Religion and Growth*

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Abstract

We use the elements of a macroeconomic production function—physical capital, human capital, labor, and technology—together with standard growth models to frame the role of religion in economic growth. Unifying a growing literature, we argue that religion can enhance or impinge upon economic growth through all four elements because it shapes individual preferences, societal norms, and institutions. Religion affects physical capital accumulation by influencing thrift and financial development. It affects human capital through both religious and secular education. It affects population and labor by influencing work effort, fertility, and the demographic transition. And it affects total factor productivity by constraining or unleashing technological change and through rituals, legal institutions, political economy, and conflict. Synthesizing a disjoint literature in this way opens many interesting directions for future research.

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1. Introduction

Why some countries are rich and some are poor is among the most important issues studied by economists and is central to the literature on economic growth and development (e.g., Smith 1776; Easterlin 1981; Landes 1998; Hall and Jones 1999; Jones 2016; Koyama and Rubin 2022). On the theoretical front, the neoclassical growth model independently developed by Solow (1956) and Swan (1956) suggested that the accumulation of physical capital led to transitional growth whereas long-run growth was ultimately driven by technological advances, which were taken as exogenous. In his Nobel-prize winning contribution to endogenous growth theory, Romer (1990) emphasized that technological change is the result of efforts by researchers and entrepreneurs who respond to economic incentives. These efforts are affected by factors such as education and basic research funding which ultimately influence an economy's long-run trajectory. In a unified growth theory, Galor (2011) stressed that during most of human existence, technological progress was offset by population growth, and living standards were near subsistence. An escape from this Malthusian trap required a fertility transition that was facilitated by a technology-induced increase in the return to human capital, opening a perspective to understand the transition to modern growth.

Yet, for all the insights this literature provides into the causes of economic growth, it does not provide broad coverage of one of the most ubiquitous social phenomena: religion.[1] The subject indices of the Handbook of Economic Growth refer to coverage of "religion" (or "relig*") on only three of 1822 pages in volume 1 (2005) and four of 1070 pages in volume 2 (2014).[2] It is puzzling why this is the case. In the past two decades, a large literature has emerged showing many ways in which religion affects various elements that either enhance or impinge upon economic growth, both historically and in the present, and both in rich and poor countries. In most societies, religion plays some role in determining nearly every input into growth models—physical capital, human capital, population/labor, and technology. What is the growth literature missing by ignoring the role of religion? Can religious differences over time and space help explain differences in growth?

[1] There are notable exceptions. For instance, Barro and McCleary (2003) present cross-country regressions connecting various aspects of religion to growth. The robustness of these results is questioned by Durlauf, Kourtellos, and Tan (2012).

[2] Similarly, Temple's (1999) survey of empirical growth research does not mention religion at all, only briefly referring to cultural barriers to growth.

In this paper, we provide a framework for conceptualizing the ways in which religion can affect economic growth.[3] We propose to incorporate the role of religion into existing growth models that build on a standard macroeconomic production function, consistent with much of the existing growth literature. Central to our framework is the idea that religion is a key determinant of the inputs considered in these models. It is not our intention to simply survey the literature on the economics of religion. Nor is it our intention to provide a laundry list of the role each major religion has played for economic outcomes. Instead, we attempt to organize various studies of different denominations, historical periods, and geographic locations to highlight the aggregate effect of religion on economic growth.

We focus on how different aspects of religion, religious practice, religious institutions, and religious doctrine impinge on inputs into different growth models by shaping preferences, norms, values, laws, and institutions. First, we consider the role that religion plays in the accumulation of physical capital, building on the neoclassical setup used in the Solow-Swan model. Various studies, dating back to those of Max Weber, have connected religion to thrift, saving, and financial development—important components of capital accumulation that vary across societies and over time. Taken in aggregate, they reveal a role for religion in physical capital formation, or lack thereof, across historical and modern societies. Second, we cover the role of religion for growth through the accumulation of human capital in light of augmented neoclassical models and endogenous growth models. Religion has been shown to exert both positive and negative effects on human capital development, particularly through its role in secular and religious education. Human capital is therefore a key mechanism through which religion indirectly affects economic growth. Third, our framework covers the role that religion plays in influencing the amount of labor available in productive activities. Religion might influence labor-force participation by encouraging or discouraging work effort. Lower population growth tends to allow for faster economic growth in the transition to a higher steady-state level of per-capita income. Unified growth theory sheds light on the role that religion plays in allowing societies to escape the demographic trap by affecting fertility. Fourth, leaning on endogenous growth models, the

[3] Following the typical usage in social sciences, we think of religion as "any shared set of beliefs, activities, and institutions premised upon faith in supernatural forces" (Iannaccone 1998), although it may not be necessary to associate religion with the supernatural. For instance, Confucianism is often considered a religion although it is largely disinterested in the supernatural, but in fact the idea of celestial wisdom and the worship (in practice) of Confucius as a "god" of culture in many temples speak at least to religious elements. We follow the definition including the supernatural association because it aligns with most studies of religion and growth in the social sciences.

framework explores the role that religion plays in technological change. Some religious doctrines actively discourage innovation, while in other cases the link between religion and innovation is indirect (for instance, through education or political economy). The framework also considers various additional roles that religion plays in affecting total factor productivity by shaping rituals, norms, legal institutions, political economy, state development, and conflict.

This framework allows us to unify a relatively disjoint literature connecting religion to several aspects relevant for economic growth. We incorporate recent works in the economics of religion which reveal microeconomic consequences of religious behavior, often in specific contexts. The authors of many of these studies answer narrow questions with a high degree of precision. By construction—and due to the incentives faced in publishing in top-tier social-science journals—such studies at most hint at their implications for economic growth, and many do not even do this. This is appropriate in studies of specific consequences of religious behavior or institutions. However, it does not mean that such studies tell us little about broader economic growth. When taken in aggregate, they paint a clear picture of just how important religion can be for economic growth. Our primary goal in writing this article is to provide a framework that aggregates these studies in a coherent fashion, thereby revealing the importance of various religious practices, doctrines, and institutions for macro phenomena.

By providing a framework for understanding the many pathways through which religion augments or impedes economic growth, we hope to underscore to economists interested in growth the potential importance of religion for the very phenomena in which they are interested. The literature in the economics of religion suggests that we need to move beyond the conventional inputs into growth models, because religion is a "deeper" determinant that can affect these inputs in various—and sometimes nonobvious—ways. On the converse, another central goal of this article is to reveal to economists and political scientists interested in religion how the aggregation of their works has advanced what we know about the process of economic growth. Such insights are often not obvious from reading individual articles. Only in aggregate is the impact clear.

Such a unifying framework has not been provided before, differentiating this article from previous surveys that overviewed various aspects of the economics of religion. The surveys of Iannaccone (1998) and Iyer (2016) provide general overviews of the literature on the economics of religion at different points in time, focusing on how religious groups and institutions work and the resulting economic implications. Two other recent surveys cover specific religions: Kuran

(2018) on the economics of Islam and Becker, Pfaff, and Rubin (2016) on the Protestant Reformation. Our recent handbook chapter (Becker, Rubin, and Woessmann 2021) surveys the role that the three Abrahamic religions have played in economic history, confined to phenomena prior to World War II. While there is natural overlap of the present article with each of these surveys, it differs from all of them in two important ways. First, the existing surveys are not concerned with growth per se. They thus do not provide a framework to think about how various features of religion aggregate to contribute to growth and how the individual works combine to tell a broader story on economic growth. As a consequence, they also do not cover many of the works that we cover here. Second, by contrast, the existing surveys cover works on the effects of religion on non-growth-related outcomes, on determinants of religious behavior, and on other aspects of the economics of religion that are unrelated to growth such as the economics of doctrine and the industrial organization of religious institutions—neither of which is the topic of our article.

While our focus on economic growth provides many insights for the process of economic development, it makes sense to delineate the concepts of growth and development. We think of growth as a change in the aggregate output of an economy—be it in initially rich or poor countries—as covered by the factors featured in standard growth models. This is distinct from the modern literature on economic development, which is often conceived as relating to the economics of "developing" or "poor" countries. While we cover any part of this literature that relates to the growth of these countries, the multiple aspects of religion in developing countries that do not directly provide insight into the countries' growth processes are beyond our scope. For example, we do not cover how religion affects behaviors of poor people in developing countries if these behaviors are not central to macroeconomic growth. This unfortunately means that papers on the developing world are under-represented in this survey, as most of the economics literature on religion in these countries studies development, not growth, outcomes.[4]

Relatedly, the process of economic development is sometimes conceived as a multi-faceted process that is not just about growth of aggregate output, but also about the fundamental transformation of an economy (Kuznets 1966). This encompasses its sectoral structure, its demography and economic geography, and the entire social and institutional setup. Again, we

[4] Examples of recent work on religion and development outcomes include papers on Ghana (Auriol et al. 2020), India (Menon and McQueeney 2020), transition economies (Popova 2014), and Brazil (Cavalcanti et al. 2022).

cover work in this broader field to the extent that these transformations are a crucial ingredient for aggregate economies to grow.

Finally, this article focuses on the various ways that religion affects economic growth and *not* the reverse pathway. Such works, most prominently on the secularization hypothesis (which sees economic growth as a potential cause of the decline in religiosity in the West), is the subject of a large literature in the social sciences and was covered extensively in previous surveys by Iannaccone (1998) and Iyer (2016). Secularization, of course, may affect economic growth through various channels including education, innovation, and labor productivity, and we cover these effects of secularization on inputs of growth models.[5]

There are two important limitations in the coverage of our survey. First, our coverage of religions outside the three Abrahamic faiths is regrettably limited, which is owed to the focus in existing research.[6] Second, our treatment falls short of a systematic coverage of every possible influence of religion on the different growth inputs, which is inevitable as many possible channels have not been addressed in existing work. Instead, we aim to cover the research that exists within established frameworks for studying growth.

This paper is organized as follows. Section 2 lays out the overall conceptual framework which builds on existing growth models. Section 3 discusses the role of religion in physical capital accumulation, Section 4 the role of religion in human capital accumulation, Section 5 the connection of religion with population and labor, and Section 6 the role of religion in total factor productivity. Section 7 concludes with some overall lessons learned on the role of religion in economic growth and a discussion of open questions that provide fruitful avenues for future research in this rapidly growing field.

[5] For instance, Strulik (2016) studies the link between secularization and long-run growth by introducing religious identity choice in an endogenous growth model. A secular identity allows an individual to derive more pleasure from consumption than religious individuals, leading secular individuals to work harder and to save more in order to experience this pleasure from consumption. In line with increased consumerism in a secularizing society, shop-opening times on Sundays have been liberated (Gruber and Hungerman 2008).

[6] We conjecture that many of the highlighted patterns apply to religions more generally. We hope that this survey will inspire specialists in Asia, Africa, Latin America, and elsewhere to research the similarities and differences.

2. Conceptual Framework

The key proposition of this article is that religion can affect economic growth through various channels. To frame our discussion, we use a canonical macroeconomic production function that expresses output (*Y*) at time *t* as a function of a set of intermediate input factors:

$$Y_t = Y(K_t, L_t, h_t, A_t). \tag{1}$$

As is common in growth research, we consider four groups of inputs: physical capital (*K*), labor (*L*), and human capital per worker (*h*) as factors of production plus total factor productivity (*A*) which depicts how the production factors are transformed into output. Although this is in no way obligatory, for concreteness we can think of a standard functional form of the Cobb-Douglas shape:

$$Y_t = K_t^{\alpha}(h_t L_t)^{1-\alpha} A_t, \tag{2}$$

where the production elasticities of physical capital (α) and human-capital-augmented labor ($1-\alpha$) are constrained to sum to 1—implying constant returns to scale—and where productivity augments both of these factors.

The central notion in this article is that religion is related to each of the four elements of the production function and, as such, has effects on growth through each of these four channels. Modern growth theory tends to consider the indicated elements of the production function as "proximate" determinants of growth (e.g., Romer 2019; Ashraf and Weil, forthcoming). These proximate determinants are explained by "deeper" or "fundamental" determinants, which may include aspects such as geography, institutions, and culture (e.g., Acemoglu, Johnson, and Robinson 2005; Spolaore and Wacziarg 2013; Mokyr 2016; Koyama and Rubin 2022). It is our contention that as a crucial aspect of culture, religion is one of the many "fundamental" determinants of each of the four inputs.

Conceptually, we think of the role of religion—the shared set of beliefs, activities, and institutions—in two primary ways. First, religion affects individual preferences. By its very nature, religion can have a bearing on individuals' altruism, reciprocity, trust, patience, risk-taking, and other preferences. These preferences directly enter the utility function and thus steer economic decisions and behavior. Future-oriented preferences such as patience and risk-taking will have a bearing on the willingness to save and on educational efforts. Similarly, religion affects people's (work) ethic and motivation.

Second, religion also shapes the rules and regulations that embed and constrain societal interaction. These come in two kinds. On the one hand, religion defines many norms and values—such as rules on family, fertility, or openness to (technological) change—often in informal ways that govern people's actions. On the other hand, religion sets formal rules, laws, and institutions—such as restrictions on interest or the authorization of specific forms of corporate organization and market exchange—and affects state development by legitimating political leadership. As both individual preferences and societal norms have to be conveyed, religious education can take on a particular role in passing the role of religion on from generation to generation. Religion can also have unintended side effects. For example, when Martin Luther urged his followers to educate their children so that they could read God's word in the bible, he probably had no intention to build economically relevant human capital.

We further develop the relation of religion with each of the four elements of the macroeconomic production function in the first sub-section of each of the following four sections. Many of the discussed papers fit directly into the structure as they clearly focus on the effect of religion on one of the four elements. Some papers tend to cover more than one element or treat the reduced-form effect of religion on growth more generally, and we will discuss them in the respective section where they fit best in our view.

3. Physical Capital Accumulation

In this section, we argue that religion is a fundamental determinant of the accumulation of physical capital as an important input of growth models. We first lay out how religion can be depicted in standard neoclassical growth models (Section 3.1). In light of this, we review two major literatures that study the role of religion for thrift and saving (Section 3.2) and the role of religion for financial development (Section 3.3).

3.1 Religion, Physical Capital, and Economic Growth

In the production framework of equation (2), the accumulation of physical capital (*K*) is related to increases in output. In a basic capital accumulation equation, capital in period *t* is the sum of the previous period's capital and investment (*I*), minus depreciation (*D*):

$$K_t = K_{t-1} + I_t - D_t. \tag{3}$$

Investment is central for capital accumulation in the long run; without investment, the capital stock eventually depreciates. In the Solow-Swan neoclassical model, higher investment rates lead to higher physical capital and higher output per worker. Thus, an increase in the investment rate leads to economic growth in the transition from one steady state to another.

As investment requires one to forgo consumption, any act of investment corresponds to an act of saving. Therefore, in the neoclassical model, differences in saving rates have a direct bearing on steady-state output. Furthermore, the development of financial institutions that intermediate between savers and investors can have an impact on the amount of resources that are available for investment in a society.

When depicting the role of religion in capital accumulation, it is useful to break investment motives down into two components: investment motivated by extrinsic (x_t) and intrinsic (n_t) incentives to save:

$$I_t = I(x_t, n_t). \tag{4}$$

Extrinsic incentives include the rate of return, risk, the availability of financial institutions, property rights, etc. Obviously, there are many roots of these incentives that have nothing to do with religion. However, religion plays a role in shaping these incentives by shaping norms and institutions that set the rules of the game. Examples include usury laws, restrictions on certain types of investments, and Islamic finance.

Religion also affects intrinsic incentives to save. The most famous example was given by Max Weber, who viewed thriftiness as a peculiarly Protestant trait (see McCleary and Barro 2019, ch. 3, for a recent summary). To the extent that religion impacts individuals' intertemporal preferences such as patience and risk-taking, it has a bearing on saving, investment, and growth.

3.2 Thrift, Saving, and Capital Accumulation: Protestant Ethic I

We start with what is probably the first major social-science argument that connects religious belief to economic development: the Weber (1904/05) thesis of a Protestant Ethic. Weber argued that Protestants are characterized by their own distinct ethic which influences their economic behaviors. His study was motivated by the observation that in Baden (a state in southwest Germany) Protestants earned more than Catholics. While Protestants in Baden were mostly Lutheran, Weber's focus was on ascetic forms of Protestantism such as Calvinism or Methodism.

Weber (1904/05, p. 118) quotes John Wesley (1703-1791), the founding father of Methodism, "as a motto for everything" that aligns with Weber's view: "For religion must necessarily produce both industry and frugality, and these cannot but produce riches." In the German original Weber quotes the English words "industry" (which he translates as "*Arbeitsamkeit*") and "frugality" (which he translates as "*Sparsamkeit*"). In the literature, "work effort" is commonly used to capture the hard work allegedly put in by ascetic Protestants, and "thrift" is commonly used as the re-translation of Weber's German word "*Sparsamkeit*".

Paying particular attention to Calvinism, Weber (1904/05, p. 56) describes predestination as Calvinism's most characteristic doctrine: that only some human beings are chosen to be saved from damnation, the choice being predetermined by God. Calvinists could not be certain whether they are among the elect, but success in a calling came to be regarded as a sign of being one of the elect. Work effort and thrift could be pathways to success.

In a national account framework, saving is the mirror image of investment. The literature focuses on measures of attitudes towards thriftiness, saving, and wealth. While the Weberian focus is on Protestantism, the broader empirical question is whether denominational differences in attitudes towards thriftiness may give rise to differences in saving behavior which in turn influence capital accumulation and growth. Using data from the World Values Survey (WVS), Guiso, Sapienza, and Zingales (2003) show that individuals who were raised religiously are more likely to consider it "important that children be encouraged to learn at home 'thrift, saving money and things'." Yet, when looking at specific denominations in the present day, Catholics and Protestants are roughly equally likely to support thriftiness but support it more strongly than Jews, Muslims, Hindus, Buddhists, and "Others". While the fact that Protestants do not put more emphasis on thriftiness than Catholics is at odds with Weber's thesis (which, to be fair, was put forth over a century ago), the fact that there are differences across religious groups is consistent with a role for religion in thriftiness. Relatedly, Andersen et al. (2017) focus on the Cistercians, a Catholic order present in many parts of medieval Europe, which Weber (1904/05, p. 72) himself singled out as encompassing values with a clear antecedent to the Protestant ethic. If the Cistercians had an impact on cultural values of the population around them, those values may have been passed on over generations. Using the same WVS question, Andersen et al. find that respondents in European regions that historically had Cistercian monasteries do indeed consider it important that children learn thrift, which influences their economic behavior as adults.

Weber suggested that Protestantism might have led to an "accumulation of capital through ascetic compulsion to save" (Weber 1905, p. 191). Alaoui and Sandroni (2018) look at the link between ascetic compulsion to accumulate wealth in secular Protestantism and the Calvinist teaching of predestination, as proposed by Weber, from a theoretical standpoint. The ascetic compulsion to save can be modeled as a direct utility from owning wealth, above and beyond wealth's instrumental value in procuring consumption and other benefits. The Calvinist teaching of predestination can be thought of as inducing a strict preference for early resolution of uncertainty about God's grace (during one's lifetime instead of afterlife). The authors show an exact equivalence between the two classes of utility functions, thereby providing a foundation for the use of direct preferences for wealth in empirical work. Looking at Prussia, the largest state in the 19th-century German Empire, Kersting, Wohnsiedler, and Wolf (2020) do not, however, find differences in savings per capita and in the number of savings banks across counties with a Protestant versus Catholic majority. This is again inconsistent with systematic differences in saving behaviors between Catholics and Protestants.

While the work described so far has looked at the population at large, Baxamusa and Jalal (2016) analyze corporate decisions taken by American CEOs depending on their religious denomination. Firms with Catholic CEOs invest less than firms with Protestant CEOs, and the decisions of Catholic CEOs are associated with lower firm value. The authors attribute this to denomination-specific personal preferences of CEOs.

The takeaway from the empirical literature that tests aspects of the Weber thesis relating to denominational differences in saving, thriftiness, and wealth is rather mixed. While Protestants have been found to be thriftier in some contexts, those results do not apply universally, and—in line with Weber's own work—Protestants are by no means the first group displaying an "ethic" of thriftiness. Weber's legacy is still significant as he has stimulated generations of social scientists to explore the link between religion and economics more broadly and beyond simple Protestant-Catholic comparisons.

3.3 Financial Development

The capacity of individuals to invest in physical capital is also determined by the development of the financial sector which matches saving to investment. We cover two leading applications of how religion affects financial development and thereby broader growth trajectories: the role of

restrictions on interest in Christianity and Islam (Section 3.3.1) and rules on finance and corporations in Islam (Section 3.3.2).

3.3.1 Interest Restrictions in Christianity and Islam

Access to credit is central to investment, as it matches those with liquid funds to those willing and able to take on large-scale projects, while channeling saving to more productive uses. However, credit has not always been freely available, even to those with the means to repay loans and a history of trustworthiness. In many societies, both historically and today, taking interest on loans was banned. Sanctions could affect either extrinsic incentives to borrow or lend at interest, such as the invalidation of contracts held to be usurious, or intrinsic motivations, such as the state of one's soul or losing one's place in society.

The Abrahamic faiths have all at one point in time placed restrictions on lending at interest. The Jewish usury ban, laid out in Exodus 22:25, Deuteronomy 23:19-20, and Leviticus 25:35-37, was interpreted to only apply to lending to fellow Jews. This interpretation would play an important role in medieval Europe, where Jews were among the primary lenders to Christians. Although there was no explicit ban on interest in the New Testament, the Catholic Church formally banned lending at interest at the Council of Nicaea in 325 CE (Rubin 2009). This was followed by increasingly harsh restrictions over the next millennium at various church synods and councils. In Islam, the Qur'an has numerous passages detailing the sinfulness of taking interest (*riba*) (Rubin 2011).[7]

Religious restrictions on interest arose in a setting where most loans were taken for consumption. After a string of bad harvests, poor farmers would borrow at high interest rates just to make it to the next season. This would cause a host of social ills including widespread debt peonage and child slavery (Rubin 2011). However, once trade and commercial activity were sufficiently widespread, interest restrictions impinged on *investment* lending. Christians and Muslims found ways of skirting interest restrictions via transactions that were muddled enough to not openly contradict doctrine. For example, a rudimentary workaround known in Medina as early as the eighth century was the double sale (*mukhātara*), in which a borrower sells to a lender some commodity for cash and then immediately buys it back for a greater sum payable later. This is

[7] There are several Qur'anic passages addressing the sinfulness of riba—a pre-Islamic practice in which a loan's principal was doubled and redoubled when the debtor was unable to pay (Rahman 1964). Muslims quickly equated riba with interest of any kind, although the Qu'ran is silent on such transactions.

tantamount to a loan at interest, with the interest being the difference between the two prices (Rubin 2011). Similar stratagems were widely used in Europe and the Middle East to evade interest restrictions.

Despite these workarounds, the literature points to two mechanisms how interest restrictions mattered for growth: path dependence and institutional formation. In Western Europe, secular authorities began to permit moderate interest in the 12th and 13th centuries as commerce began to flow more rapidly and merchants sought relief from interest restrictions. The Church was slow to catch up and continued its campaign against usury (Noonan 1957). Meanwhile, openly lending at interest remained prohibited in most Muslim polities unless some sort of stratagem (*hila*) were employed, although such restrictions were eased (though not eliminated) in the Ottoman Empire (Rubin 2011; Kuran and Rubin 2018). In other words, both intrinsic and extrinsic motivation to openly lend at interest was stifled in the Middle East.

Usury laws had a significant impact on the development of financial and banking institutions across Western Europe and the Middle East. Rubin (2010) argues that differences in bills of exchange (debt instruments) arising from differences in usury restrictions incentivized Europeans, but not Middle Easterners, to expand operations interregionally. Such expansion was exemplified by the Medici bank, whose hub-and-spoke system gave it access to most of the financial centers of Europe (de Roover 1963). A similar expansion did not happen in the Middle East, where partnerships remained small and of limited duration (Kuran 2005, 2011). More generally, recent research indicates that where access to interest-bearing loans in the past was limited, there still tends to be less access to credit in the present. Such lack of credit access has clear negative consequences for growth (King and Levine 1993; Guiso, Sapienza, and Zingales 2004). Grosjean (2011) tests the impact of past financial access to present-day finance by studying within-country variation in Ottoman rule in six countries in Southeastern Europe that were partly ruled by the Ottomans from the 14th through 20th centuries. She finds that those regions that fell under Ottoman rule have 10 percent less bank penetration in the present across countries and 4 percent less penetration within country. Walker (2020) provides evidence that such historical differences may have also affected the propensity to save in the present. Employing a lab-in-the-field experiment and a regression discontinuity across an old Ottoman-Habsburg border in Romania, she finds that people living on the Habsburg side have greater access to banks and save significantly more, which allows them to smooth consumption when faced with negative shocks.

Usury restrictions also shaped the development of financial institutions in medieval and early modern Europe. For instance, in the 15th century, the Church accepted the validity of Monte di Pietà, a "pious" institution that lent at low rates and was supposed to be an act of charity and make no profit. Originally meant to compete with Jewish lenders on the Italian peninsula, the Monti quickly developed features such as charging interest, accepting deposits, and remunerating deposits that formed the basis for modern banking in Italy. Pascali (2016) finds that cities with a Monte di Pietà during the Renaissance have significantly greater access to credit and higher banking branch density in the present and consequently have higher GDP per capita and aggregate productivity. Historical intrinsic and extrinsic motivations to lend for investment can thus become institutionalized over time and result in more growth than in places where such motivations were historically absent.

3.3.2 Islamic Finance, Commercial Enterprises, and Capital Accumulation

Religion has played a role in shaping many financial systems throughout the world. One important example comes from Islamic law, which traditionally held purview over many aspects of commerce and finance including partnerships, trusts, and inheritance, and it determined the legality of financial instruments (Kuran 2011, 2018). According to Michalopoulos, Naghavi, and Prarolo (2016), early Islamic laws emerged to encourage dynamic redistribution. While this helped expand trade by reducing the incentive of Muslims to raid other Muslims, it reduced the capacity of the commercial elite to accumulate wealth. The different features of Islamic law had many unforeseeable consequences.

One direct consequence of the ubiquity of Islamic law is that it was biased in favor of men, Muslims, and elites (Kuran and Lustig 2012; Coşgel and Ergene 2014). This diminished extrinsic incentives to invest in many types of economic activities, especially for those groups not favored by the courts: in case of a default, a woman, religious minority, or non-elite was unlikely to win a court case even if the facts were in their favor. Men, Muslims, and elites paid a price for their privilege in the form of higher interest rates. In a society where the average real interest rate was around 19 percent, these groups paid a 1.9-3.4 percentage point surcharge on their borrowing (Kuran and Rubin 2018). As these groups consisted very disproportionately of people with the financial capacity to found and expand commercial enterprises, the cumulative effect of the deterred investments likely limited economic growth.

Islamic law may have had an even greater dampening effect on investment in large commercial and financial enterprises. Until the 19th century, Islamic partnerships remained small (generally involving no more than two or three people) and lasted for a short duration (Kuran 2005). This meant that opportunities for capital investment were inherently limited by the legal and organizational infrastructure available to prospective merchants. Kuran (2005, 2011) explains that the relative size and duration of partnerships was not due to the "unchangeable" nature of Islamic law. However, the fact that Islamic law dominated commercial activity meant that there was relatively little *demand* for legal changes that would have supported larger and more durable enterprises.

According to Kuran (2005, 2011), two aspects of Islamic law stifled incentives to invest in larger enterprises: partnership and inheritance law. The relevant feature of partnership law was that partnerships were forced to disband upon the death or incapacitation of a partner. This was also a feature of the *commenda* partnership commonly employed in medieval Italian commerce. Yet, unlike Italian partnerships, Islamic partnerships did not ultimately evolve into larger, more durable partnerships capable of attracting more investment. Kuran points to inheritance law as a key difference between the two regions. It was straightforward for the heirs of a recently deceased or incapacitated partner to reconstitute an Islamic partnership and reap the proceeds of an uninterrupted venture. However, Islamic inheritance law laid out a pre-specified split among many heirs. If any one of the heirs were in a bind and needed the assets, they could force the dissolution of the partnership. This could in turn lead to significant losses, especially when goods were in transit or had to be sold at below-market prices. Kuran argues that this dampened demand for large and long-lasting ventures in the first place. Hence, the type of financial evolution that happened in Europe—which ultimately resulted in the advent of tradable shares, limited liability, the corporate form, and a host of other innovations that increased incentives for the capital-rich to invest—never emerged indigenously in the Middle East.

While Islamic inheritance law may have reduced demand for larger and more durable commercial organizations, it was possible to circumvent. Yet, as Kuran (2001, 2011) notes, one of the primary means of circumvention, the waqf, also played a role in retarding long-run capital investment and economic growth in the Middle East. The waqf was an Islamic trust typically meant to endow local public goods such as a madrasa (school), mosque, water fountain, or hospital. Waqf endowments could be used to circumvent Islamic inheritance law. A wealthy Muslim could choose

an heir by endowing a waqf and appointing the heir to administer it, with a handsome salary that would keep family assets consolidated. This practice greatly restricted the capacity of the heir to invest their assets, most of which were tied up in the waqf. By law, a waqf had to serve a purpose as dictated by its founder which could not be changed after the founders' death. Hence, if investment opportunities arose that were not in the founding deed (even if unforeseeable at the time of founding), waqf assets could not be used on such a purpose. Kuran views this as a key mechanism through which the waqf dampened long-run economic growth in the Middle East.

A related innovation that facilitated investment in the Ottoman Empire was the cash waqf. In contrast to the traditional waqf which funded an immovable object, the cash waqf—which was formed to lend money—by construction funded a movable object. Moreover, it earned income by lending at interest, typically via legally-approved mechanisms. This caused immense controversy for at least a century after their initial spread in the 15th-16th centuries. Ultimately, their legality was approved on the basis that they were so widespread and improved the welfare of the people (Mandaville 1979, pp. 297-98; Imber 1997, pp. 144-45). The cash waqf served as a substitute for banks, although they were more rigid and limited in purpose. As part of the waqf system, they were mandated to have a pre-specified purpose that could not be altered. This meant that most cash waqfs could not take on the type of activities typical of banking such as accepting deposits, branching out to meet demand, or even adjusting interest rates to market conditions. Hence, although the cash waqf was the organizational form most likely to transition into something akin to modern banking, it never did. The first Middle Eastern banks were formed in the mid-19th century with British and French capital.

It was not until the 20th century that an "Islamic banking" system emerged distinct from the type of banking found in the West. Now a $2 trillion industry, the Islamic banking system, although in many respects similar to the Western banking system, has many unique elements. Interest-based contracts are replaced with similar debt contracts that do not explicitly charge interest. In theory, excessive risk-taking is avoided via risk-sharing contracts involving a symmetrical risk/return among participants. There must be some material object underlying transactions, meaning that options and derivatives are banned. Islamic banking also prohibits sinful transactions (e.g., those related to pork, alcohol, or gambling) (Khan 2010). There is much debate regarding how different the Islamic banking system is from conventional banking (Hassan and Aliyu 2018). Some argue that Islamic banking is de facto Western banking with some de jure appeals to Islamic principles,

especially partnerships (Kuran 2004a, Khan 2010). Beck, Demirgüç-Kunt, and Merrouche (2013) qualify this argument, noting that while there is little difference in business orientation between Islamic and conventional banks, the former tend to be better capitalized and have higher asset quality.[8] This allowed them to survive the 2008 financial crisis in a better position than the average conventional bank. Likewise, Islamic banks tend to be more efficient on net (reflecting high managerial quality) but less efficient in the type of services provided (Johnes, Izzeldin, and Pappas 2014). Islamic loans also have a significantly lower default rate than conventional loans, especially during Ramadan, perhaps suggesting a religious motive to avoid default (Baele, Farooq, and Ongena 2014). For these reasons, Islamic banking has become an important vehicle for attracting investment in Muslim-majority countries. It follows that the presence and depth of Islamic banking has been found to be positively associated with economic growth (Imam and Kpodar 2016).

Overall, there are many clear examples of episodes where religion affected economic growth by promoting or hindering the accumulation of physical capital. These worked both through particular preferences for saving among religious populations and through regulations and institutions that governed the financing of investments.

4. Human Capital

This section addresses many of the ways in which religion affects economic growth through its effects on the accumulation of human capital. We begin by discussing the role of religion for human capital accumulation in the contexts of augmented neoclassical models and endogenous growth models, as well as the role of religious education (Section 4.1). We then survey several literatures that highlight different aspects of how religions help or hinder economic growth through religious education (Section 4.2) and secular education (Section 4.3).

4.1 Religion, Education, and Economic Growth

Religions often directly affect both the religious and secular education of their followers. Growth models tend to depict the effects of investment in secular education: labor can be augmented by

[8] This analysis is supported by Khediri, Charfeddine, and Youssef (2015) who find that Islamic banks are, on average, more profitable, liquid, and capitalized than conventional banks in Gulf Cooperation Council (GCC) countries over the period 2003-2010. Similarly, Mollah et al. (2017) find that Islamic banks achieve greater performance through greater risk-taking and are more capitalized than conventional banks.

investment in human capital. There are three main classes of growth models that emphasize distinct mechanisms through which human capital may affect economic growth.

First, in neoclassical growth models that are augmented to account for the accumulation of human capital (Mankiw, Romer, and Weil 1992), human capital (h_t) is modelled as another production factor that can be accumulated (see equation (2)). Educational investments augment the labor force, and the added aggregate economic inputs move the economy to a new higher steady-state level of aggregate output.[9]

Second, endogenous growth models stress the role of human capital in increasing the innovative capacity of the economy through developing new ideas and new technologies (e.g., Lucas 1988; Romer 1990; Aghion and Howitt 1998). In these models, technological change is determined by economic forces within the model that make technology (T_t)—a crucial ingredient of total factor productivity (A_t) in equation (2) that will be discussed further in Section 6—dependent on human capital:

$$T_t = T(h_t). \tag{5}$$

Third, and relatedly, models of technological diffusion stress that human capital can facilitate the transmission of knowledge needed to implement new technologies devised by others (e.g., Nelson and Phelps 1966). In this perspective, human capital can help countries increase their total factor productivity by helping to adopt new technologies from abroad.

Religion may affect human capital in ways consistent with all three frameworks. Economically valuable skills can be accumulated through informal learning (i_t), e.g., in apprenticeships or on the job, and formal education (e_t):

$$h_t = h(i_t, e_t). \tag{6}$$

Religion can affect both types of human capital accumulation. On the one hand, religion can affect informal skill formation (e.g., through the Protestant ethic), although the literature does not place

[9] A similar point can be made for health investments: health as one form of human capital plays a role in the context of augmentation of the labor force (e.g., Weil 2014), but less directly so for innovation or technological diffusion. Recent work shows that religion can affect mental health, especially with respect to depression in adolescents (Fruehwirth, Iyer, and Zhang 2019) and suicide (Becker and Woessmann 2018). Religion can also affect physical health behavior such as alcohol consumption which in turn may affect productivity (Fletcher and Kumar 2014). The bulk of work on the link between religion and health has been in medical journals (see, e.g., Koenig (2012)'s meta-study of religion, spirituality, and health). In line with the focus in the economics literature, this section focuses on the linkages between religion, education, and growth.

great weight on this mechanism. On the other hand, a frequently studied mechanism is that religion may affect the accumulation of secular education.

Religion can affect both the quantity of education and its content. Religious denominations have often been the original providers of formal schooling, extending the reach and duration of education (Ramirez and Boli 1987; West and Woessmann 2010). The content taught can load directly on human capital, as in the case of economically relevant knowledge and skills such as literacy (even if the aim is to read holy texts) and norms of thrift. This is in line with Mokyr's (2002, p. 284) concept of "useful knowledge", which he describes as "the equipment we use in our game against nature." But the content of religious education can also lower the economic usability of education—and potentially enough to more than offset any positive effect on the quantity of education. This may be the case when the content taught in religious schools is focused on instilling knowledge of religious doctrine and acts of group cohesion more than on conveying knowledge and skills that are also commercially and financially useful. The content of religious education may thus substitute for secular education, but it may also encourage secular education (Chiswick 2014, Chapter 4). We separate our following overview of the role of religion for growth through human capital along the lines of religious and secular education.

4.2 Religious Education and Long-Run Growth

We cover three literatures, each focused on one of the three Abrahamic religions, that highlight the role of religious education in economic growth: Islamic education in medieval and modern times (Section 4.2.1), the role of (mostly Christian) religious education during industrialization (Section 4.2.2), and the choice of religious over secular education among Ultra-Orthodox Jews (Section 4.2.3).

4.2.1 Islamic Education, Scientific vs. Religious Knowledge, and Economic Growth

For centuries following the spread of Islam, education and science in the Islamic world were at the world's frontier. During the "Islamic Golden Age" (roughly 7^{th}-10^{th} centuries), educational institutions, especially at higher levels, were largely secular, not religious. This favored the production of works on science relative to those on religion. Beginning in the 12^{th} century, however, works on religious topics became predominant at the expense of works related to science. These trends are documented in detail in Chaney (2023), who shows that scientific works fell in both absolute terms and, even more so, relative to Europe. He finds a clear trend break in the

proportion of authors affiliated with madrasas in the 11th century, just as madrasas were beginning to spread. In this telling, religious and secular education are substitutes, at least at higher levels of education.

A transition from secular to religious educational content impinged on economic growth in part due to the role that human capital accumulation plays in technological progress. Technological progress unlocked the keys to riches in the West (Mokyr 1990, 2009; Koyama and Rubin 2022, ch. 7-8). But there was nothing inherently inimical to technological development in Islam. For centuries following the spread of Islam, the Islamic world was far ahead of Europe, and possibly ahead of China, in scientific and technological output (Huff 2017). The tide only began to turn in the 11th century. With the rise of madrasas, human capital still played an important role in the region, but it was not the type of "useful knowledge" Mokyr (2002) views as central to economic development. For instance, Talbani (1996, p. 71) notes that a characteristic of madrasa education was that "Qur'anic verses emphasizing research, inquiry, and contemplation about the nature of the world were interpreted so that scientific aspects of these matters were ignored and theological implications were emphasized." Still, in many parts of the world madrasas are not a central component of religious education. For instance, Andrabi et al. (2006) find that in present-day Pakistan madrasa enrollment makes up less than one percent of overall school enrollment, despite Islam and religious legitimacy being important to daily and political life.

Historically, there was wide variation in the provision of secular and religious schools throughout the Muslim world. One of the key distinctions between these types of schools, in terms of "useful" knowledge, was the degree to which they taught basic literacy and numeracy. For instance, in early-20th century British India, Hindu literacy rates were typically higher than Muslim literacy rates, particularly in places with large Muslim populations. Chaudhary and Rubin (2011) explain this outcome via the historical demand for religious legitimacy in highly Muslim areas. They find that districts that had a more recent collapse of Muslim political rule had better funded religious schools, which were not as good at promoting literacy as were secular state schools. In a follow-up study on the Princely States (i.e., the parts of British India not directly controlled by the British), Chaudhary and Rubin (2016) find that Hindus in Muslim-ruled states had lower literacy than in Hindu-ruled states, but there were no literacy differences for Muslims. This is consistent with their theory that Muslim rulers channeled more resources into religious schools, which provided legitimacy for the rulers and were excludable by religion. In modern India, the state began

to liberalize in 1991. Iyer (2018) finds that religious (Hindu, Muslim, and Christian) organizations have filled the gaps left by the state, especially for those left behind, by providing health and education services. The context under which people are able to access such services matters. Recent evidence from democratic India finds that districts which received Muslim political representation had better health and educational outcomes for Muslim children (Bhalotra et al. 2014). Thus, different political environments—democratic or autocratic—can yield opposite predictions on the connection between the religious identity of political elites and educational outcomes.

In Muslim-majority countries, the tension between religious and secular education has been of acute policy relevance in the last century. In Egypt, the government undertook a series of reforms following independence to transform traditional primary schools to become more secular and modern. Prior to the reforms, the Christian minority was overrepresented in higher paying occupations, in large part because they had an educational advantage. Admittance into secondary education required secular primary education, which was mostly limited to elites. Saleh (2015) finds that the reforms imposed by the Egyptian government in the early 1950s, which permitted graduates of religious primary schools (*kuttabs*) to attend higher-level schools, positively impacted educational and labor-market outcomes for Muslims but not for Christians, helping shrink the gap between the two groups.

Yet, the growth in secular and religious schooling has had mixed results with respect to economic growth in the Islamic world. In the 20th century, reforms expanding public, compulsory education took place in Turkey, Egypt, Tunisia, and Iran, among others (Gulesci and Meyersson 2015). In Turkey, a 1998 law increased the years of compulsory schooling in secular schools. Gulesci and Meyersson (2015) find that this reform resulted in one more year of schooling for women but had no significant effect on labor-force participation or early fertility, two further inputs into growth models (see Section 5).[10] On the other hand, Berman and Stepanyan (2004) find that returns to education are lower, and fertility is higher, for graduates of Muslim schools in Indonesia, Bangladesh, India, Cote D'Ivoire, and Pakistan.

One reason for these mixed results is that there have been unanticipated consequences of expanded secular education in the Muslim world. For instance, Indonesia implemented a massive

[10] Studying the same law, Cesur and Mocan (2018) also find that the reforms resulted in a decrease in female religiosity and propensity to vote for Islamic parties. However, it had no effect on male religiosity or voting propensity.

expansion of public secular education in the 1970s. Bazzi, Hilmy, and Marx (2023) find that while these reforms decreased attendance in Islamic primary schools, the reforms ultimately increased demand for secondary schooling, which religious schools were able to absorb. These reforms, which intended to increase national identity at the expense of religious identity, therefore had the opposite effect. In Egypt, Binzel and Carvalho (2017) show that improved secular education increased the occupational expectations of the educated middle class. When this did not come to fruition, many highly educated Egyptians turned to religious movements, some extreme, to cope with failing to reach their reference point. These movements (e.g., the Muslim Brotherhood) have played a key role in Egyptian politics since the mid-1980s. Similarly, Sakalli (2019) finds that the Turkish education reforms cited above triggered a religious backlash. Following the expansion in secular schooling, residents in highly religious areas were *less* likely to send their children to secular schools in order to better promote their religious identity.

Christian-Muslim educational differences have persisted in Africa. Bauer, Platas, and Weinstein (2022) document that areas governed by Islamic states in the pre-colonial period experience fewer years of education, and lower density of nightlights, in the contemporary period in comparison to areas governed by traditional or Christian kingdoms or stateless areas. They explain these results by the location of missionaries and weak penetration of the colonial administration, rather than by the influence of Islamic beliefs. Alesina et al. (2023) find that African Christians have greater intergenerational economic mobility than Muslims. This is in large part due to Christians being more likely to move to high-mobility regions, where educational and economic opportunities are more plentiful. Like some of the studies cited above, the Christian-Muslim educational gap is greatest in areas with large Muslim communities, largely due to lower emigration rates among Muslims to higher mobility regions.

4.2.2 Religious Education, Crowding out of Secular Content, and Industrialization

The relationship between secular education and industrialization is ambiguous. While formal education did not play a large role in Britain's First Industrial Revolution (Mitch 1999; Mokyr 2009), it played an important role in allowing countries to catch up with Britain by adopting technologies in the 19th century (Becker, Hornung, and Woessmann 2011).

The relationship between *religious* education and industrialization is even more ambiguous. On the one hand, religious education may indirectly encourage the type of human capital that would be useful for an industrial workforce, such as literacy (Becker and Woessmann 2009; more

generally see Section 4.3.3). It may also be associated with pro-social and pro-commerce norms such as trust and thriftiness (see Section 3.2). On the other hand, religious education might hamper industrialization for two reasons. First, industrial technologies alter human's relationship with the physical world, and this may be contradictory to religious beliefs (Mokyr 1990; more generally see Section 6.2). For instance, Mokyr (2011) suggests that the relative paucity of Jewish innovation prior to 1850—in spite of relatively high levels of human capital—resulted from traditional Jewish beliefs, which were unfavorable to scientific innovation and industrial capitalism. Such beliefs are strengthened via religious education. Second, religious education may crowd out secular education, as was the case in various points in Islamic history (see Section 4.2.1). Crowd-out may occur through competition for instructional hours. In addition, reductions in religious schooling can lead to reduced religiosity which may in turn lower the demand for religious education for the next generation (Becker, Nagler, and Woessmann 2017; Arold, Woessmann, and Zierow 2022).

Central to the process of industrialization is innovation. Bénabou, Ticchi, and Vindigni (2022) provide a theoretical link between religion and scientific innovation via political economy. They assume that scientific discoveries can erode religious beliefs. The state may therefore block the spread of scientific innovations when the society is particularly religious and religious authorities are part of the ruling coalition. In other words, a society's (religious) culture and its institutions can interact to suppress efficiency-enhancing outcomes (Mokyr 2016). One long-run strategy for making this equilibrium impervious to shocks is via state investment in religious education (Iyigun, Rubin, and Seror 2021). Bénabou, Ticchi, and Vindigni (2022) provide empirical support for this prediction, showing that religiosity (measured by surveys) is negatively correlated with innovation as measured by patents. The prediction is also supported by Lecce, Ogliari, and Squicciarini (2021), who find that scientists were less likely to be born in more religious parts of 19th-century France. Their results suggest that religious education is a major channel, as people born in less religious places tended to acquire more scientific human capital early in their life. This was largely due to the scientific curriculum being weaker in religious schools than in secular schools.

While many innovations of the First Industrial Revolution were not based on scientific principles (with the famous exception of the steam engine) and required mechanical skill more than scientific knowledge (Mokyr 2009), there was no longer a disconnect between innovation and science during the Second Industrial Revolution. Beginning around 1870 and located across

Western Europe and North America, this period of rapid industrial change was built on the scientific knowledge base of humanity (Mokyr 1990, 2002; Koyama and Rubin 2022, pp. 180-183). Technology became skill-intensive, requiring a more technically-skilled workforce to operate and repair the new machinery. Squicciarini (2020) shows that in 19th-century France, secular schools responded with a curriculum more conducive to attaining technical skills. Catholic schools, on the other hand, were much slower to adopt a technical curriculum; in fact, in many places the emphasis on religious education increased in conjunction with a conservative, antiscientific program.[11] Squicciarini finds that this had numerous long-term consequences for local levels of industrialization and industrial employment, though only during the Second Industrial Revolution (and not before).[12]

For follower countries, the fruits of industrialization came from adoption. Liang (2010) argues that Confucian ethics such as the importance of study and academic qualifications may not have been conducive to being leaders of capitalist and technological development, but they were highly conducive to being followers. This, in turn, helps explain the catch-up growth undertaken by the Asian Tigers in the 20th century and China and parts of Southeast Asia in the 21st century. Similarly, Dong and Zhang (2023) find that the Confucian emphasis on human capital (due to needing to know the Confucian classics to pass the imperial examination system) spurred the rise of modern science in China in the 21st century, as the number of *jinshi* (highest degree holder) is related to the presence of modern schools. Chen, Kung, and Ma (2020) also find a persistent effect relating the density of *jinshi* to modern years of schooling.

4.2.3 Ultra-Orthodox Judaism and Growth

Ultra-Orthodox Judaism emerged in the late-19th century as part of the broader emancipation of Europe's Jews. Unlike most (Reform) Jews of the period, the Ultra-Orthodox increased their time spent on religious education and practice. This lowered their labor-force participation—raising poverty—while increasing their fertility. This is not due to a lack of education; Ultra-Orthodox

[11] The opposition of the Catholic church to the secular mass state school systems that emerged in most Western societies during the second half of the 19th century led to the establishment of large private Catholic school sectors in Catholic countries that allowed for religious education; this is well characterized by the slogan propagated by the Catholic bishops in the US in 1884, "every Catholic child in a Catholic school" (West and Woessmann 2010).

[12] Consistent with these findings is the broader result of Andersen and Bentzen (2022) that cities across Europe inhabited by more religious individuals, proxied by the frequency of religious first names, grew more slowly than other cities.

men attend yeshiva until they are around 40. This poses a puzzle: why do Ultra-Orthodox men spend so much time attaining religious education, when the secular returns are so low? Similar to the cases of Islam and of Catholicism, Ultra-Orthodox religious education has mostly been found to be substitutable for secular education and labor-market opportunities. Works on this topic are consistent with canonical models in the economics of religion, such as Iannaccone (1992), which argue that costly actions (from the perspective of secular income) can strengthen the religious group. The vitality of Ultra-Orthodox communities may therefore benefit from religious education, even if their members suffer economically.

Such actions have clear implications for economic growth. In the model sketched out above, human capital decreases with Ultra-Orthodox religious education when the latter substitutes for secular education. Berman (2000) addresses the puzzle that this "costly" form of education is ubiquitous among Israeli Ultra-Orthodox Jews. Since Ultra-Orthodox Jews provide attractive services such as social insurance to fellow members, they must find a way to exclude potential free riders. Iannaccone argued that religious groups do this by imposing costly and observable requirements for members—sacrifices or stigmatized actions that negatively affect secular opportunities. By requiring males to attend yeshiva well into their prime earning years, Ultra-Orthodox norms impose a significant wage penalty. Berman argues that this penalty is the price of admission into Ultra-Orthodox Judaism: it reflects a strong commitment to the group, keeping group vitality high and maintaining a high level of intragroup public goods.[13] Likewise, Berman argues that intragroup subsidies to women lower their relative real wage in the labor market, encouraging them to increase their time spent on household activities including child-rearing. This helps explain why the Ultra-Orthodox fertility rate remains much higher than for non-Ultra-Orthodox Jews.

Ultra-Orthodox Judaism emerged in the context of Jewish emancipation in the late-19th century, which opened labor-market doors to Jews that were previously shut. Why would a group respond to such a change with a set of restrictions that limited their ability to take advantage of these new opportunities? Carvalho and Koyama (2016) answer this question with a model focusing on a time-money tradeoff: religious communities can either choose to be affluent (with little time and effort spent on religious activities) or poor but with much time and effort spent on religious

[13] A similar mechanism was proposed by Abramitzky (2008) to explain why adverse selection and free riding were typically not issues for Israeli *kibbutzim*, despite their sharing of resources and promotion of economic equality.

activities. A community's response will largely depend on the labor-market conditions it faces. Where there are significant economic opportunities, there will be more incentive to choose the affluent path; where opportunities are fewer, the poorer path with greater religious vitality is more attractive. Hence, Jews located in Eastern Europe, where economic opportunities were worse than in Germany, were more likely to become Ultra-Orthodox. These norms persisted even after labor-market conditions improved in the 20th century.

The bifurcation between Reform and Ultra-Orthodox Jews also sheds light on the interaction between religious education and religious *identity*. Carvalho, Koyama, and Sacks (2017) present a model in which formal education is a means of both transmitting human capital as well as cultural values (as in Bisin and Verdier 2000, 2001). Mainstream education, which transmits the values of the majority group, may therefore be harmful to minority groups. According to this theory, groups like Ultra-Orthodox Jews, whose cultural distance is far from the mainstream, respond to increasing returns to education by investing *less* in education. This in turn reinforces intragroup cohesion, as in Iannaccone (1992) and Berman (2000). In the context of our growth model, the substitutability between mainstream and religious education entails negative economic returns to religious education for Ultra-Orthodox Jews, yet there is still an equilibrium in which they acquire a substantial amount of religious education. These cultural norms persist via education and marriage markets, thereby limiting Ultra-Orthodox assimilation within the majority communities at the expense of their economic growth.

In short, the canonical models of the economics of religion help explain why Ultra-Orthodox Jews attain such high levels of religious education at the expense of secular education, even though the latter has much higher economic returns. Combined with the above insights regarding Islamic education and industrialization, this literature suggests that growth will stagnate where i) religious education is a substitute for secular education and ii) an equilibrium exists in which part of the population desires religious education despite its lower secular returns.

4.3 Religious Transmission of Secular Human Capital

This section overviews many of the ways in which religion has contributed to economic growth by augmenting incentives to accumulate secular, economically useful education. The covered topics include the roles of Jewish education for occupational specialization (Section 4.3.1),

Christian orders (Section 4.3.2), the Protestant Reformation (Section 4.3.3), Christian missionaries (Section 4.3.4), and religious diasporas (Section 4.3.5).

4.3.1 Jewish Education and Occupational Specialization

Jews are among the most educated religious groups on earth. This is equally true for the religious education undertaken by ultra-Orthodox Jews (see the previous section) as it is for the secular education undertaken by Reform Jews. In the Middle Ages, Jews were disproportionately engaged in trade and finance, which required both numeracy and literacy. In the 20th and 21st centuries, Nobel Prize winners are disproportionately Jewish, with a share over 20 percent.[14] The standard explanation is that their minority status as a diaspora that faced a constant threat of persecution forced them to invest in education as a portable asset. This view has recently been challenged.

Botticini and Eckstein (2005, 2007) argue that the Jewish education advantage goes back well before the repeated persecutions of the medieval period and instead can be traced back nearly 2,000 years. Under Roman occupation, the Jews led a revolt and occupied Jerusalem in 66 CE, initiating the first Roman-Jewish war. In 70 CE, the Romans reclaimed Jerusalem and destroyed the Second Temple. This event shifted Judaic focus away from the cult of sacrifice to investment in literacy. This can be seen in the writing of the two Talmuds between the 3rd and 5th centuries and in the construction of synagogues as places where the written and spoken word of God took center place. Furthermore, the institution of the *kallah* (teachers' convention) represented considerable investment in education. While prior to the 8th century most Jews were farmers—like the rest of the population—literate Jews voluntarily migrated to urban areas seeking skilled employment as soon as the establishment of the Muslim Empire gave them the opportunity to do so (Botticini and Eckstein 2005). Importantly, this happened even though there were no restrictions prohibiting Jews from remaining in agriculture.

Botticini and Eckstein (2007) explain this transition into skilled urban occupations in an economic model with two options: the first option is to remain in agriculture, foregoing any returns to education—thereby also relinquishing the utility from belonging to the Jewish religion with its emphasis on education—and ultimately convert to a non-Judaic religion; the second option is to move into cities offering return on educational investments and remain Jewish. Both Jewish and non-Jewish merchants preferred to educate their children. However, Jewish merchants invested in

[14] See https://en.wikipedia.org/wiki/List_of_Jewish_Nobel_laureates.

their children's education comparatively more because their family derived direct utility from their education. The key point is that Jewish specialization in high-skilled jobs was the result of an intra-Jewish battle in the first century CE giving way to religious norms focusing on human capital acquisition and *not* external factors (discrimination, persecution) set by non-Jews.

The Jewish educational advantage over Christian majorities has been documented in many contexts. For instance, Jews put on trial in Spain during the times of the Inquisition (1478-1834) had higher numeracy (measured by lower rates of age-heaping) than Catholics on trial (Juif, Baten, and Pérez-Artés 2020). Jews also stand out in their educational achievement in modern times (Pew Research Center 2016): their average years of schooling is 13.4 years, well ahead of Christians (9.3 years), Buddhists (7.9 years), Muslims (5.6 years), and Hindus (5.6 years).

Quite closely linked is European Jewish specialization in high-skilled occupations. In 19th-century Prussia, Jews were over-represented in banking, a skill-intensive occupation in which Jews were historically strongly represented (Becker and Pascali 2019). In the Middle Ages, the Catholic Church's usury ban for Christians (see Section 3.3.1) was a key factor for the Jewish specialization in banking, but education was a condition sine qua non for Jews to be able to fill that market niche. The Protestant Reformation brought about Christian competition, because in Protestant areas, Luther's and Calvin's teaching was more tolerant of Christian activity in this sector. Becker and Pascali (2019) show that the legacy of Jewish banking specialization continued, especially in Catholic areas. Similarly, Jewish economic specialization may have facilitated greater market access for cities with Jewish communities. Johnson and Koyama (2017) find that, from 1750-1850, cities with Jewish communities grew 30-50 percent faster than cities without Jews, with the most plausible mechanism being that they were better able to take advantage of the growth in market access that happened across Europe in this period.

The Jewish case highlights that certain religious doctrines may instill norms in their believers that put a particular emphasis on secular education. The accumulated human capital in turn is a key driver of economic growth among the religious community, as indicated by occupations in higher paying sectors such as banking and academia.

4.3.2 Christian Orders and Medieval Development

In medieval Christianity, most human capital production took place in monasteries. Prior to the spread of printing and the Reformation, the art of reading and writing—hardly prevalent among the general public—was practiced and passed on among medieval monks in the study and

transcription of religious texts. Monasteries were thus central places of medieval literature, education, and science, preserving the knowledge of antiquity. They often contained substantial libraries (e.g., Mary 1953), as documented by the 1170 dictum of Godfrey of St. Barbe-en-Auge, "a monastery without a library is like a fortress without an armory" (Migne 1855, col. 845A). The human capital handed down in Christian orders thus particularly emphasized literacy, although the seven liberal arts taught in monastic schools included logic, math, and astronomy.

In the early Middle Ages, monasteries were the prime centers of book production in Western Europe. Buringh and van Zanden (2009) show that monasteries were major sources of both the supply and demand for books during large parts of the Middle Ages. Their analysis indicates that the church and its institutions shaped book production until the 11th-12th centuries, and universities and urban lay demand took over as leading factors only afterwards.

At least three aspects of the human capital accumulation in medieval Christian orders suggest that its impact on economic growth may have been quite limited, especially beyond monastic development itself. First, literacy was mostly restricted to monks and very seldomly spread beyond the walls of the monasteries towards the general population. This meant that its use in economic production, commerce, and initiative was limited. Second, with its focus on religious texts, their knowledge had a strong focus on religious content and only occasionally referred to scientific or economically valuable knowledge. Third, outreach was limited by the fact that most works were written in Latin.

Still, there are exceptions where the human capital impact of medieval orders reached beyond monastic walls. Most notably, early modern development in the Netherlands has been linked to the stimulation of human capital by a religious community, the Brethren of the Common Life. Founded in the late 14th century in Deventer, the Brethren wanted Christians to read the bible and other religious texts. They thus distributed vernacular religious texts, founded schools, and produced books. Akçomak, Webbink, and ter Weel (2016) argue that this creation of human capital among the general public was the foundation for the Netherlands' early economic development. They show that Dutch cities with a presence of the Brethren had higher levels of book production in 1470-1500 and had higher literacy rates in 1600. They further show that cities with Brethren presence had higher population growth in 1400-1560. With their outreach to the broader population, the religious community of the Brethren thus initiated economic growth through broad-based human capital accumulation.

4.3.3 The Protestant Reformation and Human Capital Development

The Protestant Reformation brought an important change with respect to human capital: rather than limiting literacy and learnedness to monks and clergymen (who read the gospel to the congregation in Latin during mass), leading Protestant reformers demanded that all Christians should be able to read the word of God themselves. Martin Luther famously translated the bible into vernacular German. From the very beginning, Luther also preached that every town should have a school for boys and for girls so that every child could learn to read the bible. Much like the case of Jewish education (see Section 4.3.1), this religiously-induced literacy could also act as economically useful human capital, laying the foundation for later growth. Thus, as an alternative to Weber's Protestant ethic (see Sections 3.2 and 5.2) as an explanation for the Protestant economic advantage over Catholics, Becker and Woessmann (2009) suggest a human capital theory of Protestant economic history: the desire for Protestants to read the bible led to a spurt of literacy in the overall population that had long-run implications for economic growth.

Luther made his case for the importance of schooling to both political authorities and the general public, initiating a shift in educational norms at both levels. Leading reformers like Philipp Melanchthon regularly traveled to the different Protestant territories for visitations to verify the implementation of school ordinances, which earned him the honorary title of *Praeceptor Germaniae* (teacher of the Germans) (Rupp 1996). By preaching to parents to send their children for instruction, Luther and his fellow reformers also tried to initiate preferences for schooling among the people. Luther's theology advanced a "universal priesthood of all believers" against priestly injunctions, which required universal basic education.

Empirically, Protestantism led to substantially higher levels of education to an extent that may account for most if not all the Protestant economic advantage over Catholics at Weber's time. Becker and Woessmann (2009) exploit the initial concentric dispersion of the Reformation in 19th-century Prussia to use distance to Wittenberg as an instrument for Protestantism. They find that Protestantism had a substantial effect on literacy and measures of income and economic modernization. In their analysis, the Protestant lead in literacy was large enough to account for practically the entire gap in economic prosperity, leaving little scope for independent effects of the factors emphasized by the Weber thesis. Becker and Woessmann (2009) also show that Protestantism was significantly associated with both higher literacy and higher per-capita GDP across countries in 1900, suggesting that the human capital explanation may generalize beyond

Prussia. In fact, by 1900 all Protestant-majority countries had virtually universal literacy, but no Catholic-majority country did.

Luther's quest for girls' as well as boys' education meant that Protestantism also furthered gender equality in education. Becker and Woessmann (2008) show that Protestantism significantly lowered the gender gap in elementary school enrollment in 19th-century Prussia. They also document that Prussia virtually reached gender parity in elementary education by the second half of the 19th century, and Protestantism reduced the gender gap in literacy among the adult population in 1871. In a cross-country analysis, Protestantism is also associated with higher educational gender parity indexes in 1970.

The Protestant-Catholic difference in human capital may be particularly pronounced in relatively conservative milieus. Boppart et al. (2013) suggest that the denominational effect on education may be mediated by other sociocultural characteristics. Using data for Swiss districts at the end of the 19th century, they find that Protestant districts have higher educational spending per student and better educational performance on pedagogical exams of conscripts. Results are most pronounced in districts that voted against three referenda that aimed to introduce progressive legislation, whereas the Protestant-Catholic difference tends to be weaker in more progressive districts (which partly reflects that progressive views may be endogenous to the population's education).

While the educational impact of Protestantism was particularly pronounced for literacy, it also extended to other cognitive skills. In the setting of late-19th century Switzerland, Boppart, Falkinger, and Grossmann (2014) make use of pedagogical exam grades of conscripts in reading, essay writing, numeracy, and history. They find that the positive effect of Protestantism was particularly pronounced in reading, consistent with the hypothesis that Protestants stressed bible reading. At the same time, there is a significant Protestant lead also in the other subjects, which the authors attribute to a higher Protestant motivation to develop cognitive skills.

An important aspect of the human capital effect of the Protestant Reformation was that it replaced Latin with vernaculars in printed texts. Binzel, Link, and Ramachandran (2023) argue that the vernacularization of printing facilitated the spread and subsequent production of knowledge in the broader population. Drawing on data on books across European cities between the mid-15th and late-16th century, they show that the Reformation was related to a strong increase in printing in the vernacular, first on religious texts and then also on non-religious texts, which

also spread beyond Protestant cities in due course. The authors also show that vernacular printing is associated with an increased number of births of famous creatives and innovators as well as higher population growth in subsequent centuries.

The Protestant-Catholic divide was further amplified by the fact that during the Counter-Reformation, the Catholic church censored the printing of books deemed in conflict with Catholic doctrine, thereby holding back the diffusion of knowledge and retarding growth. In response to the challenges that the newly emerging Protestantism posed to its monopoly, the Catholic church issued indexes of forbidden books that censored the printing and diffusion of Protestant writers and other conflicting texts. Becker, Pino, and Vidal-Robert (2021) use data on censored books across European cities to show that Catholic censorship was effective in reducing the printing of forbidden authors. In addition, defiant cities that printed indexed books were more attractive to famous people, a measure of upper-tail human capital.

4.3.4 Christian Missionaries and Colonial Development

The consequences of the Protestant emphasis on literacy and education reach worldwide. A key mechanism is Christian missionaries who established schools in Africa, Asia, and Latin America in an attempt to convert the native populations to Christianity. A rapidly expanding literature shows that these missionary investments had long-term impacts on education and economic growth in the former colonial countries. Jedwab, Meier zu Selhausen, and Moradi (2022) count fifty studies published over the past decade that have looked at long-term effects of colonial missions, thirty of which study outcomes related to education or literacy. They nearly uniformly find positive associations between Christian missions and human capital outcomes. By promoting mass education, the investments made by missionaries in the past tend to persist to the present, often despite centuries of fundamental political and economic change.

It was particularly Protestant missionaries who furthered human capital development by establishing schools. Twenty-one of the thirty studies covered by Jedwab, Meier zu Selhausen, and Moradi (2022) that link colonial missions to educational outcomes use African data. As one example, Gallego and Woodberry (2010) establish the basic association between historical Protestant missionary activity and modern schooling. They additionally emphasize a competitive effect that Catholic missionaries similarly invested in schooling in areas where they were exposed to competitive pressure from Protestant missionaries. Protestant missionaries also brought the printing press to sub-Saharan Africa and encouraged local use. Cagé and Rueda (2016) show that

the missionary effect on education is positively mediated by use of the printing press. Alesina et al. (2021) stress that Christian missions may have long-run effects on education by influencing educational mobility across generations. They find that Christian—most robustly, Protestant—missions are among the strongest correlates of intergenerational mobility in educational attainment across African regions. Outside of Africa, Bai and Kung (2015) stress that Protestant missionaries erected schools and hospitals in China. Although converting only a tiny fraction of the population, the missionary conversion had substantial effects on human capital and, thereby, on urbanization. Protestant missions also had a lasting effect on education in India (Lankina and Getachew 2012), particularly for women and for missions with higher female presence (Calvi, Hoehn-Velasco, and Mantovanelli 2022).

Some Catholic orders also emphasized education (see Section 4.3.2), and where Catholic missionaries did so, they also had a positive long-run effect on education and growth. In various settings, the Catholic order of the Jesuits—a spearhead of the Counter-Reformation—had a strong emphasis on educating children. Valencia Caicedo (2019) argues that Jesuit missions played a leading role in the education of the indigenous population in the Guaraní area in modern-day Argentina, Brazil, and Paraguay. He shows that former Jesuit presence has a persistent positive effect on literacy, educational attainment, and income today. In contrast to Jesuit missions, Catholic missions of the Franciscan order—which did not emphasize education in the Guaraní area—had no long-term effects. Waldinger (2017) finds the opposite effect for Mexico. She argues that in colonial Mexico, the educational efforts of the Jesuit order were mostly restricted to colonial elites in cities rather than the masses. By contrast, the Mendicant orders such as the Franciscans, which were committed to the poor, were strongly active in educating the native population, particularly in rural areas. Her results show that the historical presence of Mendicant missions has a persistent positive effect on literacy and education in Mexico today, whereas Jesuits missions do not. Thus, the effects of the different Catholic missionary orders appear to strongly depend on the extent to which they emphasized education of the broad native population.

In colonial Benin, Catholic missionaries founded the first regional schools. Wantchekon, Novta, and Klašnja (2015) show that attending these schools had significant positive effects on individual living standards, and the positive effects extend to the next generation—both to the original students' descendants and to the descendants of other people in the same villages who did not attend the schools. In India, Castelló-Climent, Chaudhary, and Mukhopadhyay (2018) argue

that Catholic missionaries were instrumental in opening Catholic colleges but had limited lasting influence otherwise. Their results indicate that historical Catholic missionaries had a positive effect on higher education today which raises economic growth as proxied by night light density.

4.3.5 Religious Diasporas and the Spread of Human Capital

Much of the analysis thus far refers to majority denominations in their native countries. However, religious minorities are often persecuted in their home countries (see Section 6.3.4) and forced to migrate to other countries. Throughout history, the migration of dislocated religious groups has had important implications for growth both in the persecuting country and in the countries to which they flee. When people flee, they often cannot bring much with them—except for their human capital. Also, while migrant minorities may not be able to establish institutions in the same way as in their home country, they may keep their religious norms and preferences. Thus, dislocated religious minorities may affect growth through the spread of human capital and other non-tangible values.

An example of high-skilled migration of a persecuted religious group is the Jewish population fleeing from Nazi Germany. Waldinger (2016) shows that the dismissal of Jewish scientists reduced the creation of scientific knowledge in German universities. As departments lost some of their best researchers, scientific output dropped in the short run. These negative effects persisted in the long run because departments were not able to hire adequate replacements for the lost leading scientists. The loss of Jewish high-quality faculty also reduced the subsequent outcomes of PhD students (Waldinger 2010).

For those Jews who were able to flee abroad, the gain in human capital also had an important effect in the receiving countries. Moser, Voena, and Waldinger (2014) study the effect of German Jewish émigrés on scientific inventions in the United States. They show that chemistry patenting by US inventors increased sharply in research fields of Jewish émigrés compared to research fields of other German scientists. This effect results not from increased productivity of incumbent US researchers but rather from new researchers attracted to the émigrés' research fields.

Another historical example of a religiously persecuted group are the French Calvinists called Huguenots, who fled France in 1685 when Louis XIV revoked the Edict of Nantes that had granted them religious freedom. Attracted by the Edict of Potsdam, many Huguenots—who were highly trained and skilled—formed a diaspora in Prussia, compensating for population losses during the Thirty Years' War. Hornung (2014) shows that the settlement of skilled Huguenot migrants had

substantial positive effects on the productivity of textile manufactories in Prussia a century later (see also Section 6.2 on the transfer of technology).

Religious groups who are forced to migrate can also affect the destination country by spreading specific norms. Miho, Jarotschkin, and Zhuravskaya (2023) study the deportation of German Protestants and Chechen Muslims—who they argue had very different gender norms—from the western to the eastern parts of the Soviet Union by Stalin during World War II. Cohorts of the native population who went to school when the deportees arrived had higher female higher-education attainment in destinations with more Protestant compared to Muslim deportees. Similarly, the share of Protestant deportees is positively related to various measures of gender equality such as labor-force participation and to the native population's attitudes towards the role of women today.

Overall, an array of historical and modern episodes, particularly from Judaism and Christianity, shows that religion can spur long-run growth by promoting human capital, accounting for several transitions from stagnation to growth. A central aspect is whether a specific religion puts greater emphasis on secular or religious content in education. At the peril of over-generalization, it seems that secular content often took precedence in early Islam, mainstream Judaism, and Protestantism, whereas religious content often took precedence in later Islam, Ultra-Orthodox Judaism, and historical mass Catholicism. It is an important open question under which conditions one takes precedence over the other, and under which conditions religious education may further rather than retard economic outcomes.

5. Population and Labor

This section addresses the ways in which religion affects growth through labor-force participation and demographic developments such as fertility and population growth. Population affects labor inputs in the neoclassical growth framework and the creation of ideas in many endogenous growth models, and it is at the center of unified growth theory (Section 5.1). In covering the literature on effects of religion, we provide insight into the role that religion plays for labor input (Section 5.2) and fertility (Section 5.3).

5.1 Religion, Population, and Economic Growth

Growth models differ in the extent to which population and labor affect growth. In the standard Solow-Swan model, the size of the labor force (input factor *L* in equation (2)) is effectively treated as synonymous with population size. In that model, an increase in the population growth rate raises the growth rate of aggregate output but has no permanent effect on the growth rate of per-capita output, ultimately lowering the steady-state *level* of per-capita output. By contrast, in endogenous growth models where growth is a function of ideas and the creation of ideas is a function of the number of researchers, growth depends positively on the size or growth rate of the population (Jones 2022).

Religion can affect the development of the population and the labor force in various ways. For one thing, religion may affect effective labor input because the preferences and ethical values it conveys can impact work at the intensive margin. For example, Weber's Protestant work ethic hypothesis implies that believers provide additional labor input. But time spent on religious practices may also take away from time available for work (e.g., McCleary and Barro 2019).

It has often been argued that religion played an important role in the demographic transition and in the escape from the Malthusian trap that is used to describe the pre-modern economy. The demographic transition occurred when nations moved from a "high birth rate, high death rate" regime to a "low birth rate, low death rate" regime. This occurred first in France in the 18th century and then in other European nations in the 19th century. Other parts of the world followed in the 20th century. Unified growth theory attempts to explain this demographic transition and its consequences for growth. At its core is the child quantity-quality tradeoff, whereby parents choose between the number of children and the amount they can invest in each child (Galor 2011). An increase in the demand for skills—e.g., through the advent of better but more skill-intensive technologies—can thus trigger a decline in fertility which sets the demographic transition in motion.

Similarly, religion may impede or accelerate the onset of the demographic transition and subsequent growth dynamics by affecting fertility behavior in at least three ways (Iyer 2002, pp. 30ff). First, the 'pure religion effect' hypothesis posits that religions adopt positions on the moral acceptability of birth control and abortion or norms about 'desired' family size. Second, the 'characteristics' hypothesis attributes differential fertility to socio-economic differences between religious groups. In particular, the minority status of a religious group might push it towards

procreating more to secure its future. Third, discrimination in the form of differential access to services such as health and family planning can indirectly affect fertility outcomes (see Iyer 2002 for the case of India).

5.2 Work Effort: Protestant Ethic II

Work effort is the second main part of the Weber thesis (see Section 3.2 for its first part, thrift). Developing a specific ethic to work hard, thereby increasing effective labor inputs, should give rise to increased economic output during the transition to a new steady state. The Protestant work ethic is one example of how religions develop specific ideas about the importance of work in their followers' lives.[15]

Papers that test Weber's Protestant Ethic or related hypotheses about a link between religion and work ethic tend to look at work effort in conjunction with thriftiness (see Section 3.2). For instance, Andersen et al. (2017) use items in the European Values Survey (EVS) on whether valuing "hard work" is an important trait for children to learn at home. Their focus is on the long-run effect of the historic presence of Cistercians as a Catholic order whose cultural traits resemble those ascribed to Protestants. They find that in European regions with historic presence of Cistercians, parents place greater value on hard work as a trait to instill in children.

Staying closer to the original Weber thesis by directly comparing Protestants to Catholics and looking at Weber's home country Germany, Spenkuch (2017) draws on the historical variation in Protestantism in the aftermath of the Peace of Augsburg (1555) where the principle "whose rule, his religion" was established. Modern-day Germany essentially still displays the same religious majorities as roughly 400 years ago. Results suggest that historical Protestantism is associated with longer working hours, but not higher hourly wages, in the present. This finding is consistent with a cultural values-based interpretation, as in the Weber thesis. Basten and Betz (2013) find similar results for Switzerland, employing a spatial discontinuity in the cantons of Vaud and Fribourg created by a 16th-century split between Catholicism and Reformed (Calvinist) Protestantism. Looking at preferences expressed in modern referenda, they find that Protestant support for increasing leisure time is about 13.5 percentage points lower than in Catholic electorates, in line with the Weber thesis.

[15] For instance, Sharabi (2017) compares the work ethic among Jews and Muslims in Israel.

A Protestant "work ethic" also plays a prominent, albeit indirect, role in the work of Cantoni (2015). Looking at city growth over the years 1300-1900 in Protestant versus Catholic cities in the German lands, he expects Malthusian forces to entail that urban productivity advantages translate into faster city growth. Cantoni (2015, p. 570) argues that "if Protestantism did indeed increase the productivity of urban dwellers—by providing them with a *peculiar* '*work ethic*' …—this should translate into larger city sizes." Yet, his results show that Protestant cities did not grow faster than Catholic cities, inconsistent with a prominent role for a Protestant work ethic at the city level.

Overall, the empirical evidence for the Weber thesis is mixed. While in some contexts there is evidence for denominational differences in work effort (or thrift) between Protestants and Catholics, or between different types of Protestantism, this finding is by no means universal. Religious norms *can* influence work effort and thereby effective labor inputs. But it seems that empirically, work ethic is not necessarily the most influential factor in the link between religion and growth.

5.3 Religion, Fertility, and Demography

The role of religion in fertility, demographic development, and population growth has been studied in various settings. In particular, researchers have looked at the demographic transition—a shift from high to low birth and death rates—which played a central role in the escape from the Malthusian trap. As such, it has been central to theories of long-run growth (Galor 2011; Koyama and Rubin 2022, ch. 5). It is important to note that both the quantity and quality of children are endogenous variables in the quantity-quality (Q-Q) model of unified growth theory. Galor (2011) argues that the cleanest evidence for a child Q-Q tradeoff is the response to a change in the price of fertility (e.g., cost of contraception) or in the price of child quality (e.g., cost of education).

Even before the demographic transition, there is evidence for the existence of a child Q-Q tradeoff. In their analysis of 19th-century Prussia, Becker, Cinnirella, and Woessmann (2010) use exogenous variation in the price of child quality triggered by the Protestant Reformation's fostering of public schools. Their results show that the religion-induced increase in investment in child quality, measured by education in 1849, does indeed decrease fertility. They also show that education in 1849 predicts the fertility *transition* in 1880-1905. To the extent that demographic transition was key in the transition to modern growth, this provides evidence for religious roots of the differential timing of this transition. In fact, a child Q-Q tradeoff existed even earlier, in 1816

(Becker, Cinnirella, and Woessmann 2012). In short, there is a tradeoff between a generally procreational stance and investment in education in both Protestant and Catholic denominations, but the different emphasis on the importance of education triggered different fertility responses.

A direct analysis of the link between religion and fertility is provided by Becker and Cinnirella (2020), who use municipality-level variation across roughly 50,000 locations in Prussia in 1871. Using only within-county variation, they show that fertility rates are lower the larger the share of Protestants (and Jews) in a location.

It is not always differences between religious groups that drive differences in inputs to economic growth; such differences may also result from people *turning away* from religion. Blanc (2023) shows that the process of secularization that started earlier in France than anywhere else is the key driver of France's earlier start of the demographic transition. Blanc (2023) draws on genealogical records to document fertility levels across French départements. To proxy for religiosity, he uses the share of clergymen who did not take the oath on the secular French Republic in 1791 (known as refractory clergy). Individuals born in places with refractory clergy have more children. The various works on the demographic transition thus suggest that different religious groups show different fertility behavior in this crucial phase, indicating that religion likely played a relevant role in the transition from stagnation to modern growth.

Religious health practices constitute another cause of demographic differences across religious groups. Botticini, Eckstein, and Vaturi (2019) document that over the period from 1500 to 1930, Jews in central and eastern Europe had birth rates that were about the same as those of non-Jews, but infant and child mortality among Jews was much lower and accounted for the main difference in Jewish versus non-Jewish natural population growth. The reason they suggest was that the Talmudic teaching on breastfeeding affected women's behaviors that enhanced children's well-being. The Talmud advises mothers to breastfeed their infants immediately following birth and requires 24 months of breastfeeding. The rabbis also allowed mechanical contraception during lactation to preserve the mother's ability to nurse, which directly reduced fertility by preventing a rapid succession of newborns. Such rules were not common among Christian communities and, according to the authors, explain the higher survival rate of Jewish infants.

Differential teachings on the acceptability of contraceptive devices to regulate fertility are another important difference between religious groups. The Catholic Church discourages the use of condoms whereas Protestant churches usually do not. This has both a potential direct effect on

fertility levels and a potential influence on mortality risk stemming from sexually transmitted diseases like HIV (Cagé and Rueda 2020). Religious differences in mortality have also played a major role in Durkheim's (1897) classic work on suicide, with suicide rates in Protestant areas far exceeding those in Catholic areas in 19th-century Prussia (Becker and Woessmann 2018).

Overall, the empirical work clearly shows that religion is an underlying driver of differences in fertility and mortality and thus in demographic development. Historically, religious differences—as well as secularization—influenced the demographic transition, a turning point in history and an essential condition for sustained growth.

6. Total Factor Productivity

This section considers how religion affects total factor productivity (TFP). We conceive of TFP as a function not only of technology, but also of institutional and cultural factors more broadly (Section 6.1). We review diverse literatures that treat specific aspects of how religion may affect productivity with which factor inputs are transformed into economic output, in terms of both technological change (Section 6.2) and societal institutions and cultural norms (Section 6.3).

6.1 Religion, Total Factor Productivity, and Economic Growth

A final aspect of macroeconomic growth is how the factors of production—physical capital, human capital, and labor—are transformed into output. This will depend not only on the production technology used, but also on the overall efficiency of the economy. We thus think of total factor productivity (A_t) in equation (2) as a function of technology (T_t), institutions (N_t), and other residual factors (R_t) like cultural traits such as trust, trustworthiness, and honesty:

$$A_t = A(T_t, N_t, R_t). \tag{7}$$

As highlighted in equation (5) and covered in Section 4, technological change will partly depend on human capital. This section covers those aspects of the nexus between religion, technological development, and macroeconomic efficiency that are not necessarily mediated through human capital.

The key innovation of endogenous growth models such as Romer (1990) and Aghion and Howitt (1998) is the endogenization of technological change. Apart from investment in research and development, technological change depends on the creativity of the population and its

openness to develop new technologies or adopt them from abroad. In general, available technology is the sum of previous technology, new technology produced domestically (ΔT_t^d) and new technology adopted from elsewhere (ΔT_t^a):

$$T_t = T_{t-1} + \Delta T_t^d + \Delta T_t^a. \quad (8)$$

Religions can affect new technology produced domestically for material reasons (i.e., valuing the returns to new technology), but also for spiritual or ideological reasons, as technology requires altering human's relationship with the natural world (Mokyr 1990). In particular, religious beliefs may affect both the understanding of how technologies work in a scientific sense and the willingness to abandon traditional but outdated technologies for new ones. In a similar way, the willingness to adopt new technologies can be affected by religion, as documented in the differential use of the newly emerging printing press during the Protestant Reformation (Rubin 2014). When individuals can choose between an intuitive-believing and a reflective-analytical reasoning style, a decline in religiosity can lead to an increased willingness to engage in reflective-analytical reasoning, higher productivity in research and development, and increased TFP growth (Herzer and Strulik 2020).

Beyond technology in the narrow sense, TFP is shaped more broadly by political, legal, and economic institutions. To the extent that religions shape individual preferences and values such as trust and openness to change, they will affect TFP by framing the efficiency of market interactions. In various ways, religions also impinge on economic institutions such as customs of taxation and commercial law. In many places, religious rituals, politics, and laws shape not only economic institutions, but also the state and development of societal institutions and norms more broadly. In addition, political economy models suggest that religion is often used for political legitimation. Religions can also incite conflict or call for tolerance between and within countries, affecting both the ability to produce and the extent to which economic agents can engage in interpersonal exchange. We will cover each of these aspects in turn.

6.2 Religious Beliefs, Religious Institutions, and Technological Change

We start with the impact of religion on technological change. Technological change is the central feature of modern growth (Mokyr 1990, 2009; Koyama and Rubin 2022, ch. 8). In Section 4 (particularly Section 4.2.2), we focused on the interaction between religion and education as inputs

into endogenous growth models, primarily via technology. Here we are interested in the direct nexus between religion and technology, absent the education link.

There are several avenues through which religion can play a positive role in domestic technological development and technology adoption. In the medieval period, monastic houses throughout Europe were the primary places where technical knowledge, books, and informal learning were preserved. In the 17th and 18th centuries, Jesuits acted as central conduits through which technical knowledge was passed between Europe and China (Ma 2021; Davids 2013, ch. 3). Religious minorities also brought technologies with them when they were persecuted (see also Section 4.3.5). For instance, Protestants fleeing Spanish-controlled Belgium during the Eighty Years' War (1568-1648) settled in the Netherlands, bringing their knowledge of fine draperies with them. It therefore may not be religion but *religious tolerance* that facilitates technological progress. Cinnirella and Streb (2018) test this hypothesis in the context of the Second Industrial Revolution. They find that in late-19th century Prussia, those cities that had greater religious toleration (as measured by the presence of different denominations) had greater patenting activity. Relatedly, Hornung (2019) shows that in the setting of 18th-century Berlin, greater religious diversity—brought about by the persecuted religious minority groups of Jews, Huguenots, and Bohemian Hussites—increased the utilization of loom technology in textile production.

Religion can also have a negative impact on the spread of technology. The Catholic Church's condemnation of Galileo and the anti-Darwinism of the early 20th century are leading examples. In the 21st century, religious groups have successfully pushed for limitations on embryonic stem-cell research. In Islam, Naghavi (2019) argues that a relative lack of intellectual property rights has impeded technological development. Historically, scientific production dropped dramatically in the Islamic world in the 11th and 12th centuries as the rise of the madrasas shifted learning from secular to religious topics (Chaney 2023; see Section 4.2.1). Waqf-funded religious education in madrasas played a particularly important role in limiting scientific production, as curricula were not always adjustable and waqf deeds often limited education to Islamic sciences and not rational sciences (Huff 2017, ch. 5; see Sections 3.3.2 and 4.2.1). The theory proposed by Bénabou, Ticchi, and Vindigni (2022) helps explain this negative connection between religion and technology, suggesting that scientific discoveries can erode religious beliefs (see Section 4.2.2). This is also true of technologies, especially those that transform nature or threaten the veracity of religious doctrine (e.g., evolution).

Political economy considerations likewise contribute to religious restrictions on technology. Seror (2018) suggests that economic prohibitions may be promoted by religious authorities when it improves their political bargaining power. This is especially true for conservative clerics, since prohibitions can increase resentment towards religious minorities (who take up occupations using the prohibited technology), in turn giving more political power to conservatives at the expense of their more moderate peers.

For some technologies, religious authorities stand to lose rents should adoption become widespread. Technology prohibitions can therefore occur when religious authorities are powerful enough—via their role in legitimating the state—to prevent the spread of the new technology. This was the case, for instance, with the Ottoman prohibition on the movable type printing press. As documented by Coşgel, Miceli, and Rubin (2012), who employ a similar political economy model, the Ottomans prohibited printing in the Arabic script for nearly 250 years after learning of Gutenberg's invention (from the 1480s until 1727).[16] A key reason was that the printed word threatened the monopoly the religious establishment held on intellectual activities. As long as the top religious authorities played a key role in legitimating the state, the sultan enacted a ban on printing in the Arabic script in order to protect the rents of religious authorities. It was only after the power of religious authorities diminished that these restrictions were relaxed.

In sum, there are several ways that religion can impact domestic technological change and technology adoption. Religion affects the former via religious beliefs and tolerance, whereas it affects the latter through political economy and missionary activity.

6.3 Religion and the Political Economy of Norms and Institutions

This section covers various additional aspects (besides technological change) of how religion affects the efficiency of an economy, including the role of rituals in shaping cultural norms and institutions (Section 6.3.1), religious politics and law (Section 6.3.2), the legitimation of states (Section 6.3.3), and religious conflict and tolerance (Section 6.3.4).

6.3.1 Rituals, Norms, Religiosity, and Growth

Religious rituals can affect economic growth by shaping a society's institutions and cultural norms. Rituals can affect social insurance, (mental) health, dress, cultural practices, and much more. A

[16] Religious minorities in the Ottoman Empire were permitted to print, so long as the language did not use the Arabic script (e.g., Greek, Hebrew).

growing literature reveals how such rituals can impinge on economic growth via "residual factors" that affect total factor productivity.

One particularly important religious ritual that affects around 1.8 billion people is the fasting associated with the Muslim observance of Ramadan. As one of the five pillars of Islam, observant Muslims are supposed to fast from sunrise to sunset. Social scientists have found that this ritual has varied socio-economic consequences, many of which have implications for productivity and growth. Campante and Yanagizawa-Drott (2015) find that places with longer Ramadan fasting (because they are closer to the equator or Ramadan takes place in summer) have lower output growth but higher subjective well-being. They rationalize these findings with an Iannaccone (1992)-style club good model. If greater fasting restrictions screen out less committed members, happiness should be greater for those who are in the club. Such a sacrifice has economic consequences since it comes with reduced productivity—places with longer Ramadan fasting have lower GDP per worker.

There are several other consequences of Ramadan. Although Ramadan observance is not required for pregnant women, it is the norm in many parts of the world. This can have damaging consequences for the fetus and for physical and mental development. Almond, Mazumder, and van Ewijk (2015) find that students who were exposed to Ramadan while *in utero* have lower test performance years later, and Majid (2015) finds that these effects last throughout life. On the other hand, Hornung, Schwerdt, and Strazzeri (2023) show that Muslim students exposed to longer fasting hours during Ramadan have higher test scores; they argue that Ramadan improves learning outcomes by facilitating the formation of social capital.

Religious rituals can substitute time away from economically productive activities. For instance, Montero and Yang (2022) find that Catholic patron saint day festivals in Mexico, which occur for many days at different times of the year, have a negative effect on local economic development and household income when they coincide with the agricultural planting or harvesting months. The most likely mechanism is that these festivals lower agricultural productivity: during the festivals, households are time- and liquidity-constrained, limiting their agricultural activities. Religious festivals can also crowd out agricultural financial investments and encourage communities to plant at non-optimal times.

Religious norms and rules such as marriage practices can also affect the importance of kinship networks and thereby the mode of economic cooperation and exchange. In the case of Europe,

Schulz et al. (2019) and Henrich (2020) argue that the Catholic Church's medieval ban on cousin marriage—a key mechanism binding together kin groups—undermined extensive kin networks. Instead of emphasizing in-group loyalty, places with deeper Catholic influence became more individualistic and exchange became more impersonal. Such characteristics are essential for modern economic exchange; when relegated to the kin group, there are significant limits to how much exchange can occur. Moreover, impersonal trust affects financial development. Chen, Ma, and Sinclair (2022) show that Chinese financial development was delayed due to the importance of kin-group social insurance; because members of the same kin group were expected to provide for each other in times of need, there was less pressure for more impersonal forms of lending to arise. Schulz (2022) also finds an important political consequence of weakened kin groups: places with greater historical exposure to the Catholic Church have weaker kin-group norms and thus higher levels of civicness, which facilitates higher levels of political participation.

Religion affects cooperation and norm enforcement in several other ways. One well-known example is the caste system, which proscribes all sorts of socio-economic injunctions on Hindus. One consequence of this system is that it shapes in-group versus out-group norms of cooperation. Hoff, Kshetramade, and Fehr (2011) find that those at the bottom of the caste hierarchy are less willing to punish members of their own caste because repression experiences reduce their capability for altruistic third-party punishment. This negatively affects their ability to sustain cooperation with those outside of their caste.

Some rituals can affect economic decision-making by altering beliefs in how others act. This is particularly true for traditional religions, where beliefs in spells and curses are common. Butinda et al. (2023) study the willingness to pay for religious protection rituals of beer sellers in the Democratic Republic of Congo who fear theft and confiscation and thus understock their inventory. Butinda et al. run a field experiment offering a protection ritual to some of the beer sellers. Among those who have the ritual performed for them, those who believe in its efficacy increase their inventory to a level closer to optimal (i.e., fewer stock-outs and greater profits). These results suggest that rituals can have a positive impact on inputs into economic growth regardless of whether the rituals are effective or not.

Another example for the relevance of second-order beliefs comes from Taoist beliefs about marriage matching. Ciscato, Do, and Nguyen (2023) show that in Vietnam auspicious beliefs about marriage fortune based on birth-year matches derived from Taoist astrology affect not only

marriage matching, but also positively impact income and children's educational outcomes. A likely mechanism is that auspicious matches receive higher transfers from extended family when hit by shocks, and auspicious couples believe that their relatives believe that auspicious couples are luckier.

In summary, religious rituals and norms can be an important residual factor affecting productivity and growth—in both positive and negative ways. Rituals can encourage and sustain hard work, cooperation with outsiders, and the provision of social insurance to co-religionists. On the other hand, they can encourage and sustain dangerous, unproductive, or costly actions that reduce the productivity of the religious group.

6.3.2 Religious Law, Religious Politics, and Political Preferences

An underlying assumption in endogenous growth models is that a society's legal institutions recognize and enforce some degree of property rights. Legal frameworks that actively inhibit individual rights impinge directly on total factor productivity. Historically, religious politics and law have played a key role in shaping such institutional developments. But also in modern democracies, religious preferences can shape voting patterns and political coalitions, which can in turn affect policies regarding redistribution and women's rights.

In many parts of the Islamic world, both historically and in the present, Islamic law has been the law of the land, at least over many facets of life (for instance, family law and commercial law). As discussed in Section 3.3.2, one consequence of this arrangement is that Islamic partnership and inheritance law persisted in the Muslim world, which incentivized those engaged in commercial activities to keep partnerships small (Kuran 2005, 2011). Until the 20th century, this had a substantial impact on Middle Eastern productivity. Without any type of legally-recognized organizational form capable of sustaining long-lived "big business", there was little capacity for Muslim enterprises to take advantage of economies of scale. This can contribute to an explanation why the Middle East was an industrial laggard (see Rubin 2017; Kuran 2011, 2018).

Other aspects of Islamic law impinged on the productivity of Muslims in the past, continuing to the present. For instance, one key feature of the Ottoman system of governance was that religious minorities could conduct business outside the jurisdiction of Islamic courts so long as they were transacting with non-Muslims. This became an impediment for Muslims only after advances in European commercial law permitted more complex and larger-scale transactions.

Ultimately, this permitted religious minorities in the empire (mostly Greeks, Armenians, and Jews) to pull ahead of Muslims in commercial affairs (Kuran 2004b).

Even in states in which religious law is not predominant, religious *politics* can play an important role in determining a society's productive capacity. This can be the case in democracies that contain religious parties or autocracies that depend on religious authorities for legitimation (see Section 6.3.3). One important development in the last half century has been the rise of Islamism and Islamic political parties.[17] In Indonesia, Bazzi, Koehler-Derrick, and Marx (2020) find that a significant rise in assets transferred into waqf in the 1960s (to avoid state expropriation) led to increased political power for local religious authorities via increased investment in religious schools and mosques. Over time, this led to a rise in conservative, Islamist ideology in places most affected by waqf transfers and, ultimately, to increased electoral support for Islamic parties and the adoption of sharia laws. Those areas with greater waqf endowments also had lower agricultural productivity, which was likely due to the inflexibility of waqf endowments. In Turkey, religious parties have been on the rise since the 1990s, with the Islamist AKP winning the presidency in 2002. At the local level, this has led to more pro-Islamic policies, including the removal of headscarf bans. Corekcioglu (2021) shows that towns with Islamist mayors were more likely to eliminate headscarf bans, which in turn increased employment for observant Muslim women.

Religion is intertwined with politics in the US, as well, with significant implications for economic growth. In recent decades, there has been a rise of "faith-based" initiatives promoted by religious conservatives. These initiatives authorized faith-based offices and task forces to bridge the gap between local governance and the faith-based community. Bentzen and Sperling (2020) find that places with more faith-based initiatives have more faith-based organizations and churches after the onset of the initiative. One area where this impinges on economic growth is attitudes towards women. McKenzie and Rouse (2013) find that among the US white population, conservative Christianity is associated with less egalitarian views on gender (although this is not the case for the Latino or black populations who are on average more religious). The rise in US faith-based initiatives thus increased skepticism towards women working in the labor market and receiving education, resulting in greater gender gaps in employment and education.

[17] There is a large literature in political science on the causes of the rise of Islamic parties. See Grewal et al. (2019) for a nice overview. We do not review this literature here because we focus on works that directly relate religious politics with economic growth.

Religion can also affect voters' political preferences, which can in turn influence political outcomes that affect growth. In addition to direct preference effects on political majorities, charity provision is one mechanism through which this can happen. Huber and Stanig (2011) theorize that privately provided charity can create voting cleavages among charity recipients, some of whom receive charity from the state and others from religious institutions. This in turn allows for coalitions to emerge (as in the modern US Republican Party) between the rich and "religious poor" that favor low taxes and limited redistribution. They also find that these coalitions only emerge when there is weak state financial support of religion. Stegmueller (2013) finds a similar result in the context of Western Europe: to gain support for anti-redistributive policies, political parties strategically bundle them with conservative Christian social policies. Gaskins, Golder, and Siegel (2013) argue that increases in inequality lead to both greater religious participation and increased economic conservativism among the poor (but not the rich).

In sum, there are numerous channels through which religious law, religious political parties, and religious preferences impinge on political outcomes. These can in turn affect total factor productivity through several channels such as restrictions on female labor-force participation, redistribution by the state, the perpetuation of inefficient institutions, and productivity in sectors affected by religious regulations.

6.3.3 Political Legitimation and State Development

The study of political legitimacy has been of interest to great minds for centuries—Hume, Hobbes, and Montesquieu all wrote about it at length. Historically, especially in the West and the Middle East, religion and religious authorities have played a central role in legitimating the state. Gill (1998, p. 51) provides a compelling reason why this is the case: "Ideology … is a relatively cost-effective form of control since people obey out of the belief that what the government does is right. By creating a system of values and norms, a strong ideology regulates citizens' behavior by providing an internal guide to acceptable and unacceptable activity." Seabright (2024, ch. 5, 11) argues that religion and religious authorities are particularly adept at legitimating rule because religions are *platforms*: they offer opportunities for members to network and make strong connections and are thus particularly proficient at attracting loyal followers. This is attractive to political authorities who seek support from religious authorities to increase adherence to rules. In return, religious authorities often form a part of the governing coalition. Economic implications of

these legitimating arrangements include increased city growth, public good investment, and technology adoption, all of which are key components of growth models.

Many countries have state religions, which have several economic implications (McCleary and Barro 2019, ch. 5). As Barro and McCleary (2005, p. 1332) note, "state monopoly over religion has probably been the single most important form of state monopoly in existence." They find that state control of religion tends to persist: by far the best predictor of state religion is whether the nation had a state religion in the past. Bentzen and Gokmen (2023) find that such persistence has very deep roots. Their analysis suggests that religion became institutionalized in states which used divine legitimation long in the past, and those states still have more institutionalized religion today and are more likely to be autocratic. While nations with state religions do not always adhere to the constitutional clauses promoting one religion over another (Fox and Flores 2009), the presence of a state religion is indicative of how the state legitimates rule.

How and when the state uses religious legitimation varies across time and place. For instance, Gill (1998) argues that, in Latin America, the strategy used by autocrats of legitimating rule with the Catholic Church depends on the degree of religious competition. This in turn has implications for how much the state can use its coercive power to suppress potentially subversive organizations. Coşgel and Miceli (2009) also find that religious competition affects whether the state finds it optimal to take control of religion. They argue that under monopolistic settings, religion can more effectively legitimate the state and thus lower the costs of tax collection.[18]

In the Islamic world, religion has played a role in politics since Muhammad and the First Four caliphs. Rubin (2017) argues that an equilibrium emerged in which religious legitimation was effective and thus frequently used by political authorities. This in turn meant that religious authorities received policy concessions. In fact, Blaydes, Grimmer, and McQueen (2018) find that medieval advice texts to rulers began to emphasize religion in the Middle East precisely when religious authorities began to obtain power independent of the state around the 11th century. Meanwhile, religion began to be de-emphasized in Christian advice texts in the late medieval period, as religious authorities were losing their capacity to legitimate rule. According to Rubin, this meant that religious authorities gained a greater seat at the political bargaining table in the

[18] Coşgel et al. (2018) qualify this finding empirically, noting that while monopolization of religion does lead to less secularization, this result is reversed if the ruler is of a different religion than most of the population. In this case, a monopolized religious market can have a delegitimating effect.

Middle East as their power to legitimate rule rose. For example, in a study of medieval Egypt where rulers relied heavily on religious authorities for legitimacy, Chaney (2013) finds that religious authorities gained political power and were less likely to be removed when the Nile River was either too high (flood) or low (drought). Such weather conditions placed political authorities in a precarious position, thus increasing their desire to establish their legitimacy. As a result, the bargaining power of the religious establishment was greatest at these times, and they were able to extract the most from the state.

Such arrangements could have serious consequences for economic growth. The most direct consequence is that policies that hamper economic growth persist even after it becomes clear that they stifle growth. Two examples with substantial impact on growth in the Middle East are restrictions on taking interest (which is widely thought to be banned by the Qur'an) and prohibitions on printing in the Arabic script which would have threatened the monopoly of the religious establishment over intellectual pursuits (Rubin 2017). According to Rubin, the most important effect of religious legitimation in the Islamic world is that it kept economic elites outside of the ruling coalition. With little voice, these elites could not advocate for policies that benefited themselves and, incidentally, economic growth.

Other political economy phenomena have been deemed important for the relative economic stagnation of the Middle East. One related to religious legitimation was proposed by Blaydes and Chaney (2013), who argued that Muslim rulers had fewer constraints on their rule than Europeans because the former had access to slave soldiers. This meant that Muslim rulers did not need to negotiate with other powerful elites, and thus institutions like parliaments never formed until after colonization. By contrast, European rulers were constrained by powerful lords whom they relied upon for military service, and these lords ultimately institutionalized their power in parliaments. Bisin et al. (2023) present a model in which political authorities only devolve political power (as European rulers did) when the returns from religious legitimacy are sufficiently low. They reason that there are benefits to a ruler to voluntarily constrain their own power—greater tax collection, more local law and order—but these benefits are only worth it when the ruler has weak access to other sources of power such as religious legitimacy. These insights can help explain the divergent political and economic trajectories of Western Europe and the Middle East.

In Europe, the Protestant Reformation brought a sea change in how rule was legitimated, with significant consequences for growth. Rulers that adopted the Reformation lost one of their

historical sources of legitimacy in the Catholic Church. Greif and Rubin (2023) and Rubin (2017) argue that the Reformation encouraged Protestant rulers to turn to parliaments for legitimacy. Protestant rulers were no longer able to rely on the Catholic Church to legitimate their claims to rule, and Protestant churches were a weak substitute. Parliaments were the natural alternative, as they were pre-existing forums where elites met to negotiate with the crown. This had important implications for economic growth. In England and the Dutch Republic, which became the world's leading economies soon after their reformations, parliamentary power grew substantially in the 16th and 17th centuries. This led to the enactment of many pro-growth statutes, including those related to transportation, enclosures, land reclamation, and property rights (Rubin 2017). Cantoni, Dittmar, and Yuchtman (2018) argue that state administration became more secular in the Holy Roman Empire because Protestant rulers no longer sought legitimacy from the Church. They find that Protestant university students increasingly majored in law rather than theology, seeking jobs in government administration. Religious competition also encouraged Protestant towns to adopt church ordinances, which expanded local welfare provision and public education. Dittmar and Meisenzahl (2020) find that this induced those with elite human capital to move to Protestant cities, which in turn caused them to grow faster and become more human capital intensive by 1800. Thus, throughout Europe the Reformation had a secularizing effect that ended up promoting growth.

Another outcome through which religion and political economy interact is the development of the state itself. For instance, late-medieval city states were among the first places in Europe to move away from autocratic governance. Belloc, Drago, and Galbiati (2016) show that earthquakes slowed this transition, but only in places that were ruled by religious authorities. They reason that earthquakes were viewed as signs from God, and religious authorities had a comparative advantage in interpreting them as such. This allowed religious authorities to maintain their autocratic powers, which tended to retard economic growth. More generally, a large literature attributes Europe's eventual economic growth to its fragmentation following the collapse of the Holy Roman Empire (Ko, Koyama, and Sng 2018; Scheidel 2019). Grzymala-Busse (2023) argues that the Church played a role in this fragmentation. It benefited the Church when none of the European powers were too large, so it played the powers off against each other, never allowing any one state to become too powerful. The Church could do this because it had the "wealth, spiritual authority, and expertise to fundamentally mold politics" (Grzymala-Busse 2020, p. 20). With little access to

coercive power, the papacy instead shaped states via doctrine, law, and administrative innovations. Though unintended, these innovations would play a key role in Europe's eventual economic rise.

In summary, an important mechanism through which religion affects economic growth, both historically and today, is political economy. Religious authorities can use their spiritual power to legitimate the state, which in turn allows them to influence policy. This can have far-reaching (and unintended) consequences for economic growth, affecting patterns of trade, human capital development, and productivity.

6.3.4 Religious Persecution, Tolerance, and Conflict

Civil wars, inter-religious wars, and intolerance can hamper economic growth by disrupting production and trade opportunities. Religious conflicts tend to entrench opposing sides not just in the short run but also over longer periods. Discrimination in the labor market against religious groups may lead to inefficient allocation of factors of production. Meanwhile, religious diversity may facilitate innovation and improvements in production, and inter-religious economic complementarities can mitigate conflict between religious groups. All these factors either directly or indirectly affect a society's productive capacity, thus impinging on economic growth.

The literature on ethnic diversity finds a robust negative relationship between diversity and economic growth (Easterly and Levine 1997). For religious diversity, it matters how diversity is measured. Alesina et al. (2003) find little correlation of an index of religious fractionalization with growth or its determinants. However, Montalvo and Reynal-Querol (2003) find that a measure of religious polarization that places greater weight on the extent to which groups view each other as threats is negatively associated with per-capita GDP and conditional convergence. They suggest that polarization negatively affects investment and government expenditure while making conflict more likely.

The latter channel has received much attention, especially with respect to religious *persecution*. Religious persecution is practically as old as religion itself. Jews have been persecuted throughout most of their history. Christians were a persecuted minority cult for the first three Christian centuries. Historically, Muslims have fought Christians, Catholics have fought Protestants, Sunnis have fought Shi'as, Hindus have fought Muslims, and so on. A recent literature has emerged that provides insight into how such conflicts and persecutions affect economic growth.

Jews have been persecuted throughout most of their history despite (or, perhaps, because of) playing a central role in finance and trade. Voigtländer and Voth (2012) study the continuity of

anti-Semitism in Germany. Their analysis begins with the Black Death, a plausibly exogenous shock that precipitated anti-Semitic views, as Jews were blamed for the plague (e.g., through poisoned wells). They find that places that had medieval pogroms against Jews still harbored anti-Semitic sentiments in the 20th century, as seen in Nazi vote shares and attacks on synagogues. The persistence of these cultural traits is much weaker in places with greater access to trade.

These results have serious implications for economic growth. D'Acunto, Prokopczuk, and Weber (2019) find that financial development in the present day is low in German counties with high levels of anti-Semitism. Although savings are similar across German counties, those with an anti-Semitic past invest less in stocks, have fewer bank deposits, and are less likely to get a mortgage. These results are likely due to the historical specialization of Jews in financial services, which fed anti-Semitic tropes of Jews being stock-market manipulators and avaricious moneylenders.

At the root of many persecutions are political economy considerations. Political legitimacy is a key component in how a state is run and how an economy grows (Section 6.3.3). Religious persecutions can be a means to obtain legitimacy. Johnson and Koyama (2019) argue that Jews and other minorities (e.g., Roma, "witches") in medieval Europe were tolerated only when societies were relatively stable. Since rulers relied on religious legitimacy, they could improve their religious bona fides by persecuting religious minorities in times of instability. Oster (2004) finds that witchcraft trials were particularly prominent during periods of bad weather when scapegoats were needed for crop failures. Likewise, Miguel (2005) finds that extreme rainfall shocks lead to increased murder of elderly women deemed as "witches" in Tanzania, possibly because of their relatively low labor productivity. The presence of witchcraft is also associated with several inputs of economic growth functions. Gershman (2022) finds that beliefs in witchcraft are negatively associated with markers of creative culture, innovative activity, social capital, and trust, while there is an inverted-U shape relationship between witchcraft beliefs and standard measures of economic well-being.[19]

Political economy considerations also contributed to the persecution of medieval Jews, who were more likely to be persecuted during unseasonably cold weather years (Anderson, Johnson,

[19] The negative relationship between witchcraft beliefs and social capital—both for those holding beliefs and those engaging with people who hold these beliefs—has also been found in Gershman (2016) and Le Rossignol, Lowes, and Nunn (2022).

and Koyama 2017). It was particularly in weak states—those in which authorities were not secure in their rule—that such persecutions were most likely to occur. A similar mechanism is proposed by Ticku, Shrivastava, and Iyer (2023) to explain Muslim desecration of Hindu temples in South Asia. They find that desecrations were much more likely to occur during large weather fluctuations. Iyer (2018) argues that Indian regions with greater inequality are more susceptible to religious violence because it causes politicians to exploit economic grievances by raising religious hostility. In Eastern Europe, Grosfeld, Sakalli, and Zhuravskaya (2020) find that anti-Jewish pogroms were more likely to happen in the Pale of Settlement between 1800 and 1927 when economic shocks and political turmoil occurred at the same time. Unlike the analyses of Voigtländer and Voth (2012) and Johnson and Koyama (2019), they find little evidence of Jews simply being scapegoated. Instead, they argue that Jewish moneylenders were quick to demand repayment during periods of turmoil because debtors were unable to commit to paying back their loans. This led to ethnic and religious violence and persecution.

Several studies seek to understand the consequences of religious intolerance and persecution. The Holocaust stands out as the deadliest religious persecution of the 20th century. Acemoglu, Hassan, and Robinson (2011) find that those Russian cities which had the most intense experience with the Holocaust grew less throughout the 20th century and continue to have lower population and greater Communist vote shares after the collapse of the Soviet Union. They argue that this was due to a substantial thinning-out of the middle class, as Russian Jews were primarily engaged in white-collar occupations prior to the Holocaust.

In contrast to the detrimental impact of religious persecution, inter-religious economic activity can often have a positive effect on growth. Religious tolerance and diversity can spur technological advancement (Section 6.2). Economic complementarities between religious groups can also foster dependence and trust, thus lowering animosity or a predilection to persecute. In India, Jha (2013) studies how historical economic complementarities between Hindus and Muslims can mitigate hostilities between the two groups in subsequent centuries. Such complementarities were particularly stark in port towns, where Muslim traders dominated in the medieval period. Jha argues that this encouraged the formation of institutions that supported inter-religious exchange and helped mitigate Hindu-Muslim riots in the 19th and 20th centuries.[20]

[20] Mitra and Ray (2014) present an alternative theory of Hindu-Muslim violence. They argue that an increase in income for a religious group makes violence against that group more likely to be framed as religious. This allows all members

For as long as there has been religion, there has been religious intolerance and persecution. This can have a dampening effect on economic growth through expulsions of productive religious minorities, reduced use of financial services, increased presence of extractive institutions, negative attitudes towards female education and employment, and much more. Exposure to individuals from other religions can help mitigate intolerance and inter-religious conflict, which remains a significant hurdle to economic growth.

7. Conclusions

The important insights generated over the past couple of decades by the literatures on the economics of religion and the economics of growth have mostly been disjoined. While the popular media often makes broad-brush connections between specific religions and particularly successful or detrimental growth episodes, modern economic analysis mostly shies away from such connections. This may partly be true because many of the recent advancements in the economics of religion, in particular as far as they are concerned with present-day analysis, tend to take a microeconomic rather than macroeconomic perspective. In fact, a key feature of most of the economics of religion studies that we cover is that they do not aim to contribute to the literature on economic growth and thus mostly do not make an explicit connection of their findings to growth.

We hope that our synthesis, with its structure (and, in parts, reinterpretation) along the lines of the elements of the macroeconomic production function, will not only help to better understand the important bearing of religion for growth, but also to initiate future work directly focused on the topic and to better place future work in the growth perspective. While many areas remain underexplored, we think that a few general conclusions on the relevance and nature of the impact of religion on growth and its various channels can be drawn based on our synthesis.

There is clear evidence that religion affected growth through promoting or hindering the accumulation of physical capital during various episodes across time and space. Restrictions on interest in Christianity and Islam, as well various elements of Islamic finance, are key examples of how religion affects financial development, with consequences for the matching of saving to capital investment. While there is some indication that—as argued by Max Weber—a Protestant

of the other religion to be targeted. They argue that the motivations for violence may be either economic (i.e., appropriation) or resentment.

ethic may have furthered thrift and saving in some contexts, the overall evidence on this channel is mixed.

Evidence also abounds that religion affects growth by influencing human capital. Many historical and modern examples, particularly from Judaism and Protestantism, show that religious norms, practices, and institutions—often inadvertently—led to a substantial accumulation of secular education in the mass population. By contrast, when religious content takes precedence over secular education, it often substitutes away from the generation of economically useful knowledge. Changes in Islamic education, Catholic resistance to the industrialization, and Ultra-Orthodox Judaism pose examples where religious education impeded long-run growth.

Religion can also affect growth through its impact on population and labor. Religious norms (and their decline) affect fertility and health-related mortality, thereby speeding up or holding back the demographic transition, which was essential for the transition from Malthusian stagnation to modern growth. By contrast, while relevant for denominational differences in some contexts, religious differences in work effort and thus effective labor input empirically do not seem to be the most influential factor linking religion to growth.

One of the most important channels of the role of religion for growth appears to be the shaping of norms and institutions that impact total factor productivity. Numerous empirical examples from all major world religions exemplify how religions can impact state development, policies, the emergence of growth-promoting institutions, and technological change. A key mechanism is the role of religion in legitimating political power. But religions also impact macroeconomic productivity through rituals, laws, the choice between inter-religious persecution or tolerance, and the suppression of innovations that threaten the traditional order.

As will have become painfully clear from our synthesis, there are also many obvious holes in our understanding of the link between religion and growth, which we think of as highly fruitful directions for future research. Most notably, among the “Big Five” world religions—Buddhism, Christianity, Hinduism, Islam, and Judaism—the available economics literature is clearly overly weighted towards the three Abrahamic religions and notably short of reliable insights from Buddhism and Hinduism. The same is true for other religions such as Taoism or—to the extent that it can be considered as a religion—Confucianism. Similarly, little research comparable to the studies covered here has focused on the growth implications of indigenous religions and of alternative spiritual movements. More research on non-Abrahamic religions could provide

fundamental insight into some of the most important questions in the economics of growth, such as why certain economies pulled ahead at certain points in time, why others caught up with those at the frontier (e.g., the Asian “tiger economies”), why some economies started to emerge in recent decades (e.g., some BRICS economies), and why others are still lagging behind (e.g., South Asia, sub-Saharan Africa).

The synthesized evidence on religion and education has uncovered a crucial distinction between educational content that builds economically valuable skills and content that does not. Research uncovering systematic reasons why religious content or secular education takes precedence over the other in specific contexts would clearly further our understanding of the human capital channel of the effect of religion on growth. Similarly, religious education can act either as a substitute for or complement to secular education in promoting growth-enhancing traits, and it is not well studied when and why one emerges rather than the other.

It also seems that the growth implications of the decline in religion and religiosity in some modern societies are a relatively understudied topic compared to inter-religious differences. There is evidence that secularization and a turn away from religiosity may have been an important factor for the very first demographic transition in France. Similar mechanisms may have relevance for the development of the other elements of the macroeconomic production function.

There is also little rigorous work on the role of religion in the sustainability of long-run growth. Some growth depends on the depletion of natural resources, which are obviously finite. Different forms of growth will also have different implications for climate change. Religions, and particularly religious values, may be relevant for the choices of individuals and societies in this respect.

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