of primary education.

To further validate this argument, I use data from the 1896 *Enquête industrielle* which contains detailed information on the number of workers by industrial sector and worker cohort. If school curriculum – and the accumulation of “economically useful” knowledge – is the channel through which primary education played an important role for industrialization, one should expect religious education to be negatively associated with employment in skill-intensive industries. For each cohort, I compute the share of workers in “skill-intensive” industrial sectors, and I relate it to the share of Catholic schools at the time when that specific cohort was attending primary school. I estimate equations of the form:

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

where y_{ic} is the share of workers from cohort c in skill-intensive sectors, and 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 school. The vector $\mathbf{X}_{i,c}$ includes the enrollment rate in primary schools, the (log) number of students per school, the (log) number of total schools, and department-level population.

Table 16 shows the results. The higher the share of Catholic schools when a cohort was in primary school, the lower the share of workers from that cohort employed in skill-intensive 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 skill-intensive 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 lacked the “economically useful” knowledge to operate the modern, more skill-intensive industrial technology.⁷⁸

⁷⁸This 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

4.5 Discussion: interpretation and limitations of results

The empirical analysis, in combination with the extensive historical record, suggests a clear pattern: (1) religiosity is negatively associated with industrial and economic development during the Second Industrial Revolution, and (2) Catholic education (and its curriculum) seems to be the key mechanism explaining this relationship.

This paper contributes to a large literature on the impact of religion/religiosity on economic development – and it also shares the common limitations of clearly distinguishing among different potential channels through which religion affects economic outcomes (Barro and McCleary, 2003; Becker and Woessmann, 2009). Accordingly, I do not claim that the type of primary education (Catholic vs. secular) is the *only* mechanism explaining the negative relationship between religiosity and industrial-economic progress during the Second Industrial Revolution. The antiscientific program of the Church could have been manifested in other aspects of people’s lives: in my setting, for example, the opposition to vaccinations and birth control (affecting the quantity-quality of human capital through channels not related to education) as well as the proscription of the use of electricity in churches. Table A.23 provides some evidence for this, showing that more religious departments had a lower vaccination rate and higher fertility. However, when studying the role of these alternative mechanisms for industrialization, I concluded that they are unlikely to account for my results (see Table 13).

This interpretation is consistent with the timing of the effect of religiosity on economic development. This paper focuses on a period in which Catholicism had embraced a markedly antiscientific attitude (1789-1914): 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 skill distribution was crucial for the industrialization process. The more Catholic areas started to lag behind only during the Second Industrial Revolution, when religion became a barrier to the accumulation of economically useful human capital.

For this argument to be valid, I also discussed a large set of potentially confounding factors: these have to be related to changes in education and industrialization but not captured by the department and year fixed effects. Among them, government investments (for instance, in infrastructure) could have been an additional important driver of industrialization, especially if the government was differentially devoting resources to secular- vs. Catholic-oriented departments. However, my results showed that state spending alone is unlikely to fully explain the adoption of skill-intensive technologies during the late 19th century. Thus, the empirical evidence I provided, together with a rich historical record, makes it hard to imagine that education was not the *primary* mechanism explaining the negative relationship between religiosity and economic outcomes during the Second Industrial Revolution.

and for the development of a modern economy.

In addition, I shed light on the role of curriculum as the main difference between secular and religious education. While the subjects included in the secular school curriculum (stretching from elements of natural sciences and mathematics to the more practical “*leçons des choses*”) were clearly important for accumulation of “economically useful” knowledge, I do not argue that the hours spent studying these topics turned schoolchildren into skilled workers. Children usually entered a profession after finishing primary school and they still needed to learn their exact tasks on the factory floor. However, the “economically useful” knowledge acquired could have prepared them to better learn the extra knowledge required in their specific profession. At the same time, it is not easy to assess whether religious schooling was harmless or simply useless, and the differences between Catholic and secular schools could not be restricted to the subjects studied but comprise broader attitudes that were (or were not) beneficial to the accumulation of “economically useful” human capital. Thus, I emphasize a “broad” concept of the secular school curriculum, but one that is clearly distinct from what children learned in Catholic schools. Altogether, my findings suggest that, as in modern economics, the contents of education were key in the formation of a skilled labor force and in fostering industrial-economic development also during the Second Industrial Revolution.

5 Conclusion

The interaction between religion and technological-scientific progress has been particularly complex throughout history and still is today in many regions around the globe. This paper provides empirical evidence on when religion hampers diffusion of knowledge and therefore economic development, and through which mechanism.

I exploit variation in the *intensity* of Catholicism (i.e., religiosity) within France and examine the period of the Second Industrial Revolution (1870-1914). Using several indicators for Catholic intensity from 1789 to the mid-20th century, I provide evidence of a stable spatial distribution of religiosity over time, and I show that religiosity 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. I shed light on the mechanism and focus on the role of Catholic vs. secular education for accumulation of human capital. I find that when the two school systems started to differ, the more religious areas adopted the new technical and secular curriculum more slowly, and, instead, pushed for religious education. Religious education, in turn, was negatively associated with industrial development about a decade later, when school-age children entered 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 spheres – are also experiencing large-scale technological progress, similar to the process of development in Western Eu-

rope during the Second Industrial Revolution. Three main implications emerge. First, the relationship between religion and economic development becomes negative when religion clashes with and hinders the adoption of “economically 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. Third, the mechanism through which religion can affect economic development is by affecting the content of education, and thus accumulation of human capital among the population.

References

- Abramson, S. F. and C. Boix (2013). The Roots of the Industrial Revolution: Political Institutions or (Socially Embedded) Know-How? APSA 2013 Annual Meeting Paper.
- Acemoglu, D. (1998). Why Do New Technologies Complement Skills? Directed Technical Change And Wage Inequality. *Quarterly Journal of Economics* 113(4), 1055–1089.
- Achilladelis, B. and N. Antonakis (2001). The Dynamics of technological innovation: the case of the pharmaceutical industry. *Research Policy* 30, 535–588.
- Alesina, A. and P. Giuliano (2010). The Power of the Family. *Journal of Economic Growth* 15(2), 93–125.
- Alesina, A. and P. Giuliano (2015). Culture and Institutions. *Journal of Economic Literature* 4(53), 898–944.
- Allen, R. C. (2003). Progress and Poverty in Early Modern Europe. *Economic History Review* 56(3), 403–443.
- Altonji, J. G., T. E. Elder, and C. R. Taber (2005). Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools. *Journal of Political Economy* 113(1), 151–184.
- Anderson, R. (1975). *Education in France 1848–1870*. Clarendon Press, Oxford.
- Andrews, D. W. K. and J. H. Stock (2005). Inference with Weak Instruments. NBER Working Paper 313.
- Ariés, P. (1962). *Centuries of Childhood*. New York: Alfred A. Knopf.
- Ashworth, W. (1986). *God and Nature: Historical Essays on the Encounter between Christianity and Science*, Chapter Catholicism and Early Science, pp. 136–166. Berkeley: University of California Press.
- Avenel, H. (1894). *Comment vote la France: dix-huit ans de suffrage universel, 1876-1893*. Librairies-imprimeries réunies.
- Banerjee, A., E. Duflo, Postel-Vinay, and T. Watts (2010). Long Run Health Impacts of Income Shocks: Wine and Phylloxera in 19th Century France. *Review of Economics and Statistics* 92(4), 714–728.
- Barro, R. and R. McCleary (2003). Religion and Economic Growth across Countries. *American Sociological Review* 68(5), 760–781.
- Becker, S., F. Cinnirella, and L. Woessmann (2010). The trade-off between fertility and education: evidence from before the demographic transition. *Journal of Economic Growth* 15, 177–204.
- Becker, S. O. and L. Woessmann (2009). Was Weber Wrong? A Human Capital Theory of Protestant Economic History. *Quarterly Journal of Economics* 124(2), 531–596.
- Belloc, M., F. Drago, and R. Galbiati (2016). Earthquakes, Religion, and Transition to Self-Government in Italian Cities. *Quarterly Journal of Economics* 131(4), 1875–1926.
- Bénabou, R., D. Ticchi, and A. Vindigni (2015). Forbidden Fruits: The Political Economy of Science, Religion and Growth. NBER Working Paper No. 21105.
- Bénabou, R. and J. Tirole (2006). Belief in a Just World and Redistributive Politics. *Quarterly Journal of Economics* 121(2), 699–746.
- Berman, E. (2000). Sect, subsidy, and sacrifice: an economist's view of ultra-orthodox jews. *Quarterly Journal of Economics* 115(3), 905–953.
- Bessen, J. (2012). More Machines, Better Machines...or Better Workers? *Journal of Economic History*.
- Bignon, V. and C. García-Peñalosa (2018). The Toll of Tariffs; Protectionism, Education and Fertility in Late 19th Century France. Banque de France Working Paper 690.

- Biraben, J.-N. (1975). *Les hommes et la peste en France et dans les pays européens et méditerranéens*. Paris · La Haye: Mouton.
- Bisin, A. and T. Verdier (2001). The Economics of Cultural Transmission and the Dynamics of Preferences. *Journal of Economic Theory* 97(2), 298–319.
- Boppart, T., J. Falkinger, and V. Grossmann (2014). Protestantism and Education: Reading (the Bible) and Other Skills. *Economic Inquiry* 52(2), 874–895.
- Boppart, T., J. Falkinger, V. Grossmann, U. Woitek, and G. Wthrich (2013). Under which conditions does religion affect educational outcomes? *Explorations in Economic History* 50, 242–266.
- Botticini, M. and Z. Eckstein (2012). *The Chosen Few: How Education Shaped Jewish History, 70-1492*. Princeton University Press.
- Bouillon, J. (1956). Les démocrates-socialistes aux élections de 1849. *Revue française de science politique* (1), 70–95.
- Cantoni, D. (2015). The economic effects of the protestant reformation: Testing the weber hypothesis in the german lands. *Journal of the European Economic Association* 13(4), 561–598.
- Carus-Wilson, E. M. (1966). *The Woollen Industry. Cambridge Economic History of Europe. Volume II*. Cambridge University Press.
- Carvalho, J.-P. (2013). Veiling. *Quarterly Journal of Economics* 128(1), 337–370.
- Carvalho, J.-P. and M. Koyama (2016). Jewish Emancipation and Schism: Economic Development and Religious Change. *Journal of Comparative Economics* 44(3), 562–584.
- Carvalho, J.-P., M. Koyama, and M. Sacks (2017). Education, Identity, and Community: Lessons from Jewish Emancipation. *Public Choice* 171(1–2), 119–143.
- Caselli, F. (1999). Technological Revolutions. *American Economic Review* 89(1), 78–102.
- Chaney, E. (2015). Religion and the Rise and Fall of Islamic Science. Unpublished Paper.
- Chanut, J.-M., J. Heffer, J. Mairesse, and G. Postel-Vinay (2000). *L'Industrie française au milieu du 19e siècle: les enquetes de la statistique générale de la France*. Editions de l'école des hautes études en sciences sociales, Paris.
- Chatoney, M. (2006). The Evolution of Knowledge Objects at the Primary School: A Study of the Material Concept as it is Taught in France. *International Journal of Technology and Design Education* 16, 143–161.
- Cholvy, G. and Y.-M. Hilaire (2000). *Histoire religieuse de la France (1880-1914)*. Toulouse, Privat.
- Cohn, J. (2018). *Epidemics: Hate and Compassion from the Plague of Athens to AIDS*. Oxford University Press.
- Conley, T. (1999). GMM Estimation with Cross Sectional Dependence. *Journal of Econometrics* 92, 1–45.
- Crouzet, D. (1996). *La genèse de la Réforme française: 1520-1560*. SEDES.
- Crouzet, D. and J. Good (2001). Circa 1533: Anxieties, Desires, and Dreams. *Journal of Early Modern History* 5(1), 24–61.
- Crouzet, F. (2003). The Historiography of French Economic Growth in the Nineteenth Century. *Economic History Review* 62(2), 215–242.
- Daudin, G., R. Franck, and H. Rapoport (2016). The cultural diffusion of the fertility transition: evidence from internal migration in 19th century France. IZA Discussion Paper 9945.

- Davids, K. (2013). *Religion, Technology, and the Great and Little Divergences: China and Europe Compared, c. 700–1800*. Leiden: Brill.
- de la Croix, D. and F. Perrin (2018). How far can economic incentives explain the French fertility and education transition? *European Economic Review* 108, 221–245.
- Dittmar, J. and R. Meisenzahl (2019). Public Goods Institutions, Human Capital, and Growth: Evidence from German History. *Review of Economic Studies* 2, forthcoming. Working Paper.
- Emery, R. (1962). *The friars in Medieval France*. Columbia University Press.
- Finley, T., R. Franck, and N. Johnson (2017). The Effects of Land Redistribution: Evidence from the French Revolution. Working paper.
- Forster, R. (1967, July). The Survival of the Nobility during the French Revolution. *Past and Present* (37), 71–86.
- Fouka, V. (2019). Backlash: The Unintended Effects of Language Prohibition in US Schools after World War I. *Review of Economic Studies* forthcoming. Working Paper.
- Franck, R. and O. Galor (2016). Technology-Skill Complementarity in the Early Phase of Industrialization. IZA DP No. 9758.
- Franck, R. and N. Johnson (2016). Can public policies lower religiosity? Evidence from school choice in France, 1878–1902. *Economic History Review* 69(3), 915–944.
- Franck, R. and S. Michalopoulos (2017). Emigration during the French Revolution: consequences in the short and longue durée. Working paper.
- Furet, F. and J. Ozouf (1977). *Lire et écrire. L’alphabétisation des Français de Calvin Judes Ferry*. Minuit, Paris.
- Galor, O. (2005). From Stagnation to Growth: Unified Growth Theory. In P. Aghion and S. Durlauf (Eds.), *Handbook of Economic Growth*, Volume 1, Chapter 4, pp. 171–293. Elsevier.
- Galor, O. (2011). *Unified Growth Theory*. Princeton University Press.
- Galor, O. and O. Moav (2006). Das Human-Kapital: A Theory of the Demise of the Class Structure. *The Review of Economic Studies* 73(1), 85–117.
- Galor, O., O. Moav, and D. Vollrath (2009). Inequality in Land Ownership, the Emergence of Human Capital Promoting Institutions, and the Great Divergence. *Review of Economic Studies* 76, 143–179.
- Geissendort, P. (1957). *Livre des habitants de Genève*. Genève: E. Droz.
- Gildea, R. (1983). *Education in Provincial France, 1800–1914*. Clarendon Press.
- Godfrin, J. and P. Godfrin (1965). *Une centrale de presse catholique: la Maison de la bonne presse et ses publications*. Presses universitaires de France.
- Goldin, C. and L. F. Katz (1998). The Origins of Technology-Skill Complementarity. *Quarterly Journal of Economics* 113(3), 693–732.
- Greengrass, M. (1987). *The French Reformation*. Blackwell, Oxford.
- Grew, R. and P. Harrigan (1991). *School, State, and Society: The Growth of Elementary Schooling in Nineteenth-century France – a Quantitative Analysis*. University of Michigan Press.
- Guiso, L., P. Sapienza, and L. Zingales (2003). People’s opium? Religion and economic attitudes. *Journal of Monetary Economics* 50, 225–282.

- Guiso, L., P. Sapienza, and L. Zingales (2006). Does Culture Affect Economic Outcomes? *Journal of Economic Perspectives* 20(2), 23–48.
- Harrigan, P. (2001). Church, State, and Education in France From the Falloux to the Ferry Laws: A Reassessment. *Canadian Journal of History* 36, 51–83.
- Heilbron, J. (1979). *Electricity in the 17th and 18th Centuries: A Study of Early Modern Physics*. University of California Press.
- Horrell, S. (1996). Home Demand and Industrialization. *Journal of Economic History* 56(3), 561–604.
- Hyslop, B. (1934). *French Nationalism in 1789 According to the General Cahiers*. Cambridge University Press.
- Iannaccone, L. (1998). Introduction to the economics of religion. *Journal of Economic Literature* 36(3), 1465–1496.
- Isambert, F.-A. and J.-P. Terrenoire (1980). *Atlas de la pratique religieuse des catholiques en France*. Paris, Presses de la FNSP–CNRS.
- Iyer, S. (2016). The New Economics of Religion. *Journal of Economic Literature* 54(2), 395–441.
- Iyigun, M., J. Rubin, and A. Seror (2018). A Theory of Conservative Revivals. IZA DP No. 11954.
- Jacob, M. C. (2014). *The First Knowledge Economy*. Cambridge University Press.
- Jones, P. (2012). The Challenge of Land Reform in the Eighteenth- and Nineteenth-Century France. *Past and Present* 216(1), 107–142.
- Katz, L. F. and R. A. Margo (2013). Technical change and the relative demand for skilled labor: The united states in historical perspective.
- Le Bras, H. (1986). *Les Trois France*. Odile Jacob-Le Seuil.
- Lehrer, E. (2011). *The Oxford Handbook of the Economics of Religion*, Chapter Religion, Human Capital Investments and the Family in the United States, pp. 39–56. Oxford University Press.
- Meloni, G. and J. Swinnen (2014). The Rise and Fall of the World’s Largest Wine Exporter – And Its Institutional Legacy. *Journal of Wine Economics* 9(1), 3–33.
- Minois, G. (1991). *L’Église et la science*. Paris, Fayard.
- Mitch, D. (1993). The Role of Human Capital in the First Industrial Revolution. In J. Mokyr (Ed.), *The British Industrial Revolution: An Economic Perspective*, pp. 267–307. Boulder: Westview.
- Mokyr, J. (1999). *Storia dell’economia Mondiale*, Chapter The Second Industrial Revolution, 1870–1914, pp. 219–245. Rome: Laterza.
- Mokyr, J. (2002). *The Gifts of Athena: Historical Origins of the Knowledge Economy*. Princeton, NJ: Princeton University Press.
- Mokyr, J. (2005). The Intellectual Origin of Modern Economic Growth. *Journal of Economic History* 65(2), 285–351.
- Mokyr, J. (2011). The Economics of Being Jewish. *Critical Review* 23(1-2), 195–206.
- Mokyr, J. (2016). *Culture of Growth: Origins of the Modern Economy*. Princeton University Press.
- Mours, S. (1958). *Les Églises Réformées en France. Tableaux et Cartes*. Librairie Protestante.
- Murphy, T. (2015). Old habits die hard (sometimes) Can département heterogeneity tell us something about the French fertility decline? *Journal of Economic Growth* 20, 177–122.

- Oster, E. (2017). Unobservable Selection and Coefficient Stability: Theory and Validation. *Journal of Business & Economic Statistics* 0, 1–18. NBER Working Paper 19054.
- Putnam, R. (1993). *Making Democracy Work. Civic Traditions in Modern Italy*. Princeton University Press, Princeton.
- Rubin, J. (2017). *Rulers, Religion, and Riches: Why the West Got Rich and the Middle East Did Not*. Cambridge University Press.
- Sakalli, S. (2019). Secularization and religious backlash: Evidence from turkey.
- Saleh, M. (2015). Taskhe Reluctant Transformation: State Industrialization, Religion, and Human Capital in Nineteenth-Century Egypt. *Journal of Economic History* 75(1), 65–94.
- Semrad, A. (2015). Modern secondary education and economic performance: the introduction of the gewerbeschule and realschule in nineteenth-century bavaria. *The Economic History Review* 68(4), 1306–1338.
- Shapiro, G., T. Tackett, P. Dawson, and J. Markoff (1998). *Revolutionary Demands: A Content Analysis of the Cahiers de Doléances of 1789*. Stanford University Press.
- Spolaore, E. and R. Wacziarg (2012). *NBER International Seminar on Macroeconomics*, Chapter Long-Term Barriers to the International Diffusion of Innovations, pp. 11–46. Chicago: University of Chicago Press.
- Sprandel, R. (1968). *Das Eisengewerbe im Mittelalter*. A. Hiersemann.
- Squicciarini, M. and N. Voigtländer (2015). Human Capital and Industrialization: Evidence from the Age of Enlightenment. *Quarterly Journal of Economics* 30(4), 1825–1883.
- Sunshine, G. (2003). *Reforming French Protestantism: The Development of Huguenot Ecclesiastical Institutions, 1557–1572*. Truman State University Press.
- Tabellini, G. (2008). Institutions and Culture. *Journal of the European Economic Association* 6(2–3), 255–294.
- Tabellini, G. (2010). Culture and Institutions: Economic Development in the Regions of Europe. *Journal of the European Economic Association* 8(4), 677–716.
- Tackett, T. (1986). *Religion, revolution, and regional culture in eighteenth-century France: The Ecclesiastical Oath of 1791*. Princeton, NJ: Princeton University Press.
- Toussaint, D. (2007). La préparation du brevet de capacité primaire: une contribution à la connaissance des réseaux scolaires dans la Somme de 1816 à 1879. *Revue du Nord* 3, 583–622.
- Wang, Q. and N. von Tunzelmann (2000). Complexity and the functions of the firm: breadth and depth. *Research Policy* 29, 805–818.
- Weber, M. (1905). *The Protestant Ethic and the Spirit of Capitalism*. London: Routledge.
- Yuchtman, N. (2017). Teaching to the Tests: An Economic Analysis of Traditional and Modern Education in Late Imperial and Republican China. *Explorations in Economic History* 63, 70–90. Working Paper.
- Zijdeman, R., M. van Leeuwen, D. Rébaudo, and J. Pélissier (2014). Working women in France, nineteenth and twentieth centuries. Where, when, and which women were in work at marriage? *The History of the Family* 19, 537–563.

FIGURES AND TABLES

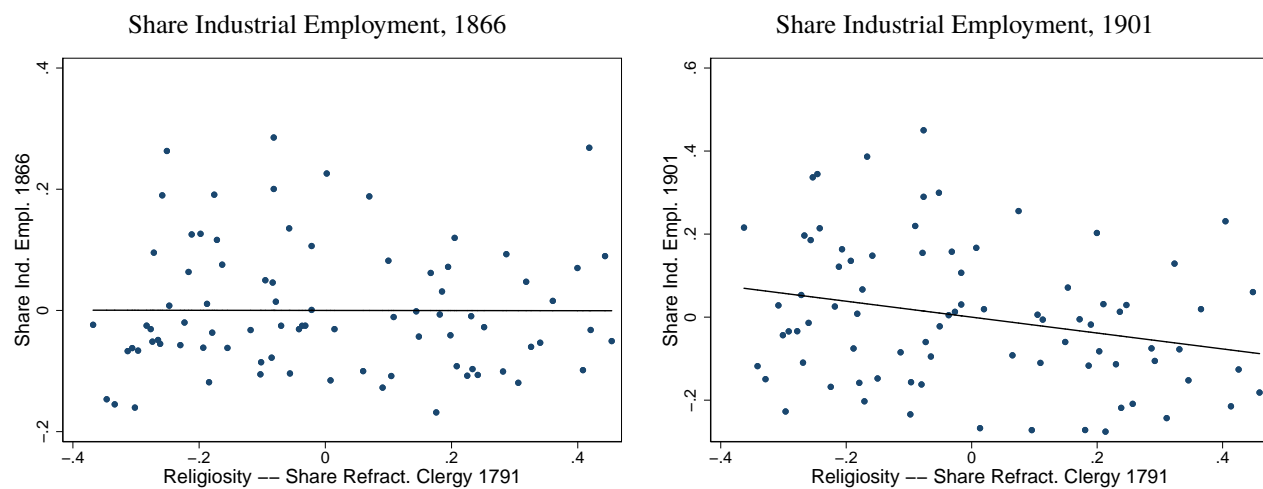


Figure 1: Religiosity and industrial employment

Notes: The figures plot the share of refractory clergy against the share of industrial employment in the 1866 (left panel) and in 1901 (right panel).

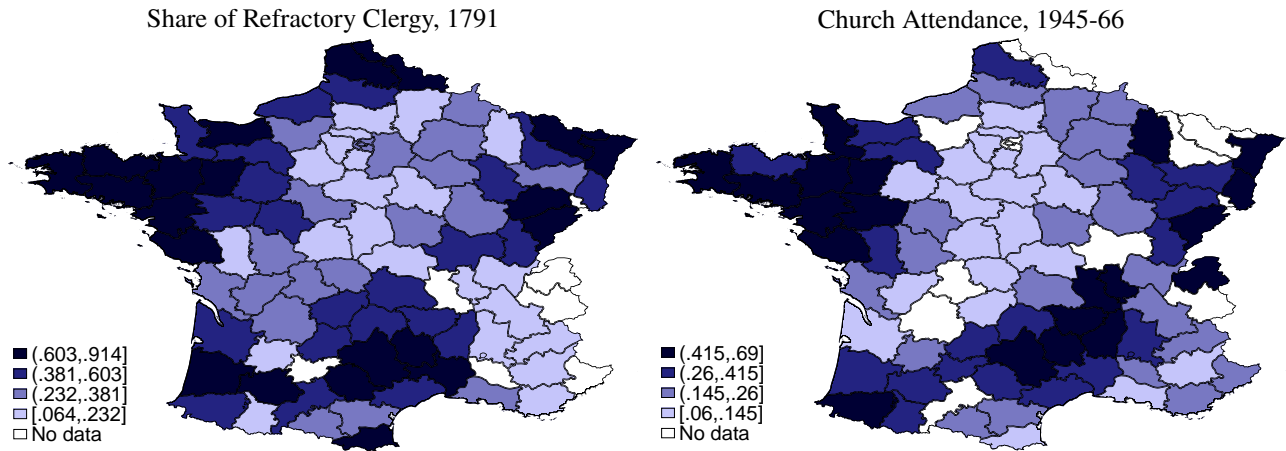


Figure 2: Religiosity in 1791 and in the mid-20th century

Notes: The left panel shows the spatial distribution of the share of refractory clergy in 1791. The right panel shows Church attendance in the 1945-66 period. The maps are obtained by using quartiles of the respective variables.

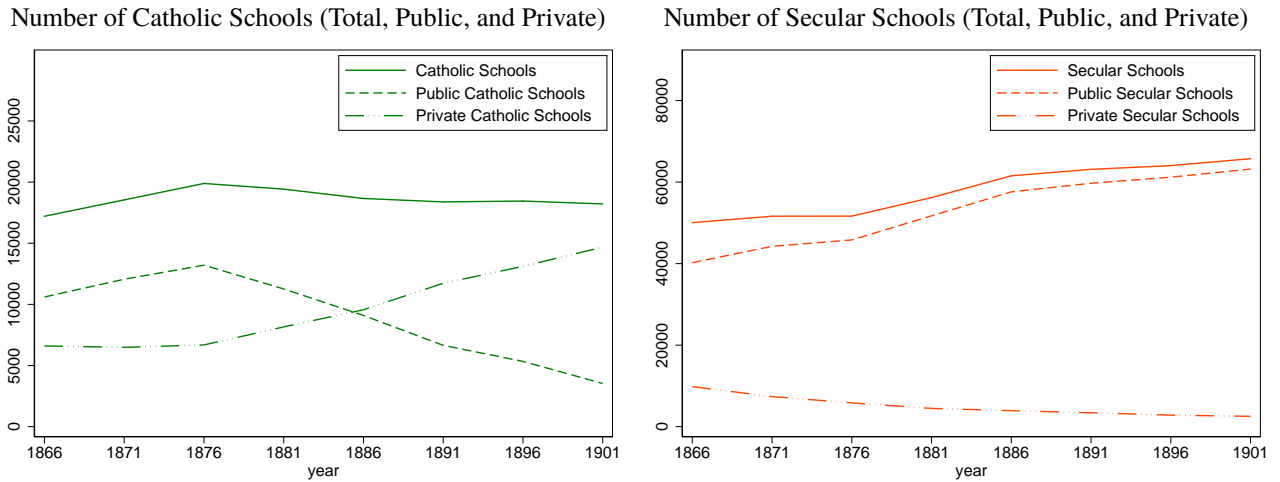


Figure 3: Catholic and secular schools in the public and private sector, 1866-1901

Notes: The left panel shows the number of total Catholic schools, public Catholic schools, and private Catholic schools. The right panel shows the number of total secular schools, public secular schools, and private secular schools.

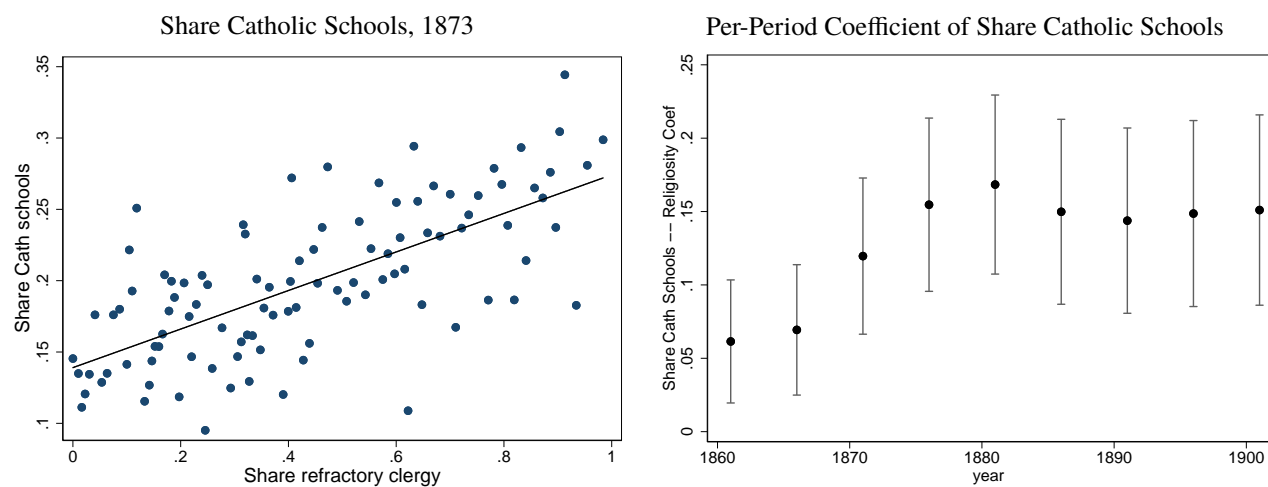


Figure 4: Religiosity and Catholic education

Notes: The left panel uses canton-level data and plots the share of refractory clergy against the share of Catholic schools in 1873 (using a binned scatterplot with 100 equal-sized bins). The right panel uses department-level data and plots the per-period coefficient of the share of Catholic schools on religiosity. The baseline time-period is 1851. Data on the share of Catholic schools are not available for the year 1856. The bars represent 90 percent confidence intervals.

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

| <u>Baseline Controls</u> | | <u>Additional Controls</u> | |
|---------------------------|----------------------|----------------------------|---------------------|
| | (1) | | (2) |
| Population | 0.114** (0.056) | Secondary Educ. pc 1876 | -0.027 (0.065) |
| Temperature | 0.052 (0.115) | Huguenots pc 1861 | 0.069 (0.058) |
| Precipitation | 0.151 (0.105) | Farm Size 1862 | -0.104** (0.047) |
| Wheat Suitability | -0.039 (0.024) | Value Agric. Prod. pc 1892 | 0.004 (0.044) |
| Pre-Industrial Activities | 0.049 (0.041) | Railways Density 1879 | -0.027 (0.050) |
| Distance from Paris | 0.041 (0.027) | | |
| Pays d' Election | -0.148*** (0.051) | | |
| Enrollment Rate | -0.236 (0.175) | | |
| Knowledge Elites | 0.003 (0.017) | | |

Notes: The table shows the coefficients of individual regressions of share of refractory clergy on a variety of department characteristics. *Population* represents (log) total department population in 1871. *Temperature* and *Precipitation* measure the (log) average precipitation and temperature in the 1700-1800 period. *Wheat Suitability* is wheat soil suitability. *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. *Distance from Paris* measures the (log) distance from Paris (in km). *Pays d' Election* is a dummy for departments where the king, before 1789, exerted particularly strong power (especially in terms of fiscal and financial matters). *Enrollment Rate* measures the ratio of students to school-age population (5 to 15 years) in 1871. *Knowledge Elites* reflects the number of subscribers to the *Encyclopedie* in 1777-1780. *Secondary Educ. pc 1876* represents the share of the male population with secondary education in 1876. *Huguenots pc 1861* represents the share of Huguenots in the population in 1861. *Farm Size* measures the (log) average farm size in 1862. *Value Agric. Prod. pc 1892* is the (log) value of agricultural production (that includes cereals production and animal husbandry) per capita in 1892. *Railways Density 1879* represents the (log) km of the railway network per hectare in 1879. 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)

| Dependent Variable: Share Refractory Clergy | | |
|---|----------------------|---------------------|
| | (1) | (2) |
| Share Antireligious <i>Cahiers</i> | -1.314*** (0.427) | -1.327** (0.575) |
| Controls | | ✓ |
| R ² | 0.09 | 0.28 |
| Observations | 75 | 70 |
| Magnitude: Share Anti-Relig. <i>Cahiers</i> | | |
| stand. beta coeff. | -0.291 | -0.288 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, col. 1 (except for the use of literacy in 1786-90 rather than enrollment rate in the 19th century). 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 Variable: | Share <i>LaCroix</i> 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 | 1.283*** (0.469) | 0.892* (0.481) | 0.383 (0.291) | 0.504** (0.249) | 0.160*** (0.050) | 0.108** (0.041) | 3.533*** (0.714) | 3.972*** (0.749) | 0.425*** (0.066) | 0.417*** (0.074) |
| Controls | | ✓ | | ✓ | | ✓ | | ✓ | | ✓ |
| R ² | 0.08 | 0.25 | 0.03 | 0.48 | 0.15 | 0.49 | 0.25 | 0.37 | 0.39 | 0.54 |
| Observations | 83 | 79 | 83 | 79 | 83 | 79 | 77 | 73 | 76 | 72 |
| Magnitude: Share Refractory Clergy | | | | | | | | | | |
| stand. beta coeff. | 0.283 | 0.198 | 0.171 | 0.222 | 0.386 | 0.265 | 0.496 | 0.549 | 0.622 | 0.601 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, col. 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 4: Negative relationship between religiosity and industrialization during the 2nd Industrial Revolution, but not before

| Dependent Variable: | 2nd Industrial Revolution | | Pre-2nd IR | |
|------------------------------------|---------------------------|----------------------|---------------------------|-------------------------|
| | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1866 | Steam Eng. pc, 1840s |
| | (1) | (2) | (3) | (4) |
| Share Refract. Clergy | -0.146* (0.085) | -0.864** (0.397) | -0.001 (0.050) | 0.030 (0.054) |
| R ² | 0.04 | 0.06 | 0.00 | 0.01 |
| Observations | 83 | 83 | 83 | 81 |
| Magnitude: Share Refractory Clergy | | | | |
| stand. beta coeff. | -0.194 | -0.249 | -0.002 | 0.089 |

Notes: All regressions are run at the department level and do not include any controls. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 5: Negative relationship between religiosity and industrialization during the 2nd Ind. Revolution

| Dependent Variable: | Share Ind. Empl., 1901 (1) | Machines pc, 1891 (2) | Share Ind. Empl., 1901 (3) | Machines pc, 1891 (4) | Share Ind. Empl., 1901 (5) | Machines pc, 1891 (6) | Share Ind. Empl., 1901 (7) | Machines pc, 1891 (8) |
|------------------------------------|----------------------------------|-----------------------------|----------------------------------|-----------------------------|----------------------------------|-----------------------------|----------------------------------|-----------------------------|
| | | | | | | | weighted by pop. | |
| Share Refract. Clergy | -0.190*** (0.058) | -1.394*** (0.294) | -0.179** (0.076) | -1.310*** (0.304) | -0.160** (0.071) | -1.201*** (0.290) | -0.203*** (0.075) | -1.470*** (0.386) |
| Population | 0.162*** (0.025) | 0.630*** (0.145) | 0.141*** (0.035) | 0.356* (0.207) | 0.127*** (0.036) | 0.304 (0.229) | 0.144*** (0.034) | 0.387 (0.247) |
| Mean Temperature | -0.037 (0.084) | 0.217 (0.344) | -0.034 (0.085) | 0.241 (0.312) | 0.068 (0.099) | 0.485 (0.315) | 0.075 (0.114) | 0.445 (0.458) |
| Mean Precipitation | -0.149** (0.062) | -0.775** (0.330) | -0.128* (0.067) | -0.542* (0.276) | -0.151** (0.060) | -0.577** (0.272) | -0.144** (0.058) | -0.705* (0.361) |
| Wheat Suitability | 0.010 (0.011) | -0.167** (0.070) | 0.009 (0.012) | -0.191** (0.087) | -0.001 (0.012) | -0.237*** (0.086) | -0.001 (0.011) | -0.313*** (0.078) |
| Pre-Industrial Activities | 0.097*** (0.023) | 0.285** (0.140) | 0.099*** (0.022) | 0.306** (0.128) | 0.087*** (0.021) | 0.247* (0.125) | 0.098*** (0.020) | 0.298* (0.153) |
| Distance from Paris | | | -0.020 (0.018) | -0.253* (0.128) | -0.024 (0.018) | -0.297** (0.131) | -0.006 (0.017) | -0.159* (0.091) |
| Pays d'Election | | | -0.014 (0.035) | -0.250* (0.145) | -0.034 (0.034) | -0.353** (0.145) | -0.040 (0.035) | -0.463** (0.177) |
| Enrollment Rate | | | | | 0.439** (0.188) | 1.337** (0.609) | 0.557*** (0.196) | 1.787** (0.781) |
| Knowledge Elites | | | | | 0.020** (0.008) | 0.071 (0.047) | 0.017** (0.007) | 0.064 (0.051) |
| R ² | 0.55 | 0.47 | 0.56 | 0.52 | 0.60 | 0.55 | 0.80 | 0.57 |
| Observations | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 |
| Magnitude: Share Refractory Clergy | | | | | | | | |
| stand. beta coeff. | -0.252 | -0.399 | -0.237 | -0.375 | -0.213 | -0.344 | -0.220 | -0.417 |

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

Table 6: Negative relationship between religiosity and industrialization during the 2nd Industrial Revolution – including additional controls

| Dependent Variable: | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 |
|----------------------------|---------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | | | | | | | weighted by pop. | |
| Share Refract. Clergy | -0.199*** (0.069) | -1.284*** (0.301) | -0.166*** (0.056) | -1.125*** (0.263) | -0.147** (0.057) | -1.029*** (0.249) | -0.147** (0.057) | -1.080*** (0.315) |
| Huguenots pc 1861 | 0.074*** (0.026) | 0.317*** (0.101) | 0.078*** (0.026) | 0.355*** (0.123) | 0.056** (0.024) | 0.245** (0.114) | 0.051** (0.024) | 0.277** (0.116) |
| Secondary Educ. pc 1876 | 0.141** (0.055) | 0.094 (0.250) | 0.079 (0.048) | 0.098 (0.218) | 0.082* (0.046) | 0.087 (0.205) | 0.069 (0.043) | 0.128 (0.245) |
| Farm size 1862 | | | 0.098*** (0.030) | 0.678*** (0.176) | 0.096*** (0.029) | 0.672*** (0.175) | 0.096*** (0.028) | 0.796*** (0.185) |
| Value Agric. Prod. pc 1892 | | | -0.150*** (0.038) | -0.340** (0.155) | -0.141*** (0.036) | -0.295** (0.143) | -0.144*** (0.032) | -0.357** (0.166) |
| Railways Density 1879 | | | | | 0.105** (0.041) | 0.477** (0.198) | 0.112** (0.043) | 0.589*** (0.211) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.65 | 0.57 | 0.74 | 0.65 | 0.76 | 0.68 | 0.88 | 0.72 |
| Observations | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 78 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, column 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 7: Negative relationship between religiosity and economic development during the 2nd Industrial Revolution – within-department analysis

| Dependent Variable: | (Log) Household Expenditure, 1901 | | | | | |
|------------------------------------|-----------------------------------|---------------------|----------------------|----------------------|----------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Share Refract. Clergy | 0.201*** (0.030) | 0.152*** (0.039) | -0.085*** (0.027) | -0.080*** (0.026) | -0.097*** (0.025) | -0.112** (0.052) |
| Population | | | ✓ | | ✓ | ✓ |
| Medit./Atlant. Ports | | | | ✓ | ✓ | ✓ |
| Department FE | | | | ✓ | ✓ | ✓ |
| R ² | 0.15 | 0.58 | 0.19 | 0.13 | 0.24 | 0.56 |
| Observations | 369 | 369 | 223 | 223 | 223 | 223 |
| Magnitude: Share Refractory Clergy | | | | | | |
| stand. beta coeff. | -0.170 | -0.255 | -0.223 | -0.212 | -0.256 | -0.294 |

Notes: All regressions are run at the canton level. (Log) household expenditure is a proxy for (log) household income (see footnote 36). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

Table 8: Dif-in-Dif: More religious departments have lower industrial employment during the 2nd IR

| Dependent Variable: Share Industrial Employment, 1866-1911 | | | | |
|--|----------------------|----------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) |
| | | | | weighted |
| ShareRef*Post1871 | -0.047*** (0.017) | -0.047*** (0.017) | -0.046** (0.018) | -0.041** (0.020) |
| Share Refract. Clergy | -0.047 (0.037) | -0.048 (0.037) | | |
| Department FE | | | ✓ | ✓ |
| Year FE | | ✓ | ✓ | ✓ |
| R ² | 0.32 | 0.39 | 0.93 | 0.95 |
| Observations | 820 | 820 | 820 | 820 |

Notes: All regressions are run at the department level and control for (log) department population and for the Post1871 indicator. Col. 4 weights the regression by department population. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 9: Higher growth in share of Catholic school in more religious departments

| Dependent Variable: | Share Cath. Schools | | | Gr. Share Cath. Schools | | | | |
|------------------------------------|---------------------|------------------|---------------------|-------------------------|---------------------|---------------------|---------------------|---------------------|
| | 1851 | 1866 | 1901 | 1851-1866 | 1866-1901 | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | | | | | | weighted | | weighted |
| Share Refract. Clergy | 0.003 (0.052) | 0.071 (0.051) | 0.141*** (0.046) | 0.284* (0.170) | 0.413*** (0.129) | 0.295*** (0.085) | 0.404*** (0.141) | 0.329*** (0.109) |
| Schooling Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | | | | | | | ✓ | ✓ |
| R ² | 0.17 | 0.32 | 0.38 | 0.35 | 0.35 | 0.35 | 0.56 | 0.56 |
| Observations | 82 | 82 | 82 | 82 | 82 | 82 | 79 | 79 |
| Magnitude: Share Refractory Clergy | | | | | | | | |
| stand. beta coeff. | 0.008 | 0.144 | 0.338 | 0.148 | 0.390 | 0.343 | 0.363 | 0.355 |

Notes: All regressions are run at the department level. Schooling controls include enrollment rate, the (log) number of students per school, the (log) number of total schools (all measured in the initial period in cols. 4-8). In addition, all specifications include (log) department population (measured in the initial period in Cols. 4-8). Cols 4-8 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 10: Higher growth in share of Catholic school in more religious cantons

| Dependent Variable: | Share Cath. Schools, 1873 | | | Share Cath. Schools, 1894 | | | Gr. Share Cath. Schools, 1873-94 | | | |
|------------------------------------|---------------------------|---------------------|---------------------|---------------------------|---------------------|---------------------|----------------------------------|-------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | | | weighted | | | weighted | | | weighted | |
| Share Refract. Clergy | 0.186*** (0.027) | 0.124*** (0.036) | 0.143*** (0.036) | 0.055*** (0.007) | 0.028*** (0.010) | 0.041*** (0.010) | 0.084*** (0.020) | 0.071* (0.038) | 0.096*** (0.034) | 0.087*** (0.033) |
| Schooling Controls | | | ✓ | | | ✓ | | | ✓ | ✓ |
| Controls (canton) | | | | | | | | | | ✓ |
| Department FE | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| R ² | 0.16 | 0.57 | 0.64 | 0.25 | 0.63 | 0.72 | 0.13 | 0.35 | 0.50 | 0.50 |
| Observations | 435 | 435 | 435 | 444 | 444 | 444 | 401 | 401 | 401 | 401 |
| Magnitude: Share Refractory Clergy | | | | | | | | | | |
| stand. beta coeff. | 0.334 | 0.219 | 0.272 | 0.352 | 0.180 | 0.263 | 0.214 | 0.183 | 0.268 | 0.245 |

Notes: All regressions are run at the canton level. Schooling controls include the (log) number of students per school, the (log) number of total schools (all measured in the initial period in cols.7-10). Columns 7-10 also control for the initial share of Catholic schools in 1873. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 11: Religiosity and type/quantity of education in primary and secondary schools

| <i>Primary Education</i> | | | | |
|------------------------------------|--|---------------------|--|-------------------|
| Dependent Variable: | Share Stud. in Cath. Schools, 1881 | | Enrollment Rate 1881 | |
| | (1) | (2) | (3) | (4) |
| Share Refract. Clergy | 0.235*** (0.058) | 0.182*** (0.057) | -0.093 (0.065) | -0.037 (0.049) |
| Controls | | ✓ | | ✓ |
| R ² | 0.20 | 0.37 | 0.04 | 0.46 |
| Observations | 83 | 79 | 83 | 79 |
| Magnitude: Share Refractory Clergy | | | | |
| stand. beta coeff. | 0.447 | 0.354 | -0.192 | -0.075 |
| <i>Secondary Education</i> | | | | |
| Dependent Variable: | Share Stud. in Modern Schools, 1880 | | Share Pop. with Second. Educ., 1876 | |
| | (1) | (2) | (3) | (4) |
| Share Refract. Clergy | -0.015 (0.039) | -0.014 (0.041) | -0.016 (0.129) | 0.009 (0.167) |
| Controls | | ✓ | | ✓ |
| R ² | 0.00 | 0.37 | 0.00 | 0.25 |
| Observations | 83 | 79 | 83 | 79 |
| Magnitude: Share Refractory Clergy | | | | |
| stand. beta coeff. | -0.046 | -0.040 | -0.012 | 0.007 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, col. 1 – but they do not include enrollment rate and knowledge elites (given the outcome variables). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 12: Catholic education negatively associated with industrial employment 10 years later

| Dependent Variable: Share Industrial Employment, 1871-1911 | | | | | |
|--|---------------------|----------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) weighted | (5) students |
| Share Cath. Schools _{<i>t</i>-10} | -0.175** (0.086) | -0.228*** (0.075) | -0.208** (0.081) | -0.191** (0.091) | |
| Enrollment Rate _{<i>t</i>-10} | | | 0.020 (0.053) | 0.044 (0.068) | 0.038 (0.057) |
| Students per School _{<i>t</i>-10} | | | -0.072* (0.040) | -0.082 (0.050) | -0.096** (0.044) |
| Total Schools _{<i>t</i>-10} | | | -0.055 (0.049) | -0.080 (0.052) | -0.058 (0.051) |
| Share Cath. Students _{<i>t</i>-10} | | | | | -0.161** (0.078) |
| Population | | 0.193** (0.075) | 0.257** (0.098) | 0.323*** (0.096) | 0.281*** (0.099) |
| Department FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.88 | 0.89 | 0.89 | 0.92 | 0.90 |
| Observations | 738 | 738 | 738 | 738 | 656 |
| Magnitude: Share Catholic Schools (Students) | | | | | |
| stand. beta coeff. | -0.182 | -0.237 | -0.217 | -0.171 | -0.190 |

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 13: Catholic education negatively associated with industrial employment – confounding factors

| Dependent Variable: Share Industrial Employment, 1871-1911 | | | | | | | |
|--|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Share Catholic Schools $_{t-10}$ | -0.208** (0.081) | -0.209** (0.081) | -0.322* (0.172) | -0.229** (0.093) | -0.200** (0.078) | -0.199** (0.089) | -0.164* (0.097) |
| Phylloxera Dummy $_{t-10}$ | 0.000 (0.005) | | | | | | |
| Fertility $_{t-10}$ | | -0.004 (0.009) | | | | | |
| Share Vaccinated Children $_{t-10}$ | | | 0.005 (0.018) | | | | |
| French Immigrants pc $_{t-10}$ | | | | 0.106 (0.121) | | | |
| Share Urban Pop. | | | | | 0.098 (0.191) | | |
| Governm. Subsidies pc | | | | | | 0.124* (0.062) | |
| Avg. Travel costs via Railways | | | | | | | -0.077 (0.082) |
| Schooling Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Department FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.89 | 0.89 | 0.89 | 0.88 | 0.89 | 0.89 | 0.90 |
| Observations | 738 | 738 | 272 | 574 | 738 | 656 | 410 |

Notes: All regressions are run at the department level and control for population in year t . Schooling controls include enrollment 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 14: Industrial employment does not predict the share of Catholic schools

| Dependent Variable: Share Catholic Schools | | |
|--|------------------|------------------|
| | (1) | (2) |
| Share Ind. Employment _{<i>t</i>-10} | 0.064 (0.060) | 0.034 (0.048) |
| Schooling Controls | | ✓ |
| Department FE | ✓ | ✓ |
| Year FE | ✓ | ✓ |
| R ² | 0.92 | 0.93 |
| Observations | 656 | 656 |

Notes: All regressions are run at the department level. Schooling controls include enrolment rate, the (log) number of students per school, the (log) number of total schools. In addition, col. 2 includes (log) department population. Standard errors (clustered at the department level) in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 15: Catholic education and industrial employment – different lags

| Dependent Variable: Share Industrial Employment | | | | |
|---|-------------------|-------------------|----------------------|------------------------------------|
| | (1) | (2) | (3) | (4) |
| measured at time | <i>t</i> | <i>t</i> – 5 | <i>t</i> – 15 | avg(<i>t</i> – 10, <i>t</i> – 15) |
| Share Cath. Schools | -0.041 (0.085) | -0.104 (0.074) | -0.231*** (0.058) | -0.250*** (0.069) |
| Department FE | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.89 | 0.89 | 0.91 | 0.91 |
| Observations | 738 | 738 | 656 | 656 |
| Magnitude: Share Refractory Clergy | | | | |
| stand. beta coeff. | -0.044 | -0.110 | -0.242 | -0.260 |

Notes: All regressions are run at the department level. Schooling controls include enrollment 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 16: “Religiously educated” cohorts less likely to be employed in innovative sectors

| Dep. Var.: Share of Workers in Modern Sectors | | |
|---|---------------------|----------------------|
| | (1) | (2) |
| Share Cath. Schools | -0.304** (0.123) | -0.514*** (0.132) |
| Schooling Controls | | ✓ |
| Department FE | ✓ | ✓ |
| Cohort FE | ✓ | ✓ |
| R ² | 0.96 | 0.96 |
| Observations | 257 | 257 |
| Magnitude: Share Catholic Schools | | |
| stand. beta coeff. | -0.211 | -0.358 |

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

Online Appendix

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

Mara P. Squicciarini
Bocconi University

A Additional specifications

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

A.1 Religiosity and industrialization: Robustness checks

Religiosity and conservatism

I consider the antiscientific approach of the Catholic Church as a measure of resistance to adoption of technical and scientific knowledge. One key concern could be that this antiscientific attitude is capturing a broader conservative *état d'esprit*. Controlling for the presence of knowledge elites partly addresses this issue. However, knowledge elites represented an enlightened intellectual minority, and their presence does not necessarily reflect the *état d'esprit* of the rest of the population. I now use data from the *cahiers de doléances* and identify seven categories reflecting “conservative” contents: (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 guilds;” (6) “*cahiers* in favor of maintaining feudal justice guilds;” and (7) “*cahiers* showing conservative nationalism.” 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

Table A.1: Religiosity positively associated to conservatism

| Dependent Variable: Share Antireligious <i>Cahiers</i> | | |
|--|-------------------|---------------------|
| | (1) | (2) |
| Share Conserv. <i>Cahiers</i> | -0.247 (0.179) | -0.377** (0.176) |
| Controls | | ✓ |
| R ² | 0.06 | 0.17 |
| Observations | 75 | 70 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, col. 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.1 shows a negative relationship between the share of antireligious contents and the share of conservative contents in the *cahiers* of the third estate,² suggesting, as one would expect, that religiosity

¹This is computed analogously to the share of antireligious contents (see section 4.1). I do not include the share of conservative contents in the *cahiers* as one of my baseline controls, since it would systematically reduce the number of observations.

²Since, in some electoral districts, the *cahiers* could mention/complain about several issues, all regressions control for the (log) number of topics covered in each *cahier*. Not including this variable would provide extremely similar results.

was related to a broader conservative attitude.

Since (as discussed in Section 2) the struggle between religion and science sometimes took on political connotations, I now use election outcomes in different moments of French history 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 (ranging from 1 to 11) that represents 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 (also before the period of the Third Republic), a negative relationship between religiosity and the share of votes for progressive parties exists (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 antireligious *cahiers* as an indicator of religiosity. The results hold.

Table A.2: Religiosity negatively associated to progressive voting

| | Dependent Variable: Votes to Progressive Parties | | | | | | | |
|----------------------------------|--|----------------------|----------------------|----------------------|------------------------|----------------------|--------------------|--------------------|
| | 1849 (Index) | | 1876 (Share) | | PCA Progressive Voting | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Share Refract. Clergy | -3.759** (1.600) | -6.417*** (1.957) | -0.252*** (0.071) | -0.267*** (0.084) | -2.126*** (0.526) | -2.679*** (0.669) | | |
| Share Anti-Relig. <i>Cahiers</i> | | | | | | | 5.036** (2.501) | 5.832** (2.312) |
| Controls | | ✓ | | ✓ | | ✓ | | ✓ |
| R ² | 0.07 | 0.29 | 0.15 | 0.46 | 0.18 | 0.39 | 0.06 | 0.28 |
| Observations | 80 | 78 | 83 | 78 | 80 | 77 | 72 | 70 |

Notes: All regressions are run at the department level. 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.

Finally, in Table A.3, I regress my economic and industrial outcomes on both religiosity and conservatism. In all specifications, the coefficient on religiosity is still negative and significant, while conservatism is not significantly associated with economic development. This suggests that the anti-scientific dimension of Catholicism (rather than a conservative attitude as such) is likely to explain the negative relationship between religiosity and economic development after 1870.

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

⁴In 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%).

⁵The 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.3: Negative relationship between religiosity and industrialization – controlling for conservatism

| Dependent Variable: | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 |
|--|---------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|
| | | | weighted by pop. | | | | weighted by pop. | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Share Refract. Clergy | -0.167** (0.083) | -1.427*** (0.314) | -0.228*** (0.086) | -1.902*** (0.349) | -0.129* (0.077) | -1.365*** (0.358) | -0.178** (0.085) | -1.686*** (0.424) |
| Share Conserv. <i>Cahiers</i> | -0.100 (0.535) | -0.449 (2.051) | -0.213 (0.461) | -0.303 (2.046) | | | | |
| Progressive Voting | | | | | 0.011 (0.015) | -0.064 (0.077) | 0.005 (0.012) | -0.089 (0.088) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.59 | 0.57 | 0.80 | 0.64 | 0.60 | 0.55 | 0.80 | 0.58 |
| Observations | 72 | 72 | 72 | 72 | 78 | 78 | 78 | 78 |
| standardized beta coefficients | | | | | | | | |
| Share Refractory Clergy | -0.215 | -0.388 | -0.241 | -0.517 | -0.171 | -0.392 | -0.190 | -0.477 |
| Share Conserv. <i>Cahiers</i> / Prog. Voting | -0.021 | -0.021 | -0.036 | -0.013 | 0.076 | -0.093 | 0.028 | -0.121 |

Notes: All regressions are run at the department level. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

More robustness checks: cross-sectional analysis

As discussed in the text, remoteness and distance (also in terms of linguistic and cultural background) could represent an important confounder. However, when carefully looking at Figure 2, the concern that geographic core-periphery patterns are driving my results is mitigated: for instance, the Northern and Eastern departments of the country are relatively close to Paris and more religious than the more distant (and less religious) Limousin or Alps departments. Similarly, the core-periphery dichotomy does not seem to hold in terms of cultural openness vs. backwardness either. For instance, much of the Loire Valley, from Nantes to Southern Brittany is easily accessible, fairly rich and culturally connected, but, at the same time, more religious than the more distant (and less accessible) areas of the Alps or of parts of the Massif Central.

Empirically, I already account for difference in the reach of central institutions (by controlling for distance from Paris and for whether a department was located in *Pays d'élections*). Here, I specifically focus on Brittany and on those departments that had traditionally spoken a language other than French. Table A.4 shows the results. Columns 1-4 exclude the region of Brittany (i.e., the departments of Finistère, Ille-et-Vilaine, Côtes d'Armor, and Morbihan), and columns 5-8 exclude the non-French speaking departments (i.e., those areas speaking Alsacien, Basque, Breton, Catalan, and Corsican).⁶

⁶I construct a dummy for cities located in non-French speaking departments 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'oïl* (the official French), and *langue francoprovençal*. I consider all three “French.” By this def-

Excluding these areas from the analysis provides very similar results to those obtained in the main specifications.

Table A.4: Negative relationship between religiosity and industrialization – excluding Brittany and non-French speaking departments

| Dependent Variable: | Excl. Bretagne | | | | Excl. Non-French Speaking | | | |
|-----------------------|---------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|
| | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 |
| | | | weighted by pop. | | | | weighted by pop. | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Share Refract. Clergy | -0.138* (0.070) | -1.086*** (0.283) | -0.176** (0.074) | -1.292*** (0.370) | -0.161** (0.072) | -1.180*** (0.307) | -0.204*** (0.076) | -1.463*** (0.400) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.61 | 0.56 | 0.80 | 0.59 | 0.60 | 0.54 | 0.79 | 0.56 |
| Observations | 75 | 75 | 75 | 75 | 76 | 76 | 76 | 76 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, column 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.5: Negative relationship between religiosity and industrialization – excluding Paris (Seine department)

| Dependent Variable: | Share Ind. Empl., 1901 | Machines pc, 1891 | Share Ind. Empl., 1901 | Machines pc, 1891 |
|-----------------------|---------------------------|----------------------|---------------------------|----------------------|
| | (1) | (2) | (3) | (4) |
| | | | weighted by pop. | |
| Share Refract. Clergy | -0.138* (0.073) | -0.926*** (0.235) | -0.167** (0.076) | -1.083*** (0.312) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.58 | 0.66 | 0.72 | 0.69 |
| Observations | 78 | 78 | 78 | 78 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, column 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

On the other hand, one could be worried that my results are driven by Paris (Seine department) – especially if it had low religiosity and was highly industrialized. Table A.5 excludes the Seine department from the analysis and all results hold.

initiation, the following dialects are “non-French”: Alsacien, Basque, Breton, Catalan, and Corsican. Since some of the departments with a non-French dialects were not part of France for the whole period of study and are already excluded from my analysis, the non-French speaking departments in my sample are Corse, Finistere, and Pyrenees Orientales.

Table A.6: Negative relationship between religiosity and industrialization – controlling for early industrialization

| Dependent Variable: | Share Ind. Empl., 1901 (1) | Machines pc, 1891 (2) | Share Ind. Empl., 1901 (3) | Machines pc, 1891 (4) |
|-----------------------|----------------------------------|-----------------------------|----------------------------------|-----------------------------|
| | | | weighted by pop. | |
| Share Refract. Clergy | -0.148** (0.057) | -1.073*** (0.255) | -0.180*** (0.058) | -1.265*** (0.321) |
| Share Ind. Empl, 1866 | 0.890*** (0.300) | | 0.903*** (0.231) | |
| Steam Eng. pc 1840s | | 4.138*** (1.008) | | 3.597*** (0.921) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.73 | 0.64 | 0.87 | 0.68 |
| Observations | 79 | 79 | 79 | 79 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, column 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Then, Table A.6 controls for the initial level of development, by including the pre-1870 outcome variables as controls in the post-1870 regressions. This further addresses the concern that less religious departments were already more industrialized and that the initial level of development, rather than religiosity, is affecting industrialization after 1870. As expected, the initial level of development during the First Industrial Revolution is positively and significantly correlated with the Second Industrial Revolution outcomes. At the same time, the coefficient on the share of refractory clergy is still negative and significant, suggesting that the results are not confounded by early industrialization.

Moreover, while I find a positive association between enrolment in secondary education and industrialization, the type of secondary schools could also play an important role for economic development – as shown by Semrad (2015) for the case of Bavaria. In France, we can distinguish between “modern” (*enseignement special or modern*) and “traditional” secondary education (*enseignement classique*). Table A.7 controls for the share people attending modern secondary schools in 1880. This variable is positively (and significantly in cols. 2, 4, and 6) associated with the industrialization outcomes, also when including the share of people with secondary education. These findings support Semrad (2015)’s results. Importantly, the coefficients on religiosity are still significant and very similar in magnitude to those in the main specifications. Furthermore, as shown in Table 11, religiosity seems to have played a crucial role in determining the type of primary education, but it was not associated with the type of secondary education, thus making it unlikely that the presence of an educated, high-skilled minority is confounding my results.

Table A.7: Negative relationship between religiosity and industrialization – controlling for secondary education

| Dependent Variable: | Share Ind. Empl., 1901 (1) | Machines pc, 1891 (2) | Share Ind. Empl., 1901 (3) | Machines pc, 1891 (4) | Share Ind. Empl., 1901 (5) | Machines pc, 1891 (6) |
|-------------------------|----------------------------------|-----------------------------|----------------------------------|-----------------------------|----------------------------------|-----------------------------|
| | | | | | weighted by pop. | |
| Share Refract. Clergy | -0.159** (0.071) | -1.168*** (0.274) | -0.164** (0.069) | -1.172*** (0.278) | -0.209*** (0.073) | -1.378*** (0.365) |
| Share Mod. Second. Educ | 0.049 (0.194) | 2.319** (1.003) | 0.126 (0.193) | 2.375** (1.023) | 0.191 (0.195) | 3.052** (1.269) |
| Secondary Educ. pc 1876 | | | 0.116** (0.056) | 0.070 (0.245) | 0.118** (0.053) | 0.099 (0.275) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.60 | 0.58 | 0.63 | 0.58 | 0.81 | 0.61 |
| Observations | 79 | 79 | 79 | 79 | 79 | 79 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1, col. 1. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Finally, I use Conley standard errors to account for spatial autocorrelation (Conley, 1999). These are computed using the geographic location of the main city of each department and assuming a cut-off window of 100 kms.⁷ The results on religiosity hold (Table A.8).

Table A.8: Religiosity and industrialization (post-1870) – Conley standard errors

| Dependent Variable: | Share Ind. Empl., 1901 (1) | Machines pc, 1891 (2) | Share Ind. Empl., 1901 (3) | Machines pc, 1891 (4) |
|-----------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|
| Share Refract. Clergy | -0.146 (0.085) [0.093] | -0.864 (0.397) [0.452] | -0.160 (0.071) [0.072] | -1.201 (0.290) [0.281] |
| Controls | | | ✓ | ✓ |
| R ² | 0.04 | 0.06 | 0.60 | 0.55 |
| Observations | 83 | 83 | 79 | 79 |

Notes: All regressions are run at the department level. Controls are those listed in Table 1 (col.1). Robust standard errors are in () and Conley standard errors in []. These are computed using the geographic location of main city of each department and assuming a cut-off window of 100 kms.

To sum up, in all specifications, the inclusion of these potentially confounding characteristics does not affect the magnitude and significance of my coefficients. This sensitivity analysis suggests that

⁷These results are robust to the use of different cut-offs for the Conley standard errors.

any remaining omitted-variable bias due to unobservables should be modest as well. This is confirmed when I formally analyze the role of unobservables using the Altonji, Elder, and Taber (2005) methodology. Altonji et al. (2005) suggest a method that takes the relationship between the endogenous variable and the observables as a basis to make inference 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. Formally, I calculate a measure showing how much stronger selection on unobservables, relative to observables, should be to explain away the full observed relationship between religiosity and my outcomes. To compute this measure, we should consider two regressions. First, I estimate the coefficient on the share of refractory clergy when running regressions with no controls (as in Table 4) and denote it as β^A . Second, I add the baseline controls (as in Table 5) 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.9 presents the results for the original Altonji et al. ratio and for the Oster's (2017) correction. The latter takes into account by how much the overall fit improves when adding controls. The R^2 increases from 0.029 to 0.604 when the dependent variable is the share of industrial employment, and from 0.085 to 0.550 when the dependent variable is the number of industrial machines per capita. This suggests that the observables included account for a large part of the overall variation. Both Altonji et al. ratios are negative, implying that the observable controls are negatively correlated with industrial outcomes and positively with religiosity (or vice-versa). When using the Oster's correction, I obtain positive ratios. These imply that, to attribute the entire OLS estimate to selection effects, selection on unobservables would have to be at least 5.42 times greater than selection on observables. In my view, these findings further suggest that it is unlikely that the estimated effect of religiosity is driven by unobservables.

Then, Table A.10 uses data for 252 arrondissements and exploits within-department variation in religiosity before the Second Industrial Revolution.⁸ The dependent variable is (log) value added (Chanut, Heffer, Mairesse, and Postel-Vinay, 2000), and the main variable of interest is the share of refractory clergy. Similar to the main specifications for the post-1870 period (Table 7), I include dum-

⁸As far as I know, measures of economic development at the canton level data are not available for the pre-1870 period.

Table A.9: Altonji and the role of unobservables

| Controls in restricted set | Controls in full set | Share Ind. Empl. 1901 | Machines pc 1891 |
|---|-------------------------|--------------------------|---------------------|
| None | Baseline | | |
| <i>Original Altonji-Elder-Taber test</i> | | [<0] | [<0] |
| <i>Oster correction of the Altonji-Elder-Taber test</i> | | 20.67 | 5.42 |
| <i>R² uncontrolled</i> | | 0.029 | 0.085 |
| <i>R² uncontrolled</i> | | 0.604 | 0.550 |

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.

mies for those arrondissements having a port on the Mediterranean Sea or on the Atlantic Ocean. Moreover, I also control for one important firm characteristic, i.e., establishment size (Chanut et al., 2000).⁹ The within-department analysis supports the department-level results: the coefficient on the share of refractory clergy is not significantly associated with my outcome variable in the pre-1870 period. The results hold when controlling for establishment size, when including dummies for arrondissements located on the Mediterranean Sea or on the Atlantic Ocean (cols. 4-5), and when adding department fixed effects (cols. 3, 5). Finally, at the bottom of the table, I report the standardized beta coefficients. Compared to the post-1870 period, these are much smaller in magnitude.

⁹At the same time, data on population at the arrondissement level for the 1840s do not exist.

Table A.10: No significant relationship between religiosity and industrialization before 1870 – within department analysis

| Dependent Variable: | Value Added, 1840s | | | | | |
|------------------------------------|--------------------|------------------|-------------------|------------------|-------------------|------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Share Refract. Clergy | 0.023 (0.334) | 0.188 (0.564) | -0.258 (0.193) | 0.159 (0.344) | -0.179 (0.199) | 0.101 (0.405) |
| Establ. per worker | | | ✓ | | ✓ | ✓ |
| Medit./Atlant. Ports | | | | ✓ | ✓ | ✓ |
| Department FE | | ✓ | | | | ✓ |
| R ² | 0.01 | 0.77 | 0.67 | 0.02 | 0.68 | 0.86 |
| Observations | 252 | 252 | 252 | 252 | 252 | 252 |
| Magnitude: Share Refractory Clergy | | | | | | |
| stand. beta coeff. | 0.004 | 0.036 | -0.049 | 0.034 | -0.034 | 0.019 |

Notes: Regressions are run at the arrondissement level. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

More robustness checks: difference-in-differences analysis

Here, I perform more robustness checks using the share of industrial employment from 1866 to 1911 in a difference-in-differences framework. Figure A.1 plots the per-period coefficient of the share of industrial employment on religiosity. This is obtained from a regression that, rather than interacting “Share Refractory Clergy” with a post-1871 indicator variable, interacts the religiosity measure with each of the time-period fixed effects. The baseline time-period is 1866. The estimated coefficients show how the negative relationship between religiosity and the outcome variable increases in magnitude during the Second Industrial Revolution, becoming particularly large in the late 1890s and in early 1900s.



Figure A.1: Religiosity and industrial employment

Notes: The figure plots the per-period coefficient of the share of industrial employment on religiosity. The baseline time-period is 1866. The bars represent 90 percent confidence intervals.

In addition, one concern could be that other department characteristics (especially those associated with religiosity) also started to matter during the period of the Second Industrial Revolution. Table A.11 uses the same specification of Table 8 and performs a difference-in-differences analysis, using (one by one) the baseline controls (listed in Table 1, col. 1) rather than the share of refractory clergy. Among them, only (log) population and the *Pays d’Elections* dummy were significantly associated

with the intensity of Catholicism (Table 1). The interaction between these variables and the *Post1871* indicator is not significant in the difference-in-differences specification. Of the other controls, only the interaction between enrollment rate in 1851 and *Post1871* has a positive and significant coefficient, probably capturing the role of early human capital for economic development during the period of the Second Industrial Revolution.¹⁰

Table A.11: Difference-in-differences: What else changed during the 2nd IR?

| Dependent Variable: Share of Industrial Employment, 1871-1911 | | | | | | | | | |
|---|---------------------|-------------------|-------------------|-----------------------|--------------------------|--------------------------|-----------------------|-----------------------------|-------------------------|
| | Pop. 1851 (1) | Temp. (2) | Precip. (3) | Wheat Suit. (4) | Pre-ind Activ. (5) | Distance Paris (6) | Pays Elect. (7) | Enroll. Rate 1851 (8) | Knowl. Elites (9) |
| Post*Control | -0.018 (0.014) | -0.014 (0.021) | -0.016 (0.020) | 0.003 (0.006) | -0.006 (0.008) | -0.006 (0.008) | 0.003 (0.010) | 0.048* (0.027) | -0.000 (0.000) |
| Department FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.89 | 0.88 | 0.88 | 0.89 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Observations | 810 | 810 | 810 | 780 | 820 | 820 | 820 | 820 | 820 |

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

¹⁰Primary education became mandatory in 1882, thus leading to very small differences in enrollment rate during the Second Industrial Revolution. Moreover, in the cross-sectional and panel analyses, I control for enrollment rate.

A.2 Religiosity, Catholic Education and economic development: Robustness checks

In this section, I further shed light on the role of primary education in explaining the negative relationship between religiosity and economic development.

Religiosity and Catholic education in the 19th century

First, Figure A.2 illustrates the timeline of the main educational reforms, from the 1833 *Loi Guizot* to the 1901-1904 *Lois Anti-congreganistes*.

Then, Table A.3 shows the total number (left panel) and the share (right panel) of Catholic and secular schools, without distinguishing between the private and public sectors. It suggests that the total number of Catholic schools, as well as their shares, remained extremely stable throughout the period, despite the effort of the French government to undermine religious education.

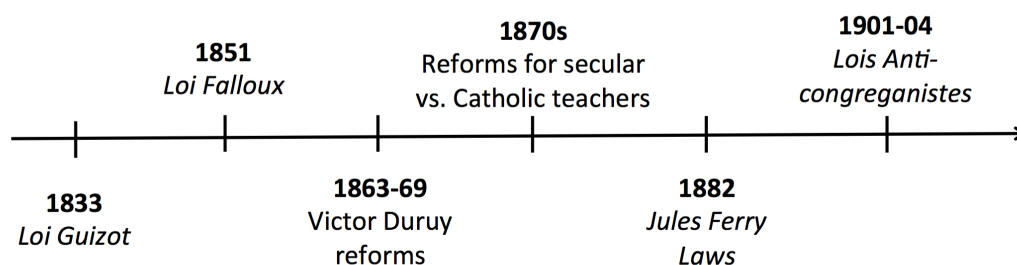


Figure A.2: Timeline of French educational reforms, 1833-1904

Then, Figure A.4 reproduces Figure 3 using the share (rather than the number) of Catholic and secular schools. It shows that the share of Catholic schools remained quite stable throughout the period, with the share of private Catholic schools increasing as their public counterparts were laicized.

Table A.12 uses the share of Catholic students, rather than the share of Catholic schools. Similar to Table 9, 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 increased. Importantly, columns 4-8 show that in the more religious departments there is also a higher growth in the share of Catholic students, especially in the 1866-1901 period. These findings hold also when including the baseline controls of Table 1 (col. 7-8) and when weighting regressions by department-level population (cols. 6, 8). Table A.13 reproduces the main specifications, but it includes no controls. Table A.14 use the (log) number of Catholic schools (columns 1-3) and of Catholic students (columns 4-6). It focuses on the two sub-periods of educational reforms (1850-1866,

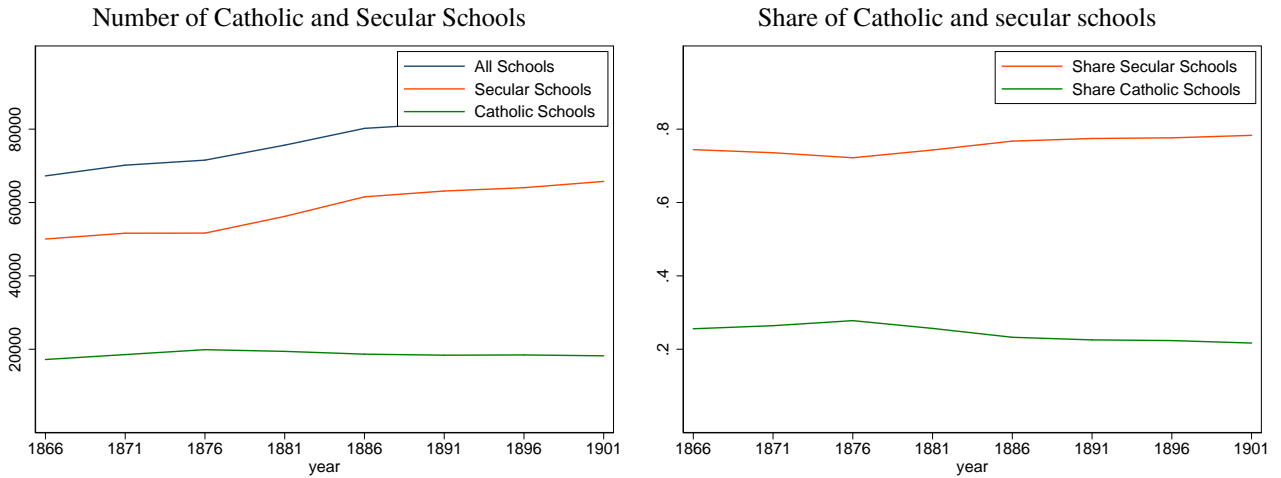


Figure A.3: Catholic and secular schools, 1866-1901

Notes: The left panel shows the number of Catholic schools and secular schools. The right panel shows the share of Catholic schools and secular schools.

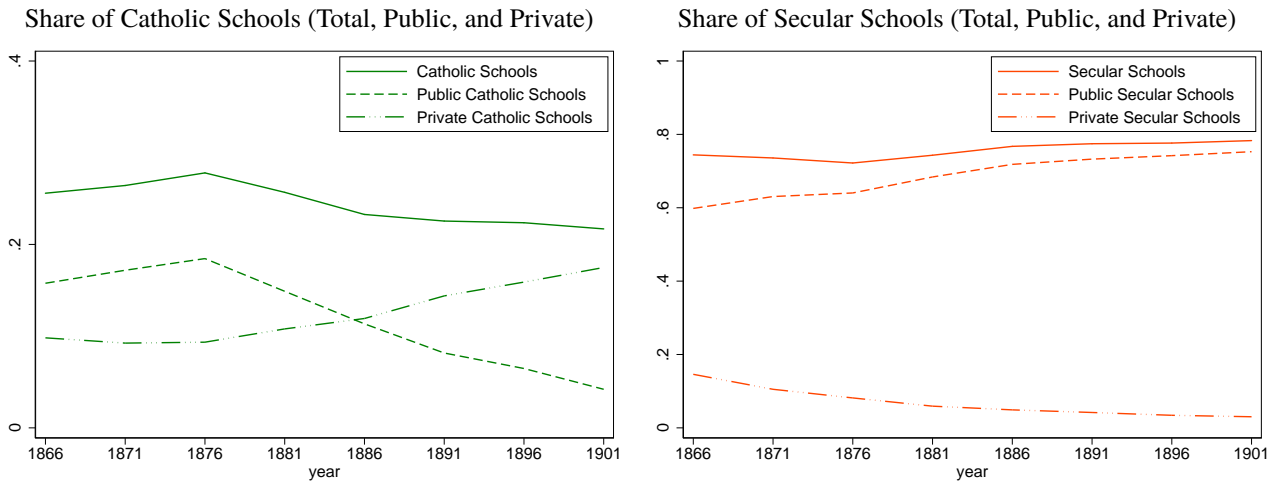


Figure A.4: Share of Catholic and secular schools, 1866-1901

Notes: The left panel shows the share of total Catholic schools, of public Catholic schools, and of private Catholic schools. The right panel shows the share of total secular schools, of public secular schools, and of private secular schools.

and 1866-1901), controlling for the initial level of Catholic schools and students in 1850 (cols. 1, 3, 4, 6) and in 1866 (cols 2, 5). The results hold.

Finally, Table A.15 uses canton-level data on students, and Table A.16 distinguishes between male and female students. The positive relationship between religiosity and Catholic education holds when considering all students together, and when distinguishing between genders. This is consistent with historical evidence suggesting that Catholic parents were especially concerned about a Catholic education for their daughters (Franck and Johnson, 2016) but that at the end of the 19th century male Catholic schools represented a strong expression of religiosity (Grew and Harrigan, 1991).¹¹

Table A.12: Higher growth in share of Catholic students in more religious departments

| Dependent Variable: | Share Cath. Students | | | Growth Share Cath. Students | | | | |
|------------------------------------|----------------------|--------------------|---------------------|-----------------------------|---------------------|---------------------|---------------------|---------------------|
| | 1851 | 1866 | 1901 | 1851-1866 | 1866-1901 | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | | | | | weighted | | weighted | |
| Share Refract. Clergy | 0.036 (0.060) | 0.118** (0.058) | 0.214*** (0.052) | 0.322* (0.177) | 0.336*** (0.096) | 0.258*** (0.078) | 0.342*** (0.106) | 0.312*** (0.100) |
| Schooling Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Controls | | | | | | | ✓ | ✓ |
| R ² | 0.19 | 0.27 | 0.39 | 0.33 | 0.24 | 0.17 | 0.37 | 0.31 |
| Observations | 82 | 82 | 82 | 82 | 82 | 82 | 79 | 79 |
| Magnitude: Share Refractory Clergy | | | | | | | | |
| stand. beta coeff. | 0.067 | 0.206 | 0.457 | 0.242 | 0.441 | 0.392 | 0.446 | 0.475 |

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 (all measured in the initial period in Cols. 4-8). In addition, all specifications include (log) department population (measured in the initial period in Cols. 4-8). Cols 4-9 also control for the initial share of Catholic students. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. The last row reports the standardized beta coefficients.

¹¹In 1901, female Catholic schools still represented 40% of all female schools, and about 80% of all Catholic schools.

Table A.13: Higher growth in share of Catholic schools in more religious departments (no controls)

| Dependent Variable: | Share Cath. Schools | | | Gr. Share Cath. Schools | | |
|-----------------------|---------------------|------------------|---------------------|-------------------------|---------------------|---------------------|
| | 1851 | 1866 | 1901 | 1851-1866 | 1866-1901 | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | | | | | weighted | |
| Share Refract. Clergy | 0.009 (0.051) | 0.078 (0.059) | 0.160*** (0.050) | 0.360** (0.170) | 0.461*** (0.122) | 0.297*** (0.092) |
| R ² | 0.00 | 0.02 | 0.15 | 0.30 | 0.27 | 0.19 |
| Observations | 82 | 82 | 82 | 82 | 82 | 82 |

Notes: All regressions are run at the department level. Cols 4-7 also control for the initial share of Catholic schools. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.14: Religiosity and Catholic schools/students (levels)

| Dependent Variable: | (Log) Cath. Schools | | | (Log) Cath. Students | | |
|-----------------------|---------------------|---------------------|---------------------|----------------------|---------------------|---------------------|
| | 1866 | 1901 | 1901 | 1866 | 1901 | 1901 |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Share Refract. Clergy | 0.209** (0.081) | 0.466*** (0.138) | 0.625*** (0.162) | 0.210** (0.102) | 0.539*** (0.152) | 0.708*** (0.181) |
| Initial Level 1850 | 0.644*** (0.048) | | 0.481*** (0.077) | 0.688*** (0.063) | | 0.612*** (0.093) |
| Initial Level 1866 | | 0.745*** (0.093) | | | 0.728*** (0.085) | |
| Schooling Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.90 | 0.84 | 0.76 | 0.92 | 0.90 | 0.85 |
| Observations | 82 | 82 | 82 | 82 | 82 | 82 |

Notes: All regressions are run at the department level. 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). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.15: Religiosity and Catholic students (canton level)

Dependent Variable: Share of Catholic Students

| | (1) | (2) | (3) | weighted | |
|-----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | | | | (4) | (5) |
| Share Refract. Clergy | 0.248*** (0.046) | 0.143*** (0.040) | 0.209*** (0.040) | 0.156*** (0.037) | 0.149*** (0.039) |
| Schooling Controls | | | ✓ | ✓ | ✓ |
| Controls (Canton) | | | | | ✓ |
| Department FE | | ✓ | | ✓ | ✓ |
| R ² | 0.20 | 0.58 | 0.31 | 0.65 | 0.66 |
| Observations | 444 | 444 | 444 | 444 | 444 |

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

Table A.16: Religiosity and Catholic students (by gender)

Dependent Variable: Share of Catholic Students

| | Males | | | | | Females | | | | |
|-----------------------|---------------------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | weighted | | (6) | (7) | (8) | weighted | |
| | | | | (4) | (5) | | | | (9) | (10) |
| Share Refract. Clergy | 0.187*** (0.044) | 0.114*** (0.042) | 0.159*** (0.044) | 0.106** (0.046) | 0.104** (0.047) | 0.314*** (0.055) | 0.166*** (0.053) | 0.290*** (0.054) | 0.208*** (0.050) | 0.195*** (0.054) |
| Schooling Controls | | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| Controls (Canton) | | | | | ✓ | | | | | ✓ |
| Department FE | | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| R ² | 0.13 | 0.47 | 0.22 | 0.62 | 0.63 | 0.19 | 0.59 | 0.21 | 0.61 | 0.61 |
| Observations | 444 | 444 | 444 | 444 | 444 | 444 | 444 | 444 | 444 | 444 |

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

Table A.17: Catholic schools and state spending

| Dependent variable: Share Catholic Schools | | |
|--|-------------------|-------------------|
| | (1) | (2) |
| State Spending | -0.000 (0.005) | -0.005 (0.004) |
| Schooling Controls | | ✓ |
| Department FE | ✓ | ✓ |
| Year FE | ✓ | ✓ |
| R ² | 0.98 | 0.98 |
| Observations | 410 | 410 |

Notes: All regressions are run at the department level. Schooling controls include enrolment rate, the (log) number of students per school and the (log) number of total schools. Moreover, col. 2 also controls for (log) department population. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Catholic education and industrialization

Here, using panel data, I perform more robustness checks and study the role of the type of education (Catholic vs. secular) for industrial development in the 1871-1911 period.

Table 13 showed that the negative relationship between the share of Catholic schools and industrial employment holds when I include potentially confounding factors that are not captured by department and year fixed effects. Among these, public budget considerations are probably the most relevant in the context of my study. A challenge for my interpretation could be that increases in government investment (especially in secular-oriented departments) were the dominant factor leading to higher industrialization, while changes in the type of primary education were only a sideshow without economic relevance. In the decades marked by the massive expansion of the railway system, railroads could facilitate market access and industrial development – thus representing a critical confounder. Table 13 controlled for changes in travel costs via the rail network to any other department in France. Here, I use additional measures of travel costs: (1) changes in travel costs via railways to Paris, which could capture the influence of central institutions and the exposure to new ideas spreading from the capital; (2) density of national roads; (3) expenditure for national roads (per km). Even if roads were not so massively expanded as railways, they could also represent a critical confounder. Table A.18 controls for these additional measures of travel costs and the results on the share of Catholic education hold. Finally, Table A.19 checks whether changes in Catholic education are correlated with changes in public spending; it finds that the share of Catholic schools does not systematically vary with any measures of government investment. This suggests that parents' religious preferences, rather than public budget considerations, are determining changes in Catholic and secular education over time.

Next, A.20 shows the results by gender, suggesting that the negative relationship between industrial employment and Catholic education holds for both female and male workers. This is in line with historical evidence arguing that, in secular schools, all students were supposed to study the more technical and “economically useful” knowledge, which could provide them with “agility aptitudes” useful to perform their tasks on the factory floor. Since women were also largely involved in industry during the Second Industrial Revolution,¹² we expect secular education to be useful for both genders. Table A.20 shows a negative relationship between the share of Catholic education (which is the “inverse” of the share of secular education) and industrial employment for both male and female workers.

While I showed that Catholic education played a key role in explaining the negative relationship between religiosity and economic development during the Second Industrial Revolution, the historical record suggests that differences in the curricula of secular vs. Catholic schools were key. One concern

¹²Many types of machineries did not require specific physical effort by their operators. Moreover, mechanization also demanded dexterity, meticulousness, and patience, qualities usually associated with female workers (Zijdeman, van Leeuwen, Rébaudo, and Pélissier, 2014).

Table A.18: Industrial employment and infrastructure -

| Dependent Variable: Share Industrial Employment, 1871-1911 | | | |
|--|--------------------|----------------------|----------------------|
| | (1) | (2) | (3) |
| Share Catholic Schools t_{-10} | -0.166* (0.096) | -0.262*** (0.088) | -0.251*** (0.084) |
| Travel Costs to Paris | -0.049 (0.064) | | |
| Roads Density | | -0.126 (0.109) | |
| Expenditure on Roads (per km) | | | -0.026 (0.027) |
| Schooling Controls | ✓ | ✓ | ✓ |
| Department FE | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ |
| R ² | 0.90 | 0.90 | 0.90 |
| Observations | 410 | 492 | 410 |

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 A.19: Catholic schools and government spending

| Dependent Variable: | Government | Roads and Railways | | | |
|------------------------|-------------------|--------------------|------------------|-------------------|------------------|
| | Subsidies | National | Expenditure | Travel Costs | |
| | pc | Roads Dens. | on Roads(per km) | to Paris | to any dept. |
| | (1) | (2) | (3) | (4) | (5) |
| Share Catholic Schools | -0.095 (0.195) | -0.024 (0.229) | 0.386 (0.553) | -0.003 (0.195) | 0.112 (0.137) |
| Department FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| R ² | 0.98 | 0.96 | 0.89 | 1.00 | 0.99 |
| Observations | 574 | 410 | 328 | 328 | 328 |

Notes: All regressions are run at the department level. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.20: Catholic education and industrial employment – by gender

| Dep. Variable: Share Industrial Empl., 1871-1911 | | |
|--|--------------------|----------------------|
| | (1) | (2) |
| | Male | Female |
| Share Cath. Schools _{<i>t</i>-10} | -0.124* (0.069) | -0.171*** (0.060) |
| Schooling Controls | ✓ | ✓ |
| Department FE | ✓ | ✓ |
| Year FE | ✓ | ✓ |
| R ² | 0.95 | 0.90 |
| Observations | 738 | 738 |

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. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

could be that the two types of primary education differed in other important dimensions. Among them, student attendance and schools' resources could be particularly critical. Table A.21 uses as a dependent variable the share of students attending primary schools during summer months. The explanatory variable is the share of Catholic schools. The results show that the share of Catholic schools is not associated with student attendance, even when including the schooling controls (col. 2). Moreover, data from the French National Archives provide detailed information on the quality of school buildings for more than 2,400 cantons in 1873. Table A.22 uses the share of buildings in bad condition as a proxy for schools' financial resources. Columns 1-4 focus on the full sample and cols. 5-8 only on those cantons for which data on religiosity are also available. The coefficient on the share of Catholic schools is generally not significant (except for Column 3), suggesting that Catholic schools did not systematically have less resources – if anything, they had a lower share of buildings in bad condition.

Finally, while the results on primary schooling hold when using different specifications and when including potentially confounding factors, I do not claim that the type of primary education (Catholic vs. secular) is the *only* mechanism explaining the negative relationship between religiosity and industrial-economic progress during the Second Industrial Revolution. The antiscientific program of the Church could have been manifested in other aspects of people's lives; in my setting, examples could be the opposition toward vaccinations and birth control (affecting the quantity-quality of human capital through channels not related to education). Table A.23 provides some evidence for this, showing that the more

religious departments had a lower rate of vaccinations and higher fertility. However, when studying the role of these alternative mechanisms for the industrialization process, I concluded that they are unlikely to account for my results (see Table 13).

Table A.21: Catholic schools and attendance

Dep. var.: Share students attending in summer, 1876

| | (1) | (2) |
|------------------------|------------------|------------------|
| Share Catholic Schools | 0.121 (0.075) | 0.035 (0.063) |
| Schooling Controls | | ✓ |
| R ² | 0.03 | 0.09 |
| Observations | 83 | 83 |

Notes: All regressions are run at the department level. Schooling controls include enrolment rate, the (log) number of students per school and the (log) number of total schools. Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.22: Catholic schools and physical facilities

| Dependent Variable: Share of school buildings in bad condition, 1873 | | | | | | | | |
|--|-------------------|-------------------|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Restricted Sample | | | | | | | |
| Share Cath. Schools | -0.038 (0.033) | -0.015 (0.032) | -0.049*** (0.018) | -0.023 (0.018) | -0.024 (0.055) | -0.019 (0.054) | -0.028 (0.035) | -0.021 (0.039) |
| Schooling Controls | | ✓ | | ✓ | | ✓ | | ✓ |
| Department FE | | | ✓ | ✓ | | | ✓ | ✓ |
| R ² | 0.01 | 0.02 | 0.27 | 0.28 | 0.00 | 0.01 | 0.40 | 0.40 |
| Observations | 2427 | 2381 | 2427 | 2381 | 433 | 432 | 433 | 432 |

Notes: All regressions are run at the canton level. Schooling controls include the (log) number of students per school, the (log) number of total schools. In addition, cols. 2 and 4 control for (log) city population. Standard errors (clustered at the department level) in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A.23: Lower adoption of technological progress and modern ideas in more religious departments

| Dependent Variable: | Share vaccinated | | Fertility | |
|------------------------------------|--------------------|--------------------|-------------------|---------------------|
| | children 1871 | | 1871 | 1901 |
| | (1) | (2) | (3) | (4) |
| Share Refract. Clergy | -0.190* (0.114) | -0.183* (0.107) | 0.455* (0.259) | 0.662*** (0.244) |
| Fertility | | -0.017 (0.059) | | |
| R ² | 0.04 | 0.04 | 0.04 | 0.10 |
| Observations | 66 | 66 | 83 | 83 |
| Magnitude: Share Refractory Clergy | | | | |
| stand. beta coeff. | -0.202 | -0.194 | 0.204 | 0.324 |

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

B Source of exogenous variation in religiosity: plague outbreaks during the Reformation

In this section, I provide evidence for a source of exogenous variation in religiosity. Following the recent work of Dittmar and Meisenzahl (2019), I use plague outbreaks during a narrow period (the Protestant Reformation in France, 1517-1598) as an instrumental variable.

As Dittmar and Meisenzahl (2019) argue, the Reformation – starting with the circulation of Martin Luther’s theses in 1517 – undermined the monopoly of Catholicism, introducing competition in the market for religion. This represented a “global shock” throughout central Europe and it created an alternative to the Catholic ideology. Importantly, this new religious competition interacted with shocks at the local level. Focusing on German cities, Dittmar and Meisenzahl (2019) show that, once the new doctrine had created an opening for change, the occurrence of plagues discredited the incumbent elites, led to criticism toward the “status-quo,” and lowered the price of political action. Religious and political competition at the local level increased and drove the adoption of public goods institutions.¹³

In France too, the Reformation provided an alternative to the Catholic ideology. The decades before the Reformation were characterized by widespread “eschatological anxiety” and by the belief that the world would shortly come to an end (Crouzet and Good, 2001). Pamphlets predicting calamities circulated and natural disasters (such as plagues and floods) were considered God’s imminent vengeance upon a sinful society.¹⁴ In this context, the Church had established itself as a monopolistic “provider of salvation.” For instance, in 1480, in Le Puy, a procession with the painting *Our Lady of Puy* was organized to receive a remedy from God to end the plague, which was considered a punishment for people’s sin (Cohn, 2018). In Metz, a flood that killed animals and destroyed infrastructure was interpreted as a divine punishment, and a collective sense of catastrophe spread throughout the city. The Church pushed people to confess their sins and to receive the communion, and it organized daily processions of expiation. Jean de Bourdigné wrote in *Chronique d’Anjou et de Maine* that around the day of Pentecost, a strong rain was considered a vengeance from God. The community, following the advice of local clergymen, started to “make daily processions, having their children of nine or ten and older walk barefoot.” Analyzing the French religious context of the 16th century, Crouzet concludes

¹³In the German context, religious competition also took political connotations. On the other hand, the authors show that, before the introduction of religious competition, plague shocks did not lead to institutional change.

¹⁴These beliefs were spreading across several parts of Europe. From Italy to German lands, a series of printed prophecies circulated and preachers were predicting enormous disasters. Some of the strongest eschatological tension was felt in Italy in 1513, when Girolamo of Verona (according to the calculations of Joachim of Fiore in the *Concordia Novi et Veteris Testamenti*) announced that his generation would be the last one. A few years later (1524-1525) there was another “case of collective panic.” All of Italy, awaited flooding and people bricked up the doors of their houses or built themselves wooden houses in the hills, stock-piled with food (Crouzet and Good, 2001). This approach of the Church initially characterized also the German lands, but there, by the mid-16th century, Protestantism became well established and the Catholic Church lost power.

that “popular Catholicism in France was steeped in mysticism and apocalypticism and fed by almanacs filled with reports of signs and portents and with astrological predictions of disasters and the end of the world.”

In this context, the Reformation was immediately welcomed in France. However, the following decades saw frequent persecutions of the Huguenots (the French Protestants).¹⁵ Finally, in 1598, with the Edict of Nantes, Henry IV granted rights to Protestants. The years spanning from the first appearance of the Protestant doctrine to 1598 saw the strongest religious competition in the country. In France, as in the German setting, the global effects of religious competition interacted with local shocks and, where plagues occurred, the prophetic approach of the Catholic Church was further scrutinized: “The Reformation in France heightened attitudes about the forces of good and bad, ... and plagues became a battle hammering out Church positions” (Cohn, 2018, p. 155). Experience with plagues resulted in tensions with the Catholic ideology, in the emergence of early Protestant groups, and in stronger local religious competition.¹⁶ Indeed, embracing the new doctrine “can best be understood as a rejection of this mystical view of the world; its appeal lay in a replacement of the prophetic anguish of Catholicism with a serene assurance of salvation on the part of the elect” (Crouzet, 1996).

Thus, my hypothesis is that, in the period of strongest religious competition, experience with plagues discredited the Catholic doctrine and shifted religious views toward Protestantism.¹⁷ Following the approach of Dittmar and Meisenzahl (2019), in my empirical analysis, I use variation in plague outbreaks during a limited period as excluded instrument for religiosity. Specifically, I focus on outbreaks during the years of strongest religious competition in France. Historical epidemiologists (such as Biraben, 1975) suggest that, conditional on observables, the short-run occurrence of outbreaks was random, was geographically localized, and did not spread “neighbor-to-neighbor” (Dittmar and Meisenzahl, 2019). Moreover, to deal with the concern that other factors (such as trade exposure) are associated with the occurrence of plagues and also affect economic development, I follow Dittmar and Meisenzahl (2019) and I control for long-run variation in plagues.

To test my hypothesis, I rely on the work of Biraben (1975), which provides city-level data on the number and year of major outbreaks in European history. Specifically, 3,088 outbreaks were recorded in France from 1347 to 1786, 1,049 of which occurred between 1517 and 1598. Given the disaggre-

¹⁵There were many attempts to stop the spread of Protestantism. Some of them (such as the *Affaire des Placards* in 1534 and religious conflicts starting in 1562) got violent. Luther’s doctrine spread swiftly across France and, throughout the 16th century, Calvinism also became extremely common.

¹⁶Moreover, contrary to what happened in German cities, higher local religious competition was not conducive to institutional change. This was due to the uncertain (often illegal) status of Protestantism in France.

¹⁷While religious competition fostered dissensus toward the Catholic Church, the several persecutions dissuaded many from converting to Protestantism. One could interpret plague outbreaks in the 1517-1598 period as shifting the overall distribution of religiosity, leading to a decrease in Catholic religiosity, and, in some cases, to conversion to Protestantism.

gated nature of the data, I can exploit canton-level variation in plague outbreaks and religiosity.¹⁸

Thus, I compute the share of plagues in the 1517-1598 period over the total number of plagues and use it as an instrument for religiosity. In Table B.1, I present the instrumental variable estimates. The first stage shows that the share of plagues in the 1517-1598 period is a strong predictor of Catholic religiosity in 1791. In the second stage, I obtain large and statistically significant coefficients on the share of refractory clergy. The results hold when adding dummies for those cantons having a port on the Mediterranean Sea or on the Atlantic Ocean (thus, specifically addressing the concern that “openness” is confounding my results), when including department fixed effects, and when weighting regressions by canton-level population. The F-statistic is reported at the bottom of the table and, in square brackets, I also report p-values based on the Anderson-Rubin test of statistical significance, which are robust to weak instruments (Andrews and Stock, 2005).¹⁹

Table B.1: IV Estimates

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------|---|---------------------------------|---------------------------------|--------------------------------|---------------------------------|---------------------------------|
| <i>Second Stage</i> | Dependent Variable: (Log) Household Expenditure, 1901 | | | | | |
| Share Refract. Clergy | -0.521** (0.221) [0.004] | -0.536*** (0.179) [0.011] | -0.553*** (0.212) [0.000] | -0.600** (0.246) [0.002] | -0.608*** (0.232) [0.000] | -0.601*** (0.221) [0.006] |
| <i>First Stage</i> | Dependent Variable: Share Refractory Clergy | | | | | |
| Plagues, 1517-1598 | -0.172*** (0.053) | -0.139** (0.062) | -0.140** (0.062) | -0.165*** (0.053) | -0.163*** (0.056) | -0.135** (0.064) |
| Population | | | ✓ | | ✓ | ✓ |
| Medit./Atlant. Ports | | | | ✓ | ✓ | ✓ |
| Department FE | | ✓ | | | | ✓ |
| R ² | 0.06 | 0.80 | 0.80 | 0.09 | 0.10 | 0.80 |
| Observations | 223 | 223 | 223 | 223 | 223 | 223 |
| KP F-stat | 10.793 | 5.039 | 9.195 | 9.656 | 8.659 | 4.415 |

Notes: All regressions are run at the canton level and control for the (log) number of total plagues. (Log) household expenditure is a proxy for (log) household income (see footnote 36). Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Second stage results also report the p-values [in square brackets] for the Anderson- Rubin (Chi-square) test of statistical significance (heteroskedasticity-robust). This test is robust to weak instruments (see Andrews and Stock (2005) for a detailed review).

¹⁸Typically, city data on plagues map one-to-one into cantons. In two cases, two cities that experienced a plague were located in the same canton. In these cases, I aggregate this information at the canton level.

¹⁹The F-statistic is slightly smaller when including department fixed effects. Thus, I report the p-values based on the Anderson-Rubin test, which are robust to weak instruments (Andrews and Stock, 2005).

By controlling for long-run plague outbreaks, I account for underlying differences in canton characteristics, thus identifying off variation in outbreaks during the critical 1517-1598 period. In Table B.2, I further address this issue by studying the relationship between religiosity and plagues in the pre-1517 (cols. 3-4) and post-1598 (cols 5-6) periods.²⁰ First, I show (as in Table B.1, first stage), that my measure of Catholic intensity is negatively associated with plague outbreaks in the 1517-1598 period (cols. 1-2).²¹ At the same time, there is no significant relationship between the share of plagues in the placebo periods and the share of refractory clergy. These findings suggest that the interaction between religious competition and local plague shocks (rather than plagues per se) triggered dissensus toward the Catholic Church and decreased Catholic religiosity.

Table B.2: Plague outbreaks, Catholic intensity, and early Protestantism

| Dependent Variable: | Share Refractory Clergy | | | | | | Early Protestants | |
|----------------------|-------------------------|---------------------|------------------|------------------|-------------------|------------------|---------------------|-------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Placebo Periods | | | | | | | |
| Plagues, 1517-1598 | -0.172*** (0.053) | -0.139** (0.062) | | | | | 0.332** (0.131) | 0.327* (0.174) |
| Plagues, pre-1517 | | | 0.110 (0.145) | 0.020 (0.063) | | | | |
| Plagues, post-1598 | | | | | -0.042 (0.063) | 0.008 (0.040) | | |
| Distance from Geneva | | | | | | | -0.108** (0.054) | -0.102 (0.270) |
| Department FE | | ✓ | | ✓ | | ✓ | | ✓ |
| R ² | 0.06 | 0.80 | 0.05 | 0.79 | 0.05 | 0.79 | 0.04 | 0.47 |
| Observations | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |

Notes: All regressions are run at the canton level and control for the (log) number of total plagues. * p<0.1, ** p<0.05, *** p<0.01.

Then, if this dissensus was accompanied by conversion to Protestantism, I would expect a positive relationship between plague outbreaks and the emergence of early Protestant groups. To have information on the initial distribution of Protestantism within France, I digitized data from the *Livre des habitants de Genève* (Geissendort, 1957). This is a list of French Protestant refugees in Geneva from 1549 to 1560, from 1572 to 1574, and from 1585 to 1588, with details on their city of origin.²²

²⁰Similarly to plagues in 1517-1598, these variables are constructed, respectively, as the shares of plagues in 1347-1517 and in 1599-1786 over the total number of plagues reported. Considering in the untreated period the same number of years as in the “treated” period would not change the results.

²¹I partly reproduce the results of the First Stage (B.1) to closely compare the treated and placebo periods in the same table and using the same specifications.

²²Already in 1534 (with the *Affair des Placards*) and, even more, with legal repressions of Protestants in the subsequent

I construct a dummy for those cantons from which French refugees escaped to Geneva and use this as my measure of early emergence of Protestantism within France. Geissendort (1957) suggests that refugees in Geneva originated from throughout the French territory and should represent the geographical distribution of early Protestantism in the country.²³ Thus, in Columns 7-8 of Table B.2, I use as dependent variable my measure for the early spreading of Protestantism and show positive and significant coefficients on plague outbreaks, also when controlling for distance from Geneva. All results hold when including department fixed effects (cols. 2, 4, 6, and 8).

One concern could be that my findings are confounded by the presence of Protestants, who are usually associated with entrepreneurship and economic development. However, this does not seem to be case, for two main reasons. First, Sunshine (2003, p.17) suggests that in the early 16th century, “there is not a clear connection between social class and occupation, and adherence to either Protestantism or Catholicism.” Rather, several Christians simply recognized the Church’s many problems and asked for reforms. Thus, the conversion to Protestantism was motivated by religious rather than by economic factors (Rothrock, 1979).²⁴ Second, while the occurrence of outbreaks decreased Catholic religiosity and fostered the emergence of early Protestant groups, after the strong persecutions against the Protestants and the subsequent massive migration waves, only a small minority of these groups had survived by the mid-17th century (Greengrass, 1987; Mours, 1958). Indeed, the distribution of Huguenots in the 19th century is not associated with Catholic intensity (as shown in Table 1).

Thus, all these findings together suggest that plagues occurring in the years of strong religious competition – and not plagues as such – are predicting Catholic intensity in later centuries.

Next, to be a valid instrument the exclusion restriction would require that cities with more outbreaks became more developed only because of their lower religiosity. However, plagues could affect economic development through different channels, such as through their demographic consequences. If this is the case, then plague outbreaks before and after the period of high religious competition should also affect economic development. Thus, to assess the validity of my IV estimates, I perform falsification tests that examine the reduced-form relationship between plagues before 1517 or after 1598 and economic development. Table B.3 shows the results. There is a strong and positive relationship between plague outbreaks in the 1517-1598 period and my measure of economic development,

decades, French refugees had migrated to Geneva. By the end of the 1540s, there were so many that the city council decided to keep a register.

²³I prefer using information on cantons of origins of Huguenots refugees, rather than on their number, because the latter could suffer more from bias coming from geographical distance from Genève. However, using the (log) number of refugees would provide very similar results.

²⁴Similarly, Becker and Woessmann (2009) argue, for the case of Prussia, that wealthy regions may have been less likely to select into Protestantism at the time of the Reformation because they benefited more from the hierarchical Catholic structure. Only later, when Protestants had invested in education and literacy (originally needed for religious reasons), did they become an economically successful minority.

also when adding city level controls and when including department fixed effects (cols. 1-3). Columns 4-9 report the same reduced-form estimates for both the pre-1517 period (cols. 4-6) and the post-1598 period (cols. 7-9). Unlike plagues occurring in 1517-1598, there is no systematic relationship between the occurrence of outbreaks before 1517 or after 1598 and economic development. At the bottom of the table, I report the standardized beta coefficients: these are much larger in magnitude in the period of strong religious competition (cols. 1-3) than in the placebo periods (cols 4-9).

Table B.3: Reduced form relationship between plagues outbreaks and economic development

| Dependent Variable: (Log) Household Expenditure, 1901 | | | | | | | | | |
|---|---------------------------|---------------------|--------------------|------------------|------------------|------------------|-------------------|-------------------|-------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | Relig. Competition Period | | | Placebo Periods | | | | | |
| | 1517-1598 | | | pre-1517 | | post-1598 | | | |
| Plague Outbreaks | 0.090*** (0.031) | 0.098*** (0.027) | 0.081** (0.036) | 0.026 (0.062) | 0.007 (0.046) | 0.013 (0.057) | -0.009 (0.020) | -0.011 (0.019) | -0.020 (0.023) |
| Population | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Medit./Atlant. Ports | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Department FE | | | ✓ | | | ✓ | | | ✓ |
| R ² | 0.12 | 0.22 | 0.56 | 0.09 | 0.18 | 0.54 | 0.09 | 0.18 | 0.55 |
| Observations | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| Magnitude: Plague outbreaks | | | | | | | | | |
| stand. beta coeff. | 0.218 | 0.238 | 0.198 | 0.053 | 0.013 | 0.026 | -0.028 | -0.035 | -0.061 |

Notes: All regressions are run at the canton level. (Log) household expenditure is a proxy for (log) household income (see footnote 36). * p<0.1, ** p<0.05, *** p<0.01.

Finally, to further validate the argument that the Reformation period was key in determining later religiosity at the local level, one would ideally like to show that the share of refractory clergy is not correlated with other measures of Catholic intensity before the Reformation. I provide some evidence for this. Specifically, I digitized city-level data on convents present in France during the Middle Ages (Emery, 1962). I use this information as a pre-Reformation indicator of religiosity at the local level. In Table B.4, I show that the (log) number of medieval convents in the Middle Ages is not significantly associated with the share of refractory clergy, thus suggesting that 19th-century Catholic religiosity can be traced back to the Reformation period and providing further support for my instrumental variable strategy.

Table B.4: Catholic religiosity before and after the Protestant Reformation

| Dependent Variable: | Share Refractory Clergy | | | |
|----------------------|-------------------------|-------------------|------------------|-------------------|
| | (1) | (2) | (3) | (4) |
| Medieval Convents | 0.009 (0.029) | -0.003 (0.027) | 0.012 (0.030) | -0.005 (0.027) |
| Medit./Atlant. Ports | | | ✓ | ✓ |
| Department FE | | ✓ | | ✓ |
| R ² | 0.04 | 0.79 | 0.07 | 0.79 |
| Observations | 223 | 223 | 223 | 223 |

Notes: All regressions are run at the canton level. Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

C Data: Description and sources

C.1 Information on French departments and cantons

A large part of my cross-sectional analysis and my panel analysis are performed at the French department (district) level. Departments were created in 1789 by the National Constituent Assembly. 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. Initially, there were 83 departments. That number increased to 130 during the Napoleonic period and, in 1815, with the Congress of Vienna, it was reduced to 86 (three of the initial departments were split). In 1860, also the departments of Savoie and Haute-Savoie were annexed to the French territory. After the Franco-Prussian war instead, France lost the departments of Haut-Rhin and of Bas-Rhin (except for the Territoire de Belfort, which was officially recognized as a department only in 1922), as well as a very large area of the departments of the Moselle and 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 Meurthe, Moselle, (Meurthe-et-Moselle), Haut-Rhin, Bas-Rhin (and Belfort), Savoie and Haute-Savoie, leading to a total of 83 departments.

Next, part of my cross-sectional analysis for the post-1870 period is performed at the canton (metropolitan area) level. Cantons were created during the French Revolution and, in 1801, departments were divided into about 2,900 cantons. Most cantons include one main city and about a dozen of smaller communes and villages. Two of my variables (the share of refractory clergy and the number of plagues) are reported at the city level. In this case, I should aggregate city-level information to the canton level. However, city data on religiosity always map one-to-one into cantons. As for plagues data, in two cases, two cities that experienced a plague were located in the same canton – I aggregate this information at the canton level. Finally, I perform my cross-sectional analysis in the pre-1870 period at the French arrondissement (county) level. These were also created during the French Revolution. Departments were divided into 370 arrondissements.

C.2 Outcome variables

Industrial employment

Data on industrial employment (1866-1901) are from different French censuses (*Recensement Général*). They represent the share of people active in industry over the total number of people active. These variable is available every five years from 1866 to 1911.

Industrial machines per capita in 1891

Data on the number of industrial machines in 1891 are from the *Annuaire Statistique de la France* and are computed as the number of machines per 1,000. These include fixed steam engines, as well as

locomotives and steamrollers. On average there were 1.8 industrial machines per 1,000 people.

Steam engines per capita in 1839-1847

Data on steam engines are 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 people in the 1839-1847 period.

Share of workers in skill-intensive sectors in 1896

The *Enquête industrielle* provides data by industrial sector and workers' cohort for 1896. For each cohort, I compute the share of workers in skill-intensive sectors. Cohorts are defined as workers between 15-24, 25-34, 35-44. Based on historical literature, I classify "transformation" and "transport" as skill-intensive sectors – as opposed to fishing, agriculture and mining.

(Log) Household Expenditure in 1901, canton level

(Log) household expenditure is a proxy for household income. These data are from *Salaire et cout de la vie* and are available for the year 1901. Household expenditure measures (canton-level) monthly expenditure for a household of four people.

Value added in 1839-1847, arrondissement level

Data on value added in industry in the 1839-1847 period are from Chanut et al. (2000). This represents value added per establishment (obtained by subtracting from revenues the costs of wages and of raw materials).

C.3 Other indicators of religiosity

Cahiers de Doléances in 1788

For each of the 233 *bailliages* (electoral districts) and (generally) for each of the three estates, Hyslop (1934) provides a list of 49 content categories mentioned in the *cahiers de doléances*. I identified four categories reflecting antireligious attitudes. For each *bailliage*, I compute the share of antireligious categories in the *cahiers* of the third estate. In the same way, I also compute the share of conservative categories. I then match the 233 *bailliages* to the departments in my sample and compute the department-level average. Eight departments that report data on the share of refractory clergy have no information on the the *cahiers de doléances*. I end up with 75 observations.

Share of readers of the newspaper La Croix in 1893

This is an index ranging from 1 to 4 that captures the share of readers of the newspaper *La Croix* in 1893 (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 in the 1950s

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

Priest ordinations per capita in the 1950s

These data are from Godfrin and Godfrin (1965). This index, ranging from 1 to 6, captures the priest ordinations per capita in the 1950s.

C.4 Schooling data

Schooling data at the department level are from the *Statistique de l'enseignement primaire*.

Schooling data at the canton level are from the *Statistique Générale de la France* (National Archives - Series: F17)

C.5 Control variables: cross-sectional analysis

Population (several years)

This variable measures the (log) total population at the department level. This information is from the *Recensement Général*.

Average temperature and precipitation

Average temperature and precipitation are measured over the 1701-1800 period. These data are from Franck and Michalopoulos (2017).

Soil suitability

Data on wheat soil suitability are from Finley, Franck, and Johnson (2017).

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.

Distance from Paris

Distance from Paris is the (log) distance (in km) from Paris to the main city in a department.

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).

Enrollment rate

Enrollment rate measures the ratio of students to school-age population (5 to 15 years). These data are from the *Statistique de l'enseignement primaire*.

Knowledge elites

Data on knowledge elites are from Squicciarini and Voigtländer (2015). These represent the density of subscriptions to the *Encyclopédie* of Diderot and d'Alembert.

Share of secondary educated individuals in 1876

The share of secondary of secondary educated individuals represents the share of the male population with secondary education in 1876. These data are from the *Statistique de l'enseignement secondaire*.

Huguenots per capita in 1861

Data on Huguenots are from Mours (1958). I use information on the Huguenot population residing in 1861 in each French department.

Average farm size in 1862

Farm size measures the (log) average farm size in 1862. These data are from Finley et al. (2017)

Value of agricultural production per capita in 1892

Agricultural production includes cereals production and animal husbandry. These data were compiled by Bignon and García-Peñalosa (2018).

Density of the railway system in 1879

Railways density represents the (log) km of the railway network divided by total department surface. These data are from the *Annuaire Statistique de la France*.

C.6 Control variables: panel analysis

Baseline controls (panel analysis), 1861-1901

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 de l'enseignement primaire*.

Phyloxera dummy, 1861-1901

Between 1863 and 1890, the phyloxera 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 I construct a dummy for the year when a department was hit by the pest. In my sample, 35 departments were hit by the phylloxera throughout the period of study.

Fertility rate, 1861-1901

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)

Share of children being vaccinated, 1866-1881

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

Share of urban population, 1861-1901

Using data from the *Recensement Général*, I compute the share of urban population by dividing urban population by total population.

Immigration, 1871-1891

I include the number of immigrants per 100 inhabitants from the *Recensement Général*. 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).

Average travel costs via railways, 1871-1911

These data are from Daudin et al. (2016). Using a four step procedure (that takes into account the progressive development of the railroad network, as well as the price of a train ticket), the authors compute a matrix of bilateral time-varying transport costs. In the main specification, I use average

travel costs to any departments. In robustness checks, I use travel costs to Paris. These data are reported every 10 years.

Extraordinary government subsidies pc, 1871-1906

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.

State spending on education

State spending on education is the (log) state spending on education. These data are from the *Annuaire Statistique de la France* and they are available for the years 1876, 1881 and 1901.

National roads density

National roads density is computed as the (log) total length of national roads divided by total department surface. These data are from the *Annuaire Statistique de la France* and they are available for the years 1881, 1886, 1896, and 1901.

Expenditures for national roads (per km)

Expenditures for national roads are computed as (log) total expenditure divided by the length of national roads (in km). These data are from the *Annuaire Statistique de la France* and they are available for the years 1881, 1886, and 1901.

References

- Abramson, S. F. and C. Boix (2013). The Roots of the Industrial Revolution: Political Institutions or (Socially Embedded) Know-How? APSA 2013 Annual Meeting Paper.
- Altonji, J. G., T. E. Elder, and C. R. Taber (2005). Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools. *Journal of Political Economy* 113(1), 151–184.
- Andrews, D. W. K. and J. H. Stock (2005). Inference with Weak Instruments. NBER Working Paper 313.
- Avenel, H. (1894). *Comment vote la France: dix-huit ans de suffrage universel, 1876-1893*. Librairies-imprimeries réunies.
- Banerjee, A., E. Duflo, Postel-Vinay, and T. Watts (2010). Long Run Health Impacts of Income Shocks: Wine and Phylloxera in 19th Century France. *Review of Economics and Statistics* 92(4), 714–728.
- Becker, S. O. and L. Woessmann (2009). Was Weber Wrong? A Human Capital Theory of Protestant Economic History. *Quarterly Journal of Economics* 124(2), 531–596.
- Bignon, V. and C. García-Peñalosa (2018). The Toll of Tariffs; Protectionism, Education and Fertility in Late 19th Century France. Banque de France Working Paper 690.
- Biraben, J.-N. (1975). *Les hommes et la peste en France et dans les pays européens et méditerranéens*. Paris · La Haye: Mouton.
- Bouillon, J. (1956). Les démocrates-socialistes aux élections de 1849. *Revue française de science politique* (1), 70–95.
- Carus-Wilson, E. M. (1966). *The Woollen Industry. Cambridge Economic History of Europe. Volume II*. Cambridge University Press.
- Chanut, J.-M., J. Heffer, J. Mairesse, and G. Postel-Vinay (2000). *L'Industrie française au milieu du 19e siècle: les enquetes de la statistique générale de la France*. Editions de l'école des hautes études en sciences sociales, Paris.
- Cholvy, G. and Y.-M. Hilaire (2000). *Histoire religieuse de la France (1880-1914)*. Toulouse, Privat.
- Clair, C. (1976). *A History of European Printing*. London: Academic.
- Cohn, J. (2018). *Epidemics: Hate and Compassion from the Plague of Athens to AIDS*. Oxford University Press.
- Conley, T. (1999). GMM Estimation with Cross Sectional Dependence. *Journal of Econometrics* 92, 1–45.
- Crouzet, D. (1996). *La genèse de la Réforme française: 1520-1560*. SEDES.
- Crouzet, D. and J. Good (2001). Circa 1533: Anxieties, Desires, and Dreams. *Journal of Early Modern History* 5(1), 24–61.
- Darby, H. C. and H. Fullard (1970). *The New Cambridge Modern History*, Volume 14. Cambridge: Cambridge University Press.
- Daudin, G., R. Franck, and H. Rapoport (2016). The cultural diffusion of the fertility transition: evidence from internal migration in 19th century France. IZA Discussion Paper 9945.
- Dittmar, J. and R. Meisenzahl (2019). Public Goods Institutions, Human Capital, and Growth: Evidence from German History. *Review of Economic Studies* 2, forthcoming. Working Paper.
- Dittmar, J. E. (2011). Information Technology and Economic Change: The Impact of the Printing Press. *Quarterly Journal of Economics* 126, 1133–1172.

- Emery, R. (1962). *The friars in Medieval France*. Columbia University Press.
- Febvre, L. and H.-J. Martin (1958). *L'Apparition du Livre*. Paris: Albin Michel.
- Finley, T., R. Franck, and N. Johnson (2017). The Effects of Land Redistribution: Evidence from the French Revolution. Working paper.
- Franck, R. and N. Johnson (2016). Can public policies lower religiosity? Evidence from school choice in France, 1878–1902. *Economic History Review* 69(3), 915–944.
- Franck, R. and S. Michalopoulos (2017). Emigration during the French Revolution: consequences in the short and longue durée. Working paper.
- Geissendort, P. (1957). *Livre des habitants de Genève*. Genève: E. Droz.
- Godfrin, J. and P. Godfrin (1965). *Une centrale de presse catholique: la Maison de la bonne presse et ses publications*. Presses universitaires de France.
- Greengrass, M. (1987). *The French Reformation*. Blackwell, Oxford.
- Grew, R. and P. Harrigan (1991). *School, State, and Society: The Growth of Elementary Schooling in Nineteenth-century France – a Quantitative Analysis*. University of Michigan Press.
- Hyslop, B. (1934). *French Nationalism in 1789 According to the General Cahiers*. Cambridge University Press.
- Isambert, F.-A. and J.-P. Terrenoire (1980). *Atlas de la pratique religieuse des catholiques en France*. Paris, Presses de la FNSP-CNRS.
- Jedin, H., K. S. Latourette, and J. Martin (1970). *Atlas Zur Kirchengeschichte*. Freiburg: Herder.
- Le Bras, H. (1986). *Les Trois France*. Odile Jacob-Le Seuil.
- Meloni, G. and J. Swinnen (2014). The Rise and Fall of the World's Largest Wine Exporter – And Its Institutional Legacy. *Journal of Wine Economics* 9(1), 3–33.
- Mours, S. (1958). *Les Églises Réformées en France. Tableaux et Cartes*. Librairie Protestante.
- Murphy, T. (2015). Old habits die hard (sometimes) Can département heterogeneity tell us something about the French fertility decline? *Journal of Economic Growth* 20, 177–122.
- Oster, E. (2017). Unobservable Selection and Coefficient Stability: Theory and Validation. *Journal of Business & Economic Statistics* 0, 1–18. NBER Working Paper 19054.
- Semrad, A. (2015). Modern secondary education and economic performance: the introduction of the gewerbeschule and realschule in nineteenth-century bavaria. *The Economic History Review* 68(4), 1306–1338.
- Sprandel, R. (1968). *Das Eisengewerbe im Mittelalter*. A. Hiersemann.
- Squicciarini, M. and N. Voigtländer (2015). Human Capital and Industrialization: Evidence from the Age of Enlightenment. *Quarterly Journal of Economics* 30(4), 1825–1883.
- Statistique Général de la France (1907). *Salaires et durée du travail, coût de la vie pour certaines catégories d'ouvriers en 1906*. Paris: Imprimerie nationale.
- Sunshine, G. (2003). *Reforming French Protestantism: The Development of Huguenot Ecclesiastical Institutions, 1557–1572*. Truman State University Press.
- Tackett, T. (1986). *Religion, revolution, and regional culture in eighteenth-century France: The Ecclesiastical Oath of 1791*. Princeton, NJ: Princeton University Press.

Zijdeman, R., M. van Leeuwen, D. Rébaudo, and J. Péliissier (2014). Working women in France, nineteenth and twentieth centuries. Where, when, and which women were in work at marriage? *The History of the Family* 19, 537–563.

Overview of the variables used in the paper (1/3)

| Variable Name | Variable Description | Source |
|--|--|--|
| Indicators of Religiosity | | |
| Share refractory clergy | number of clergy not signing the oath divided by the total number of clergy | Tackett (1986) |
| Share of (anti-)religious cahiers | number of "antireligious" contents divided by the total number of contents in the <i>cahiers</i> | Hyslop (1934) |
| Share of readers of <i>La Croix</i> | index (from 1 to 4) for the share of readers of <i>La Croix in 1893</i> | 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 Mass 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) |
| Schooling Variables | | |
| Students per school | (log) number of students divided by total number of schools | Statistique de l'enseignement primaire |
| Number of schools | (log) number of total schools | Statistique de l'enseignement primaire |
| Enrollment rate | number of students divided by school-age population (5-15 years) | Statistique de l'enseignement primaire |
| Share of Catholic schools (canton-level) | Catholic schools divided by total number of schools | National Archives. Series: F17 |
| Outcome Variables | | |
| Share industrial employment | people active in industry divided by total active population | Recensement Général |
| Machines per capita | number of machineries per 1,000 inhabitants | Annuaire Statistique de la France |
| Steam engines per capita | number of steam engine per 1,000 inhabitants | Chanut et al. (2000) |
| Household expenditure | (log) household expenditure – canton level | Salaire et cout de la vie |
| Value added in 1839-1847 | (log) revenues minus wages and raw material – arrondiss. level | Chanut et al. (2000) |

Overview of the variables used in the paper (2/3)

| Variable Name | Variable Description | Source |
|--|--|--|
| Cross-Sectional Analysis (department level): Baseline Controls | | |
| Population | (log) total department population | Recensement Général |
| Average temperature | average temperature over the 1701-1800 period | Franck and Michalopoulos (2017) |
| Average precipitation | average precipitation over the 1701-1800 period | Franck and Michalopoulos (2017) |
| Soil suitability | wheat soil suitability | Finley et al. (2017) |
| Pre-Industrial activities | (log) number of pre-industrial centers | Carus-Wilson (1966); Sprandel (1968) |
| Distance from Paris | (log) distance (in km) from Paris | |
| Pays d'élection | dummy for departments located in <i>pays d'élection</i> | Le Bras (1986) |
| Knowledge elites | density of subscriptions to the <i>Encyclopedie</i> of Diderot and d'Alembert | Squicciarini and Voigtlander (2015) |
| Cross-Sectional Analysis (department level): Additional Controls | | |
| Share secondary education | secondary-educated individuals divided by total male population | Statistique de l'enseignement secondaire |
| Huguenots pc | number of huguenots divided by total population | Mours (1958) |
| Farm size | (log) average farm size in 1862 | Finley et al. (2017) |
| Value agric. production pc | (log) value of agricultural production (cereal and animal husbandry) divided by total population | Bignon and García-Peñalosa (2018) |
| Railway density | (log) km of railway network divided by total surface | Annuaire Statistique de la France |
| Cross-Sectional Analysis: Canton-Level Controls | | |
| Population | (log) total canton population in 1894 | National Archives Series: F17 |
| Atlantic port | dummy for cantons having a port on the Atlantic Ocean | |
| Mediterranean port | dummy for cantons having a port on the Mediterranean Sea | |

Overview of the variables used in the paper (3/3)

| Variable Name | Variable Description | Source |
|--------------------------------------|---|---|
| Panel Analysis: Controls | | |
| Population | (log) total department population | Recensement Général |
| Phylxxxera | dummy equal to 1 for the year in which a department was hit by the phylxxxera | Banerjee et al. (2010) |
| Fertility rate | I_g Princeton fertility index | Murphy (2015) |
| Share of vaccinated children | children being vaccinated divided by the total number of births | Rapport sur les vaccinations |
| Share of urban population | urban population divided by total population | Recensement Général |
| Immigration | number of immigrants per 100 inhabitants | Recensement Général |
| Department subsidies pc | government extraordinary subsidies divided by total population | <i>Bulletin des lois de la République française</i> |
| Avg. travel costs via railway | average travel costs via railways to any departments | Daudin et al. (2016) |
| Data used in the robustness checks | | |
| Share of conservative cahiers | number of “conservative” contents divided by the total number of contents in the <i>cahiers</i> | Hyslop (1934) |
| 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) |
| Share “modern” secondary education | students in “modern” secondary schools divided by students in secondary schools | Annuaire Statistique de la France |
| Avg. travel costs to Paris | average travel costs via railways to Paris | Daudin et al. (2016) |
| Roads density | (log) length of national roads divided by total surface | Annuaire Statistique de la France |
| Expenditure on roads | (log) total expenditure divided by the length of national roads (in km) | Annuaire Statistique de la France |
| Share of buildings in bad conditions | school buildings in bad conditions over the total number of buildings in 1873 | National Archives Series: F17 |
| Share student attending in summer | student attending in summer over total number of student in 1876 | Statistique de l'enseignement primaire |
| Plagues, 1517-1598 | number of plagues in the 1517-98 period over the total number of plagues (in 1347-1786) | Biraben (1975) |
| Early Protestant | dummy for cantons from which French refugees escaped to Geneva | Geissendort (1957) |
| Medieval convents | (log) number of medieval convents in each canton | Emery (1962) |