Classicism and Modern Growth: The Shadow of the Sages

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Abstract

This paper examines how intellectual culture has affected economic modernization in China, where the learned class embraced classical wisdom for millennia but encountered the shock of Western industrial influence in the mid-19$^{\text{th}}$ century. I use the number of sage temples to measure the strength of classical worship in 269 prefectures, and instrument for the distribution of sage temples using the distribution of sages' birthplaces. I find that classical worship discouraged intellectuals from appreciating modern learning and thus inhibited the growth of industrial firms between 1858 and 1927. By contrast, industrialization grew faster in regions less constrained by classicism.

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"*To get the information firsthand, of course*" [say Hardin].
"*But wheah's the necessity?... Look heah, now, I've got the wuhks of all the old mastahs—the gweat ahchaeologists of the past... How insuffewably cwude it would be to go to Ahctuwus, oah to Sol, foah instance, and blundah about, when the old mastahs have covahed the gwound so much moah effectually than we could possibly hope to do*" [say Lord Dorwin].

Foundation, Isaac Asimov (1951, p. 65).

"*The humor of blaming the present, and admiring the past, is strongly rooted in human nature, and has an influence even on persons endued with the profoundest judgment and most extensive learning.*" David Hume (1754, p. 464).

1. Introduction

The role of intellectual culture is receiving growing attention in the search for the origins of modern economic growth (Mokyr 2016). A culture of progress, in the broad sense, is believed to be essential to the transition from a traditional to a modern economy. The European Enlightenment in the 17$^{\text{th}}$ and 18$^{\text{th}}$ centuries perhaps best illustrates this culture: the intellectuals appreciated novel ideas and the utility of new knowledge in promoting material progress, which laid the intellectual foundations of the Industrial Revolution and modern growth (Gay 1966; Jacob 1997; Mokyr 2005, 2016).

The Enlightenment, however, is somewhat exceptional in intellectual history. Backward-looking cultures, entrenched in the glory and worship of classical wisdom, are more common (Hume 1754; Gay 1966). After all, classic texts dominated the educational curriculum in most historical societies, and classical languages, philology, and scholasticism were the marks of higher education. Many cultures, particularly in the Islamic world, imperial China, and Catholic Europe, greatly admired their glorious classical antiquity. Notwithstanding their early success, most classical civilizations fell behind Enlightenment Europe in economic development after around the 18$^{\text{th}}$ century.

Whether classical worship inhibited economic modernization, however, remains a paradox. On the one hand, such worship could constrain paganism and innovation due to the classicists' inherent cultural superiority and deprecation of heresies, as well as competition in the marketplace for ideas, especially when the cultural incumbents received many benefits from the classical system. Even if new approaches may bring greater rewards, intellectuals may still follow the rule of (classical) thumb given the cost and uncertainty of modernization. The Quarrel of the Ancients and the Moderns in France, the Battle of the Books in England, and the inquisitions of new sciences in

the Catholic Church are prominent historical examples of resisting modernization (Levine 1991; Becker, Pino, and Vidal-Robert 2021).

On the other hand, classicism and modernism may not necessarily be incompatible. Indeed, classicism may reflect respect for knowledge accumulation. Standing on the shoulders of giants, scholars can develop new ideas by revisiting classical principles. And new configurations of old knowledge can also expand the limits of economic growth (Weitzman 1998). Even Isaac Newton, the icon of the modern school of his time, attributed many of his revolutionary findings to antique wisdom (Levine 1991). Likewise, Diderot, Montesquieu, and other leading figures in the Enlightenment era had strong classical tastes (Gay 1966; Ferrone 2015). Therefore, the extent to which classical belief affects modern economic growth remains an empirical issue. I use the case of China in the late 19th to early 20th century to examine this question for two reasons.

First, China has a long intellectual tradition of classical worship (Mokyr 2016). From the 2nd century BC to the 19th century, the imperial authorities honored great scholars for their contributions to developing the Chinese classics—primarily moral and natural philosophies and literary works. These classical masters were acknowledged as 'sages' (literally, holy wise and virtuous men). Their texts were regarded as imperial orthodoxy and employed as the curriculum of the imperial examinations—the ladder to success in traditional China. This firmly established the sanctity of the sages and their classic letters in the Chinese intelligentsia. They admired and idolized their intellectual ancestors in a quasi-religious manner, building temples to worship and propagate their canonical learning and thoughts.

Since the temples were the primary signals of classical worship, I assess their distribution to measure the strength of classical worship across regions. Using the systematic records on the temples contained in the *Unified Chorography of the Qing Dynasty* compiled by the imperial court in 1820, I identified 336 temples built to worship the sages based on the biographies of the figures enshrined. These sage temples are unevenly distributed across the 269 prefectures of China proper—the study sample. I compare these to the 2,836 temples built to worship other (non-sage) scholars, officials, monarchs, moral models, warriors, and folk gods to isolate the economic impact of classical worship from that of other forms of worship and the correlates of temple construction.

The second reason I analyze the case of China is that it experienced a clash between the ancients and the moderns after it was forced to open up to the West in 1842. The penetration of Western industrial civilization stimulated the Chinese intellectuals, at least some of whom were open minded, to industrialize the empire following Western

ideals. By 1927, nearly 3,000 domestic industrial firms had been established. These firms were concentrated in only half of the Chinese prefectures; the number of firms varied widely between prefectures from 1 to over 700. I investigate whether the geography of classical worship contributed to this uneven industrial development across regions.

By analyzing data from the 269 Chinese prefectures between 1858 and 1927, I provide evidence that classical worship may have inhibited industrialization. First, this hindrance effect is evident when comparing pre-industrial and industrial development in response to classical worship. I find that the number of sage temples was positively correlated with pre-industrial population size, agricultural income, and textile distribution, but turned out to be negatively correlated with the number of industrial firms in the study period. Meanwhile, the number of non-sage temples does not negatively affect industrial development, which provides a placebo to the negative effect of classical worship from the sage temples.

Second, this negative effect is robust to controlling for three groups of possible confounding factors. The first pertains to geographic endowments, including distance to the coast, distance to the nearest navigable river, terrain ruggedness, land area, and agricultural suitability index. Second, I control for initial (pre-industrial) economic conditions using the population in 1820 and the distribution of treaty ports, through which Western influence may have undermined classical culture but promoted industrial development. Third, although it is challenging to distinguish classical worship from classical human capital, I attenuate the latter's confounding effect by controlling for the number of candidates and degree holders in the imperial examinations. This concern is further alleviated when I restrict the sample to the period after the classical education/examination system was abolished in 1905. The results show that even after classical education no longer constituted the ladder to success, classical beliefs still prevented intellectuals from embracing modern technologies.

To further disentangle classical worship from unobserved confounding factors, I employ the number of sages born in each prefecture to instrument for the strength of classical worship there. In sages' home prefectures, locals had a greater incentive to erect temples to honor the sages to demonstrate their glory and sacred positions on the empire's intellectual map. A stronger classicism was thus cultivated and maintained in these 'holy lands' than in other places. Apart from the persistence of classical worship, the distribution of sages should have little to do with the industrial geography after the mid-19th century, simply because most sages lived in ancient times (before 256 BC), when the socio-economic correlates of intellectual success were fundamentally different from those in the industrial era. The instrumented estimation

also indicates that classical worship has a significant and negative effect on industrialization. On average, each additional sage temple is associated with a reduction of nearly five industrial firms in each prefecture between 1858 and 1927.

One important mechanism underlying the negative impact of classicism is the competition of ideas between the classical and the modern, because classical belief discouraged intellectuals from appreciating modern ideas and knowledge that are pivotal to economic modernization. To test the impact of this mechanism, I employ the number of modern science journals sponsored by Chinese scholars from 1872 to 1927 to gauge local intellectuals' openness to modern knowledge across prefectures, and find that fewer journals were sponsored in prefectures with more sage temples. Accordingly, modern human capital in support of industrialization grew more slowly in prefectures with a stronger classical ethos. Prefectures with more sage temples had fewer students enrolled in modern schools during China's educational modernization period (1901–1914); these prefectures produced fewer engineers who would otherwise play a crucial role in industrialization.[1]

These main findings indicate the importance of intellectual culture in shaping the progress of economic modernization. By examining the intellectual origins of the transition from a Malthusian to an industrial economy, most studies have focused on the *knowledge* aspect of intellectuals (e.g., Cantoni and Yuchtman 2013; Squicciarini and Voigtländer 2015; Dittmar and Meisenzahl 2020; Cinnirella, Hornung, and Koschnick 2022).[2] For instance, Yutchman (2017) and Bai (2019) document how modern industrial talent contributed to industrial development in early 20th century China. This paper contributes to this literature by investigating the *cultural* aspect of intellectuals, and provides suggestive evidence of the importance of intellectuals' beliefs in shaping their choice of knowledge – and thus modern economic growth (Mokyr 2005, 2016).

This study contributes to the broader literature on how historical cultures and religions affect economic change. Prior research has revealed the significant economic impacts of typical cultural values and norms, such as trust, patience, prudence, and civic norms (see Nunn [2012, 2020] and Voth [2021] for reviews), and the comparative economic consequences of different religions (see Becker, Rubin, and Woessmann [2020]

[1] Other conservative forces beyond the channel of intellectual conservatism – such as the lack of entrepreneurship or mercantile spirits, conservative local officials, labor mobility, and anti-Western sentiments – may have also inhibited China's industrial progress in the late 19th and early 20th centuries. However, these additional influences are beyond the scope of this paper.

[2] For the role of human capital in general (rather than knowledge elite only) during the Industrial Revolution, see, for example, Mitch (1993), Broadberry (2003), Galor (2005), and Becker, Hornung, and Woessmann (2011).

for a survey). I focus here on the culture of the intellectual circle and show that the worship of classical wisdom may stand in the way of human capital and economic modernization. The case of China echoes the negative impacts of Catholicism on educational and economic modernization in 19th century France (Squicciarini 2020), the decline of the Islamic sciences resulting from rising religious power after the 12th century (Chaney 2016; Rubin 2017), and more generally, the negative relationship between religiosity and innovation (Bénabou, Ticchi, and Vindigni 2021) and the shadow of traditional cultural configurations on modernization (Acemoglu and Robinson 2022).

The following section introduces the history of classical worship and China's modern economic transition. Section 3 discusses the main data and variables, and Section 4 presents the main findings on how classical worship affects industrial development. Section 5 provides evidence of how classical worship thwarted the diffusion of new knowledge and human capital that were pivotal to industrialization. Section 6 concludes.

2. Historical Background

2.1. Classical Worship

Masters were worshipped in China from as early as the Western Zhou Dynasty (1046–771 BC), when schools offered sacrifices to the deceased masters to foster students' respect for the learning of the older generations. From the Han Dynasty (202 BC–220) onwards, the worship of masters became gradually institutionalized. Emperors conferred the title of 'sage' on eminent masters and enshrined them the Imperial Temple of Culture—the highest honor for scholars in imperial China. Their works were promoted as classics, and employed as the principal curriculum in the schools and civil examinations. This allowed the imperial authorities to control the direction of the scholarship and the empire's ideology. From the Tang Dynasty (618–907), sage worship became a regular activity in imperial schools. Official sacrificial ceremonies were usually held twice a year, following rigorous rituals enacted by the imperial court.[3]

[3] Wilson (2002, p. 3) describes in detail the liturgy held in the imperial schools: "Twice a year members of the local educated elites and the highest officials in the area gathered before dawn to offer a feast of wine, animal sacrifices, vegetables, grains, soups, and cakes to the spirit of Confucius, his disciples, and the eminent scholars ... Drums, bronze bells, jade chimes, and string and wind instruments were played, promising youth from the local school danced in a slow, deliberate

The private worship of classical masters was more prevalent and influential than regular official sacrifices. This worship was mainly conducted in local temples dedicated to specific sages. The temples were typically built in county seats or academies, and open for scholars and students to visit and worship the sages whose statues were placed in the middle of the main hall. Sophisticated sacrificial ceremonies also took place in these temples (see Appendix Figure A1 for illustrations of sage temples and sacrificial activities). To some extent, classical worship became the 'religion' of the Chinese learned class. Historical narratives indicate that many literati sincerely practiced this worship. They believed in the superiority and sanctity of the sages' learning, and that their devotion could 'connect' them to the sages' spiritual world (Lu 2016).

The classical education (and examination) system further consolidated classical worship. The imperial authorities used examinations to select qualified officials from the 6th century until their abolition in 1905. Given that candidates required a mastery of classical learning to pass the civil service exams, such learning dominated school education and academia. Sons of literate families were trained to recite the texts of the Four Books and the Five Classics from the age of 5 or 6 years old. Scholars' academic standing was based on their mastery and exegesis of classical texts.

Considerable talent and resources were therefore directed to classical studies. Since the Han Dynasty, classical education had been highly valued in educated families, as described in the proverb 'bequeathing your sons a piece of classic book is better than leaving them a basket of gold' (*Books of Han Dynasty*). In the 17$^{\text{th}}$ to 18$^{\text{th}}$ centuries, scholars of the *Kaoju* (evidential studies) school attempted to use 'concrete learning' to reform the metaphysical neo-Confucian scholarship. Yet they mainly focused on 'rediscovering' the antiquarian texts, and their methodology was philological rather than experimental (Elman 1984). While there were some 'cultural entrepreneurs' in traditional China, their innovations were largely in the tradition of the classical canons; they were much less revolutionary and enlightening than their European counterparts such as Francis Bacon, Isaac Newton, and Martin Luther. Even the most renowned Qing mathematician, Mei Wending (1633–1721), asserted that "the accumulation of human knowledge is merely a token of the ancients' superior merit" (Jami 2012, p. 220).[4]

In sum, continuous state promotion made classical worship so persistent in historical China. Nor was there a religious reformation or market for ideas that could

sequence of prescribed bodily dispositions, and celebrants sang prayers extolling Confucius as without peer in human history, equal to Heaven and Earth."

[4] See Mokyr (2016, Part V) for more examples of the classical constraint of Chinese cultural entrepreneurs and comparisons with those in the West.

challenge the classical orthodoxy as experienced in Western Europe. The classical scholastic system functioned so well that Chinese elites had few incentives to develop a new or modern one, which would be costly, uncertain, and likely to jeopardize their vested interest in the classical system (Qian 1985; Mokyr 2016). Therefore, classical worship in historical China seems to be more institutionalized and overwhelming than that of Britain at the time, where many intellectuals exhibited distinct classical tastes but still appreciated new learning in the market of ideas.

Finally, China's classical beliefs encountered an unprecedented challenge from industrialization after the forced opening up in 1842. The question is whether, and to what extent, China's long-lasting classicism would constitute an intellectual constraint on the penetration of modern forces.

2.2. Modernization and its Classical Fetter

China's economic modernization began in the mid-19th century following its defeat by Britain in the First Opium War (1839–1842). It was forced to lift its centuries-long autarkic policy and open up to the Western powers; industrial civilization and 'useful knowledge' were imported through the treaty ports.

This influence stimulated some open-minded Chinese elites to found modern schools, sponsor journals, and translate books to introduce Western thoughts and industrial technologies. These efforts gave China the impetus for industrialization. From the late 1850s, new industrial firms experienced steady growth in the textile, machinery, chemical, and various other industrial sectors (see Appendix Figure A2).

However, classical beliefs and mindsets still drove many conservative elites to seek ways of self-strengthening from their intellectual ancestors, and to resist the tide of modernization. They believed Western technologies were superior only at the 'implementation' level but were not comparable to Chinese learning in 'spirit'. Viewing modernization as a threat to Chinese orthodoxy, classicists such as Wo Ren (1804–1871) used their political and cultural influence to criticize industrial technologies and defend Chinese classics. Wo Ren believed that ancient Chinese wisdom in the self-cultivation of propriety could defeat Western weapons and machines. Likewise, Zhang Shengzao, an imperial censor in Shandong Province (the home of Confucius), petitioned the emperor to oppose the establishment of Tong Wen Guan, the first modern institute for teaching Western languages and sciences, on the grounds that the new curriculum would direct students' interest from the essentials (classical learning) to the trifles (technologies), and thus erode the cultural foundation of the empire (Zhongguo shixue

hui 1961). Such cultural triumphalism made them what Landes (2006) called a singularly 'bad learner'.

Even modern intellectuals were more or less overshadowed by classicism. For example, pioneers of the Westernization movement (also known as the Self-strengthening Movement) from the 1860s to the 1890s still upheld the principle of *zhongti xiyong* (Western learning for use under the body of Chinese learning). This sentiment echoes those of their *Kaoju* predecessors, who absorbed the Jesuit sciences into the Chinese classics rather than developing Chinese sciences using European methods (Ma 2021). Likewise, the leader of the Wuxu Constitutional reform, Kang Youwei (1858–1927), sought legitimacy for his reform proposal from Confucius.

The defense of the classical camp did not cease after the imperial regime collapsed in 1911. The classicists initiated movements to protect Chinese orthodoxy in response to the New Culture Movement that propagated the sciences and modernity in the 1910s to 1920s. These quarrels resembled the battles between the Ancients and the Moderns in 17th- and 18th-century Europe. In the next section I quantitatively assess whether the classical ethos systematically inhibited China's industrialization.

3. Data and Variables

The sample is all 269 prefectures of China proper based on the administrative map of the Qing Dynasty in 1820 (CHGIS, version 6).[5] The following empirical analyses are primarily drawn on the cross-sectional regressions at the prefectural level.

3.1. Classical Worship

To measure the strength of classical worship in each prefecture, I use the number of temples that were built to worship the sages, i.e., acknowledged masters of classical learning. Scholars were selected as sages via a process of nomination and approval from other renowned scholars of the time (Chu 2008); the imperial authorities then conferred their status. Therefore, the distribution of sages across prefectures is unlikely to have been influenced by the Emperor in the same way that the Catholic Church strategically selected more saints in regions that had more Protestants (Barro and McCleary 2016).

[5] China proper comprises the 18 core provinces dominated by the Han Chinese at this time. It excludes the 'frontier provinces', for which less data is available.

I use the temple measurement for two reasons. First, temples constitute the tangible presence of classical worship in historical China. Local scholars and elites built them to carry out sacrificial visits, ceremonies, and other memorial services. More temples were erected in regions where the admiration of classical wisdom prevailed. Second, since the temples were the primary sites conducting classical worship, they would further consolidate the ethos of classicism in a region. Historical narratives indicate that local scholars viewed the temples as the 'nodes' that linked them to the ancient masters by transmitting the masters' spirit and wisdom (Yang 1997).

I collected data on the sage temples from the *Unified Chorography of the Qing Dynasty* (*Jiaqing Chongxiu Daqing Yitong Zhi*). Compiled by the Qing court in 1820, the *Chorography* records all the temples in each prefecture, including each temple's location and which figures it features (sages or non-sages) (see Appendix Figure A3 for an illustration). I manually checked the biography of each figure and identified 336 temples that worshipped sages.[6] The sage temples were unevenly distributed across China proper; about 57% of prefectures had at least one, up to a maximum of 11 (see Figure 1 for the map and Appendix Figure A4(a) for the histogram of the number of sage temples). More temples were built in regions that were economically and educationally prosperous, in part because they could better afford to build, renovate, and maintain them, and since scholars built and operated most of these temples.

The sage temples were built between the 6$^{\text{th}}$ century BC and 1820, peaking from the 12$^{\text{th}}$ to the 17$^{\text{th}}$ centuries. Therefore, the number of temples in 1820 reflects the accumulation of classical worship from the distant past and is thus less subject to the reverse causality of industrialization after the mid-19$^{\text{th}}$ century. However, this measure may not capture later changes in the strength of classical worship, such as being undermined by modern forces in some regions. In the absence of systematic data on the distribution of sage temples after 1820, I assume that classical worship accumulated from the millennium-long history persisted until the sample period (1858–1927).

Another concern is that the temples recorded in the *Chorography* may not include all temples that ever existed, as some may have disappeared by 1820. Yet the survival of the temples is also informative and may strengthen the measure of classical worship, since temples are more likely to persist in stronger worship regions. That said, the

[6] The sage temples do not include temples in government schools. In the Qing Dynasty, each county had one government school that was used to host the imperial examination candidates. Each school had a Temple of Culture to enshrine all the sages. These temples were mainly used to hold regular official sacrificial ceremonies during the school year; they were not typically open for private visits. Therefore, the number of such official temples does not reflect the actual level of local classical worship. Controlling for the number of these official temples, which is equivalent to controlling for the number of counties, does not change the effect of sage temples.

temple measure does not exclude measurement errors. For instance, sages in some prefectures received forms of worship other than temples (e.g. in scholars' homes, writings, and hearts), which this measure cannot capture.

For comparison, I also counted the distribution of other temples built to worship non-sage figures, including scholars, officials, monarchs, moral models, warriors, and folk gods. There are a total of 2,836 non-sage temples, covering a larger geographic area than the sage temples. By comparing the economic impacts of the number of sage temples and the number of non-sage temples, I can estimate the effect of classical worship net of the other forms of worship and the correlates of temple construction.

3.2. Modern Economic Growth

Given that China's early economic modernization centered on industrialization, I use the number of industrial firms as the primary outcome variable. I obtained this data from Du (1991), who systematically recorded all domestic industrial firms established in each prefecture between 1858 and 1927. For each prefecture, I aggregate the number of firms founded during this period as the primary dependent variable. This variable gauges the cross-prefectural variation in industrial development over 70 years, covering the period of China's early industrialization from the traditional economy. As shown in Figure 1, the number of firms varied strikingly across the 269 prefectures.

Due to data limitations, this study does not discuss post-1927 industrial development. It is also beyond the scope of this study to examine whether the influence of classicism has persisted until the present day. I investigate how China's traditional intellectual culture shaped its first transition from a traditional to an industrial economy.

I also employ the number of modern banks as an alternative measure of economic modernization, and use the number of modern journals and human capital (engineers and modern school enrollment) to capture the underlying intellectual channels at play.

3.3. Control Variables

Geography. I control for five prefecture-level geographic characteristics. First, since both temples and industrial firms are located close to coastal areas, I control for a prefecture's shortest distance to the coastline. Second, given the critical transport function of rivers in historical China, I control for the distance to the nearest navigable river. A third and related control is the terrain ruggedness index, as it may affect the entry costs of new ideas and industrial firms. The fourth is the land area of each

prefecture, given its possible effect on market size and the landscape of industrial expansion. Fifth, I control for agricultural productivity because it determines a traditional society's income level while competing with (or complementing) industrialization. I use the soil suitability index for planting the major staple crops (wheat, rice, maize, and potatoes) as the proxy.

Economic Conditions. A prefecture's industrial development is linked to its initial economic prosperity. In addition, more prosperous regions may be able to afford to build more sage temples, thus attenuating the true impact of classical worship. To address this concern, I control for a prefecture's population size in 1820, before China's economic modernization, based on Cao's (2000) estimates.[7] Another essential condition for industrial development in China is the distribution of the treaty ports. Treaties signed between China and Western powers opened up 43 ports to the West for trade and commerce from 1842 to 1927. These ports became the fountainheads of China's modernization, outperforming the other regions in economic development (Jia 2014; Kung 2022). In addition, since Western influence through the ports may have undermined traditional Chinese culture, I control for a dummy indicating whether a prefecture had a treaty port by 1927.

Classical Human (Political) Capital. The culture of classicism is nested in the classical education/examination system in imperial China. Therefore, the level of classical worship is associated with the strength of classical human capital. It might be the case that classical *human capital*, rather than classical *culture*, shaped the growth of industrial firms. Bai (2019), for example, documents that many traditionally educated elites did not embrace modern professions until the classical examination system was abolished in 1905. To mitigate the confounding effect of classical human capital, I control for the latter using the number of candidates (quota) and degree holders (*jinshi*) in the imperial examinations.[8] In addition, given that elite recruitment was based on the examination, the number of examination candidates and degree holders also reflects the strength of the political elites in a prefecture. Appendix Table A1 reports summary statistics for all variables.

[7] Using population data from 1880 or 1910, the other time points with available population data, produces similar results (not reported). However, both population figures may be subject to the feedback effect of industrial development.

[8] The quota refers to the number of examination candidates the imperial court allocated to each prefecture for the entry-level examinations, which was partially based on the prefecture's educational level. I use the quota in the late 19th century based on Bai and Jia (2016). For *jinshi* degree holders, I aggregate their number between 1371 and 1820 for each prefecture to capture the accumulation of elite human capital. The data is from Chen, Kung, and Ma (2020).

4. Classical Worship and Industrial Development

4.1 Basic Patterns

To examine how classical worship affected industrial development, I regress the number of industrial firms on the number of sage temples across all 269 Chinese prefectures, conditional on the prefectural controls discussed in the previous section.

I first examine the role of sage temples in the pre-industrial economy to check whether prefectures with stronger classical worship were already more economically backward before industrialization started. I employ three measures of pre-industrial economic development. The first is the population size in 1580 and 1820, which is a conventional proxy for pre-industrial economic prosperity based on the assumption that only prosperous regions could support a large population.[9] The second pertains to agricultural income, proxied by the agricultural tax revenue levied in each prefecture in 1820. The third measure relates to the traditional (handicraft) industry, for which I use the distribution of silk textile centers in the Ming and Qing dynasties, since silk was a representative and leading industry in traditional China. Then, I compare the impact of sage temples on these pre-industrial economic measures to their impact on industrial firms.

In the above analysis, I also compare the effect of sage temples to that of non-sage temples. I include non-sage temples to help disentangle the effect of classical worship from that of other forms of worship, folk religions, or correlates of temple construction. In sum, pre-industrial prosperity and non-sage temples provide two placebos to contrast the effect of classical worship on modern growth. This strategy can be specified in the following equations:

$$\text{Pre-Industrial}_i = \alpha + \beta_1 \times \text{SageTemples}_i + \beta_2 \times \text{NonSageTemples}_i + \gamma \times \text{X}_i + \varepsilon_i, \quad (1)$$

$$\text{Industrial}_i = \alpha + \beta_1 \times \text{SageTemples}_i + \beta_2 \times \text{NonSageTemples}_i + \gamma \times \text{X}_i + \varepsilon_i, \quad (2)$$

where Equation (1) examines the relationship between sage temples and traditional economic prosperity before China's industrialization started in the mid-19$^{\text{th}}$ century. Equation (2) evaluates modern economic outcomes by examining the effect of sage temples on the number of industrial firms between 1858 and 1927. Both equations

[9] The population data is from Cao (2000). I exclude population data before 1580 because many sage temples had not yet been established then. The data on agricultural revenue is from Liang (2008).

include the number of non-sage temples for comparison. X_i includes the set of geographic controls introduced in Section 3.3. ε_i is the error term.[10]

Figure 2 reports the estimation results of the two equations. The number of sage temples is positively correlated with population size, agricultural tax revenue, and the probability of having a silk textile center in traditional China. These results indicate that classical worship was more prevalent in economically prosperous areas in pre-industrial China. This is because only developed regions could afford temple construction, classical education, and consequently a classical intellectual culture.

However, after industrialization began, sage temples are negatively associated with the number of industrial firms: one additional sage temple reduced the number of industrial firms by nearly four (a decrease of 35% evaluated by the mean number of industrial firms). This implies that classical worship may have had a hampering effect on industrial development. This effect is further highlighted by comparing it to the effect of non-sage temples, which remains positive for both pre-industrial and industrial development.

The results displayed in Figure 2 also indicate that modern industries did not necessarily emerge in traditionally prosperous regions, but in those with fewer constraints from classicism (all else equal). Next, I consider other prefectural factors that may affect both classical worship and industrial development to determine whether the negative effect of classical worship holds.

4.2. Additional Controls

To address the possible effect of pre-industrial economic conditions on industrial development, I control for each prefecture's population in 1820. I also control for the distribution of treaty ports to gauge the impact of Western influence. To disentangle classical worship from classical human capital (and its rewards from the imperial examination), I control for each prefecture's examination quota and number of degree holders. The ordinary least squares (OLS) estimation shows that these factors do not mitigate the negative effect of sage temples on industrial development (column 2 of Table 1). Compared to the results without these additional controls (column 1), the effect of sage temples becomes even greater. Since the number of industrial firms has

[10] To account for the possible spatial autocorrelation that may arise from the worship culture spilling over to nearby prefectures, I report standard errors clustered in a broader geographic scale. I cluster standard errors in a radius of 136 km from the prefectural centroid, which approximately covers neighboring prefectures based on the prefectural centroids, based on the method of Colella et al. (2019). The results are similar to those using robust standard errors without clustering.

count data and a large share of zeros (Appendix Figure A4(b)), I also use Poisson regression and find that the effect of sage temples still holds (column 3 of Table 1).

4.3. After the Rewards of Classical Education was Gone

The payoffs of retaining classicism were closely associated with the classical institutions of imperial China, chiefly the education and examination system that based students' career mobility on their efforts in sage learning. However, China began to modernize its education system in 1901 and then abolished the examinations in 1905, removing the institutional foundation of classical worship. Therefore, the rewards from studying classics sharply declined after 1905.[11] If sage temples still influenced the growth of industrial firms during this period, this would be more likely to reflect a cultural effect from intellectual conservatism (rather than the effect of classical education institutions). When I restrict the sample to the post-1905 period, sage temples still have a significant negative effect on industrial firms, suggesting that the traditional intellectual culture persisted after formal institutions that promoted this culture closed (column 4 of Table 1).

A related concern is the trend of the classicism effect. Was the negative effect of classical worship on the number of industrial firms gradually mitigated by the sustained modernization that took place during the 70-year study period, or was it driven by variations in firm establishment in particular years? To address these questions, I examine the dynamic effect of sage temples on the number of firms over time. I aggregate the number of firms by seven decadal intervals between 1858 and 1927 for each prefecture, and regress it on the interaction terms between the number of sage temples and the seven decadal dummies. Figure 3 displays the trend of the effect of sage temples. The number of sage temples has a persistently negative impact on the number of industrial firms (at least until 1927), which indicates that regions with a burden of classical history gradually fell behind the others in industrialization. The non-sage (placebo) temples have no negative impact on industrial firms during this period.

[11] The abolition of the examination system substantially changed the mobility channel and incentives of the educated; many of them turned to alternative outlets for fame and wealth, especially in modern industries, education, and more radical political movements (see, Bai and Jia 2016; Bai 2019). This is also reflected in the positive impact of traditional human capital on industrial firms reported in column 4 of Table 1.

4.4. Decomposing the Worship

To further investigate the temple effect from the worship of past wisdom, I divided the temples into three groups based on when the sages enshrined in them lived: 1) ancient times (580–221 BC), 2) early to middle imperial period (221 BC-960), and 3) later imperial times until 1820. These three periods vary in the achievements and degree of influence of sage learning. The ancient period was when most sages lived and wrote classic works. The systematization and exegesis of the ancient classic letters occurred in the second period. In the third period, scholars continued to do the exegesis work, but there was significant development and 'reformation' of the classics, notably the development of the neo-Confucian School in the Song Dynasty (960–1279) and the School of Mind in the Ming (1368–1643), among others (Bol 2008). Therefore, if classical worship *did* matter, worshipping the more ancient (and perhaps more sacred) wisdom should have had a greater (negative) impact on modern growth.

I horse-raced the number of sage temples with sages born during the three periods, controlling for the same set of covariates as in column 2 of Table 1, and plot the results in Figure 4(a). The results are consistent with above hypothesis. Temples built to worship ancient sages have the greatest negative relationship with the number of industrial firms, whereas those that honor more recent masters have a smaller effect, in both magnitude and significance.[12]

Next, I decompose the non-sage temples into six types based on the figures they enshrined (scholars (but not sages), officials, monarchs, warriors, moral exemplars, and folk gods)[13] to examine whether some specific types of worship – such as worship of learning (scholars) or power (officials and monarchs) – may confound the effect of classical worship on industrial development. I horse-race the sage temples with different types of non-sage temples in the same regression, and find that the negative effect of sage temples remains robust (Figure 4(b)).

4.5. Alternative Measures of Modern Growth

For robustness, I examine how sage temples affect five measures of industrial development (results summarized in Appendix Tables A2 and A3). First, the number

[12] Their differential effects remain robust after regressing industrial firms on the three periods of temples one by one.

[13] Note that some types overlap because a figure may have multiple identities. For example, many officials were also scholars, and some war heroes were worshipped as moral models because of their distinct loyalty and integrity in the wars. Therefore, a temple enshrining a figure with multiple identities may be included in different corresponding temple types.

of firms has extreme values. While most prefectures have less than 10 firms, some have more than 100; Songjiang Prefecture or Shanghai has the most, 735 (Appendix Figure A4(b)). To mitigate the impact of extreme values without trimming the sample, I winsorized the top 1% in the distribution of the number of firms. This does not affect the significance of the sage temple effect (column 1 of Table A2).

Second, I exclude prefectures that had no industrial firms during the sample period to restrict the sample to more homogenous (industrializing) regions. The number of sage temples still has a significant negative impact on the number of industrial firms (column 2 of Table A2).

Third, I use the per capita measure of industrial firms, normalizing the number of firms by the average population in 1910 and 1920 (per million) in each prefecture. This can mitigate the possible effect of population growth on industrial development. I use the inverse hyperbolic sine transformation of the per capita number of firms to normalize the distribution. The results demonstrate that sage temples still negatively affect per capita firms, though the significance decreases to the 10% level (column 3 of Table A2). One possible reason is that the number of firms, which are discrete count values, become smaller after being normalized by the continuous population variable. The result holds when I restrict the sample to the post-1905 period (column 4).

Fourth, the number of sage temples also reduced the number of modern banks—another pillar of economic modernization that is closely associated with industrialization in China (column 5 of Table A2). I use the number of modern Chinese banks in 1927, which reflects the development of modern finance since the first Chinese bank was established in 1897 (Lin et al. 2021). One additional sage temple is associated with a 0.86 (or 156%) reduction in the number of banks, which indicates that the effect of classical worship spills over to the financial market.

Finally, the *number* of firms may not accurately measure industrial development across prefectures. Modern capital-intensive industrial firms or firms in heavy industries, for example, tended to be large to achieve economies of scale, but their number may be small. In the absence of capital and employee data, I divide firms by industrial sector and examine the effect of sage temples on the number of firms in different sectors. This method can approximately mitigate the effect of industrial type on the number of firms. Given the small number of industrial firms in each sector, I aggregated some sectors that are similar in scale and capital intensity, and classified the firms into five sectors based on Du (1991): 1) textiles, 2) food processing, 3) chemical industry, 4) machinery, transport, and mining, and 5) construction, water supply and electricity. The results are reported in Table A3. Both OLS and Poisson estimations show that the negative effect of sage temples remains consistent across all

the industrial sectors. The textile industry, the leading manufacturing industry in China at the time (Liu 2020), received the greatest influence from classical worship.

4.6. Sages and Classical Worship: Instrumented Evidence

The control variables in the above analyses may not rule out all possible factors that may confound the effect of classical worship. To address this concern, I employ an instrumental variable that predicts the strength of classical worship but has little to do with industrialization after the mid-19th century – the number of sages born in each prefecture.

The first-stage relationship between the number of sages and the strength of classical worship is premised on the glory of the classical achievements the sages brought to their native places. In sages' home prefectures, scholars had a greater incentive to build temples to honor the sages than in places without such historical giants. By building the sage temples, scholars also demonstrated and consolidated their localities' orthodox status on the empire's intellectual map (Yang 1997).[14] For example, Yanzhou Prefecture (home of Confucius and his disciples) and Jianning (home of Zhu Xi, the master of the Neo-Confucian school) maintained seven sage temples each by 1820, much more than prefectures without such sage history (on average, 0.88 temples per prefecture). Figure 5 shows the 47 home prefectures of 139 sages; it indicates that more temples were built in these holy lands.[15]

I test the first-stage relationship in Table 2 (columns 1 and 2). Regressing the number of sage temples on the number of sages yields a significant and positive link. On average, one additional sage would bring 0.145 (or 12%) more sage temples after controlling for population, degree holders, and geographic factors. The results also indicate that sage temples are more likely to be built in (traditionally) prosperous regions, i.e., those with a denser population and more scholars.

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[14] Within Chinese classical academia, scholars of different schools competed for national cultural dominance or maintaining regional cultural hegemony. This is important in a society where scholarship was closely linked to elite production (through the imperial examinations). Therefore, in regions that had the good fortune of having ancient sages, local elites made greater efforts to explore the sages' culture heritage. They viewed building temples as the most effective way to concretize the sages' presence and influence. For example, scholars at Yuelu Academy in Hunan Province believed a region's cultural prosperity had to be sustained by reiterating the sacrificial rites in the temples (Yang 1997).

[15] See *Prefectural Gazetteer of Yanzhou* (the holy land of Confucius) compiled in 1770 for the list of sages. The Chinese imperial authorities conferred a total of 178 sages between circa 25 and 1911. I exclude 39 sages from the sample because they either were not scholars or were conferred after 1820.

The placebo test on non-sage temples reaffirms the importance of the sages in shaping the geography of classicism (columns 3 and 4 of Table 2). The number of non-sage temples is also positively correlated with economic and educational prosperity, but does not depend on the number of sages. This indicates that sages' influence on classical worship works through the persistence of the glory of classical achievements, rather than through other popular cultures and local correlates of temple building.

The sage distribution is arguably orthogonal to the industrial geography in 1858 to 1927, other than through the persistence of classical worship. This is mainly because the sages lived in the distant past when the socioeconomic conditions of intellectual success largely differed from those during China's modernization period (Figure 6). The vast majority (92%) of the sages were born before the 13$^{\text{th}}$ century; 73% of these were born in ancient times (before 256 BC).[16]

However, if the sages' places of origin were economically or geographically backward, these disadvantages may persistently inhibit economic development. This is unlikely to be the case, since scholarship hardly prospered in remote or backward areas, especially in pre-industrial times. Most ancient sages were produced in the fountainhead of Chinese civilization, i.e., the North China plain where the earliest city-states were found. I regress a set of geographical factors on the number of sages, and find that the sages were not concentrated in prefectures distant from the coast and navigable rivers, or in rugged or barren lands. They tended to be born in prosperous (populous) areas (see columns 1–5 of Appendix Table A4).

Moreover, the intellectual geography changed substantially from the sage era to the 19$^{\text{th}}$ century, which is illustrated by the lack of correlation between the distribution of sages and the distribution of *jinshi* degree holders in the 14$^{\text{th}}$ to 19$^{\text{th}}$ centuries (column 6 of Appendix Table A4). Therefore, the sages may not affect industrialization by shaping the distribution of classical human capital and elite. The sages also had little impact on the popularity of clans—the lineage organizations affected by Confucianism that competed with modern economic institutions (Chen, Ma, and Sinclair 2022) —by the eve of industrialization (column 7).

Another concern is state capacity. Since most sages were born in regions with early states, these regions may have had a more sophisticated government administration or state capacity. State capacity in an imperial regime, however, may not necessarily be instrumental to economic modernization. Following Acemoglu et al. (2015) and Sng (2014), I use the number of post offices and the number of county-level administrative units to proxy for state capacity in the late 19$^{\text{th}}$ century. I find that state capacity is

[16] The latest sage in the sample was born before 1630, at least two centuries before the industrial period.

significantly stronger in prefectures with more sages (columns 8 and 9 of Table A4). To address this concern, I control for the two capacity measures in the following instrumental variable estimations.

Finally, the placebo tests in columns 5–7 of Table 2 provide further (suggestive) evidence of the validity of the instrumental variable. The reduced-form regression shows that the number of sages has a significant and negative effect on the number of industrial firms. This effect remains after controlling for the number of non-sage temples, but disappears after controlling for the number of sage temples in the regression. The effect of sage temples on industrial firms, though endogenous, remains significantly negative. The comparison of columns 5 to 7 implies that sages' long-term influence on industrialization mainly works through classical worship. Since these tests may not exclude every factor that may channel sages' effect on industrialization beyond classical worship, we should interpret the instrumented results as suggestive rather than conclusive.

Table 3 reports the two-stage least squares (2SLS) estimates of the effect of classical worship on industrial firms. Instrumented by the number of sages, the number of sage temples still negatively impacts the number of industrial firms. The effect remains stable after controlling for geography, economic conditions, classical education, and state capacity (columns 1–3), and when the sample is restricted to the post-1905 period of educational modernization. Now an additional sage temple decreases the number of industrial firms by 4.2, which is almost equivalent to the corresponding OLS effect. The results remain robust to using the winsorized number of firms and sages to attenuate extreme values, excluding prefectures without firms, normalizing firms by population, and using modern banks as an alternative dependent variable (see Appendix Table A2, Panel B).

5. The Intellectual Channel: Modern Knowledge and Human Capital

Classical worship is expected to impede industrialization by discouraging intellectuals from appreciating new ideas or knowledge. In China's market of ideas, sparked by Western influence after 1842, new knowledge would face a higher entry cost in regions dominated by classicism. The classical incumbents would defend their interests, esteem, and cultural privileges by resisting modern ideas. This section examines this intellectual channel by looking at regional variations in the diffusion of modern knowledge, using the distribution of modern journals on science and technology as the proxy.

Furthermore, I show that such intellectual conservatism inhibited the formation of modern human capital. I focus on a pivotal type of human capital for early industrialization, engineers, and the formation of modern human capital in a broader sense, i.e., student enrollment in modern schools.

5.1. Modern Journals

Modern journals were introduced to China in the late 19th century and became a primary medium introducing modern sciences, technologies, and other new subjects. The first modern journal, *Peking Magazine*, was founded by the missionaries William Martin and Joseph Edkins in Peking in 1872. It inspired Chinese elites to develop journals to pursue new knowledge and modernization. From 1872 to 1927, they founded 424 journals that published essays on science and technology in 38 cities, according to the statistics in Yao, Wang, and Yao (2008).[17] I counted the number of journal editorial offices located in each prefecture. If a prefecture's intellectuals retained stronger classical beliefs, they should have been less likely to sponsor modern journals.

To test this assumption, I regress the number of modern journals on the number of sage temples at the prefectural level, controlling for the same set of prefectural covariates as in Table 1. The result shows that there are significantly fewer journals in prefectures with more sage temples (Table 4). This result remains robust to using the Poisson estimation to address the large share of zero observations, instrumenting for classical worship using the number of sages, or examining only the journals founded after classical education was abolished. The instrumented results indicate that one additional sage temple is associated with 1.2 fewer journals. This implies that intellectual conservatism hampered the diffusion of new knowledge. In other words, modern knowledge found a small market of ideas in regions dominated by classicism.

5.2. Modern Human Capital

Prior research has recognized the importance of engineering human capital to industrialization (Murphy et al. 1991; Mokyr 2005; Maloney and Valencia Caicedo 2022). China experienced a growth in engineering talent from the late 19th century. Ziyuan Weiyuan Hui's *Who's Who Chinese Engineers* (1941) contains biographical

[17] In this source, a journal was included if it published essays related to science or technology. To the best of my knowledge, there are no systematic records on the number of non-science/technology journals during this period. Nor is there data on the number of journal subscriptions. Another potential measure of modern knowledge diffusion is the number of translations of Western books. However, most books were translated by presses in Shanghai and thus lack regional variation.

information on 10,723 engineers born between 1880 and 1920, including all recorded Chinese graduates of the engineering schools and some eminent engineering practitioners. I exclude the 5,071 engineers recorded in the book that lack complete information from the sample.

The engineers' birthplaces are distributed in 85% of Chinese prefectures; the numbers range from 1 to 901. By 1920, i.e., about 60 years after industrialization started in China, 39 prefectures still had not produced any engineers, and nearly half had produced fewer than 10 even though some were economically prosperous or close to the country's industrial centers. This implies that China's industrial development did not necessarily convince local students to study engineering or industrial technologies. In other words, some regions may have lacked sufficient 'push' forces in this respect. In this subsection I test whether this was partly due to the historical burden of classicism.

I regress the density of engineers born in each prefecture from 1880 to 1920 on the number of sage temples (Table 5, columns 1 and 2). The number of engineers is normalized by million residents in 1910. To normalize the distribution, I take the natural logarithm of the density (plus 1 to keep 0 values). The OLS and instrumented estimations demonstrate that sage temples have a significant and negative impact on the density of engineers. Using the number of sages to instrument the number of sage temples, one additional temple reduces the number of engineers by about 27% (or seven engineers per million people when evaluated by the mean). Since the engineers' distribution is based on their home prefectures, the results imply that students from regions with a stronger classicist background were less likely to choose engineering professions.

To assess the broader effect of classical worship on human capital modernization, I measure the latter using the number of students enrolled in modern primary and secondary schools.[18] The Qing Dynasty began modernizing the education system under the New Policies Reform in 1901. New schools were gradually established that adopted modern curricula and statutes following the Western models. During the 8 years of primary and 5 years of secondary schooling, students in these new schools were required to take STEM subjects, foreign languages, and geography in addition to the traditional subjects such as literature and history. There were also elective courses on law, finance, and crafts. The subsequent Republican regime continued this educational modernization.

[18] Unfortunately, there is no data on student enrollment in traditional schools or on tertiary school enrollment.

The national education surveys conducted by Imperial Educational Ministry (1907, 1909) and Ministry of Education (1914) reveal the regional disparity in the progress of educational modernization. After a decade of reform, modern school enrollment increased significantly but varied from zero to more than 40,000 per million inhabitants across prefectures. Therefore, although the state promoted the reform, the effort and pace of modernizing education varied strikingly across regions.

To test whether this uneven progress was partly driven by the geography of classicism, I regress modern school enrollment on the number of sage temples, controlling for the same set of covariates as in column 2 of Table 1. I use the average number of modern students in the three survey years (1907, 1909, and 1914) and normalize it by per million inhabitants in 1910. To normalize the distribution, I take the natural logarithm of the number. The results in Table 5 (columns 3 and 4) indicate that sage temples have a significant and negative impact on enrollment in modern schools. Using the number of sages to instrument for the number of sage temples, an additional temple would reduce enrollment by about 18%.[19]

In sum, the results reported in Table 5 indicate that classical worship may have a talent allocation effect. More students chose to take courses in the new curricula and pursue industrial occupations in regions with fewer classical constraints. This pattern coincides with the tardy adoption of technical curriculum (but the persistence of religious education) in the more Catholic regions in late 19$^{\text{th}}$-century France (Squicciarini 2020). Likewise, theological students and occupations declined in Protestant regions after the Reformation in Europe, yet students were reluctant to pursue new or secular occupations in Catholic-dominant regions (Cantoni, Dittmar, and Yuchtman 2018).

5.3. The Correlation between Modern Human Capital and Modern Growth

Finally, I illustrate the close relationship between modern knowledge and human capital, on the one hand, and China's industrial development on the other hand. I regress the number of industrial firms on the measures of modern knowledge and human capital discussed above. I use the number of industrial firms established between 1906 and 1927, a period after classical education was abolished that coincides with the period of the modern human capital measures.

Table 6 reports the regression results. The number of industrial firms is highly correlated with the number of modern science and technology journals (columns 1 and

[19] These results are consistent when respectively regressing the three waves of enrollment on classical worship (not reported).

2). One additional journal published in a prefecture is associated with an increase of about 3.5 industrial firms. This calculation only captures the correlation of the journals and industrial development in local prefectures; it does not measure the possible impact of journals spilling over to other prefectures through subscriptions.

There are also significantly more industrial firms in prefectures in which more engineers were born (columns 3 and 4 of Table 6). This is consistent with Yuchtman's (2017) finding that graduates of science and engineering schools played a more significant role in China's modern industry than those who received a classical education. However, while the number of students in modern (primary and secondary) schools is positively correlated with the number of industrial firms, the correlation is not statistically significant. This finding coincides with the dominant role of elite (rather than common) human capital in determining industrial growth in 19th-century Europe (Mokyr 2002, 2005; Squicciarini and Voigtländer 2015) and the Americas (Maloney and Valencia Caicedo 2022). In sum, the results in columns 3 and 4 suggest the leading role of modern 'upper-tail' human capital in China's early industrialization.

6. Concluding Remarks

The paper's statistical findings suggest that the cultural norms of intellectual circles may shape a country's economic changes. The prevailing worship of classical wisdom may impede a region's transition from a traditional to an industrial economy, at least in the context of China, because it increases the entry costs of new learning that is pivotal to industrialization. Therefore, the intellectual origins of modern economic growth are based not only on what intellectuals *know*, but also on what they *believe*. Comparing China's classical worship to Europe's Enlightenment illustrates the importance of 'cultural entrepreneurship' in modernizing human capital and economic growth.

To the extent that the ancient sage learning inspired the worship of the classics, the paper's results also indicate a burden of history; that is, ancient intellectual success and glory may inhibit long-term innovation by fostering a backward-looking culture. The shadow of ancient sages illuminates the cultural roots of comparative development in other economies: the rise of Western Europe following its intellectual Enlightenment, and the stagnation of classical civilizations despite their earlier cultural success.

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Figures and Tables

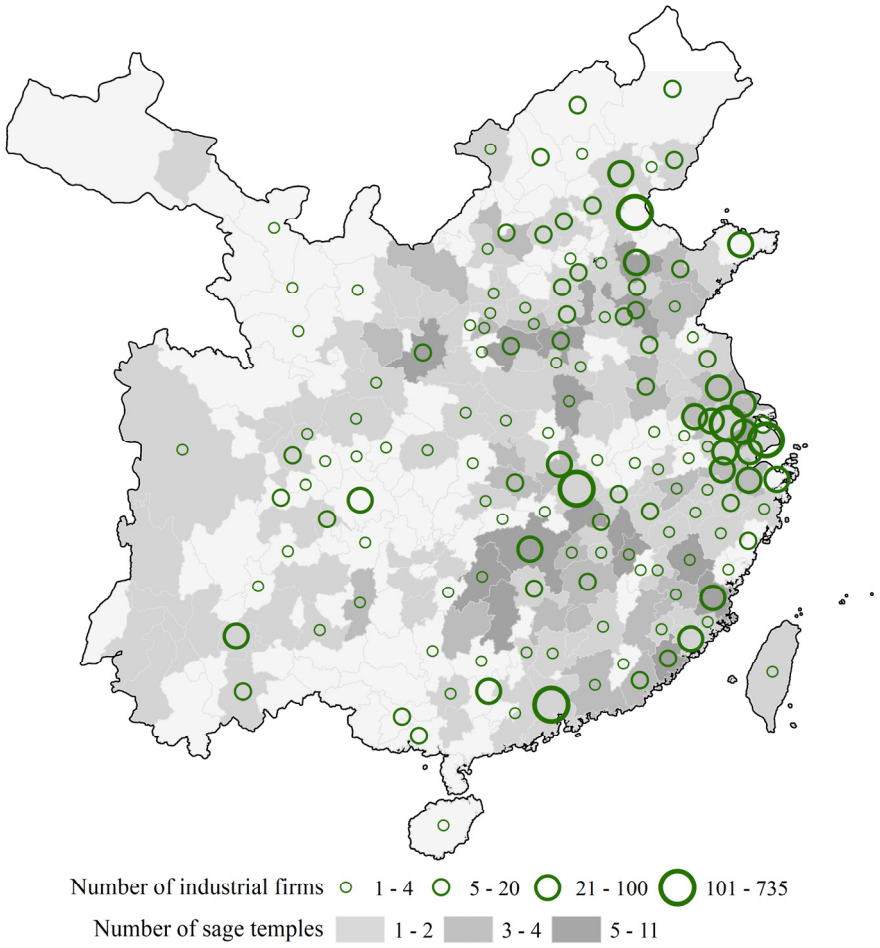


Figure 1. Distribution of Sage Temples (1820) and Industrial Firms (1858–1927)

Notes: The strength of classical worship is reflected in the number of sage temples that were built to worship the acknowledged masters of classical learning by 1820. Industrialization is shown as the number of Chinese domestic industrial firms established between 1858 and 1927. The map includes 269 prefectures of China proper based on the Qing Dynasty administration in 1820 (CHGIS, version 6).

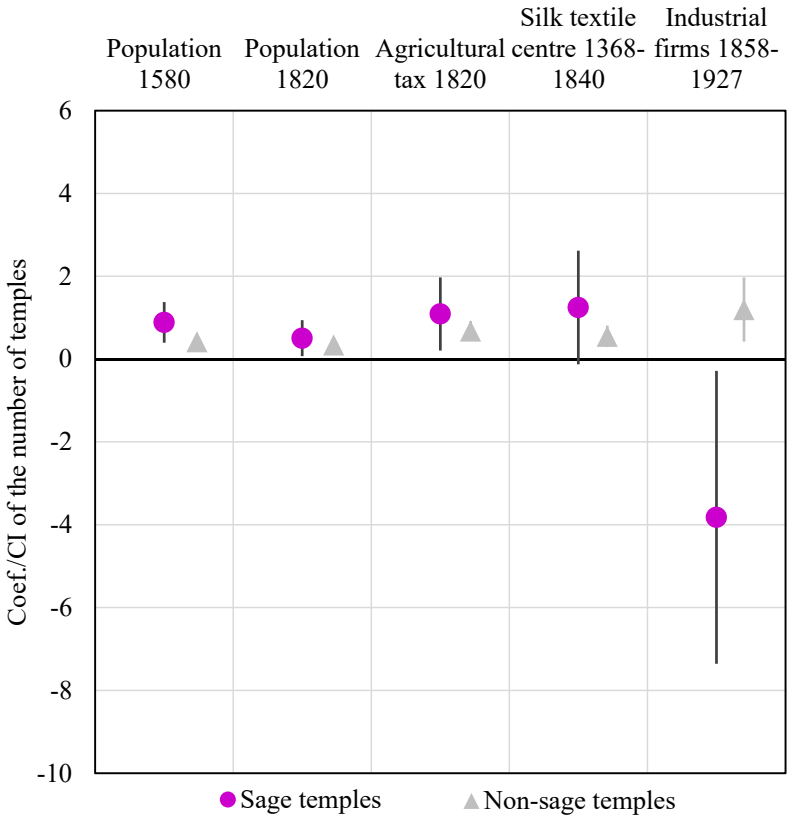


Figure 2. The Role of Classical Worship in Pre-industrial and Industrial Development

Notes: Population in 1580 and 1820 (log), agricultural tax in 1820 (log), and silk textile center dummy measure pre-industrial economic prosperity, and the number of industrial firms established in 1858–1927 reflects the progress of industrialization across the 269 Chinese prefectures. The number of sage temples measures the strength of classical worship. The number of non-sage temples is used as the placebo; these include all temples that worship non-sage figures (scholars, officials, monarchs, warriors, moral models, and folk gods) in each prefecture. All are OLS estimates except for the Probit estimates (*10) for the silk textile dummy. The coefficients (with 95% conference intervals) of the sage and non-sage temples are estimated in a single regression (Equations (1) and (2)) conditional on the log distance to the coast, log distance to the nearest navigable river, terrain ruggedness index, log land area, and agricultural suitability index (for planting wheat, rice, maize, and potatoes). Standard errors are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019).

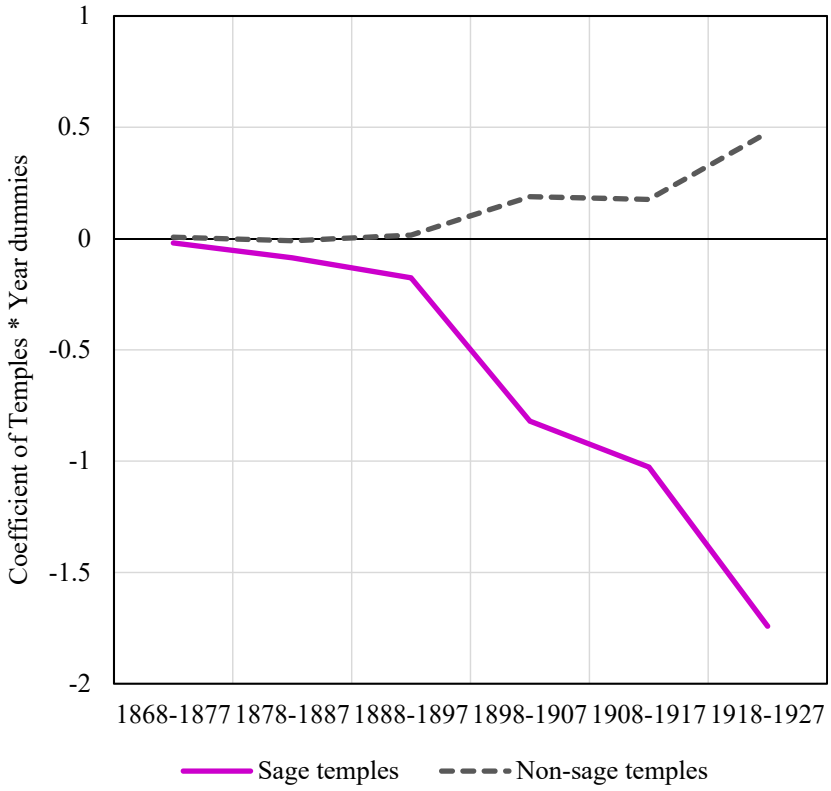
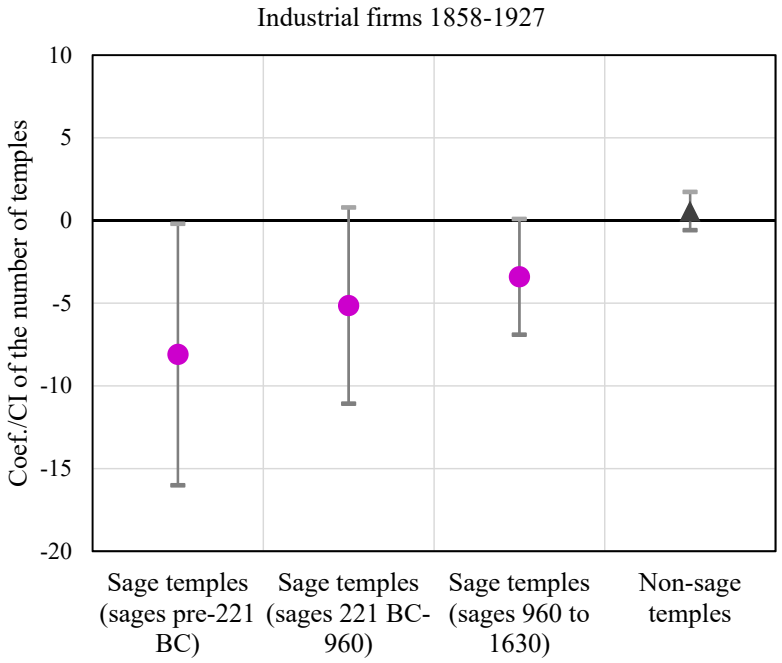


Figure 3. Dynamic Effect of Classical Worship on Industrial Firms

Notes: The figure compares the effects of sage temples vs. non-sage temples on the number of industrial firms, based on the panel regression specification:

$$\text{Firms}_{it} = \alpha + \beta_1 \sum_{1868}^{1927} D_t \times \text{SageTemples}_i + \beta_2 \sum_{1868}^{1927} D_t \times \text{NonSageTemples}_i + \lambda \sum_{1868}^{1927} D_t \times \mathbf{X}' + P_i + D_t + \varepsilon_{it},$$

in which β_1 and β_2 are plotted in the figure, with the decade 1858-1867 as the reference. $\mathbf{X}'$ denotes a vector of control variables that are the same as those used in Table 1 (column 2). P_i and D_t denote prefectural and decadal fixed effects, respectively. Standard errors are clustered at the prefectural level.



(a) By sages' living times

(b) By type of non-sage figures

Figure 4. Decomposing the Temple Effect

Notes: The two charts plot the OLS estimates (coefficients with 95% confidence intervals) of Equation (2), dividing the temples by type and comparing their relative importance in affecting the number of industrial firms. In Figure (a), sage temples are divided into three groups based on when the enshrined sages lived. Figure (b) divides non-sage temples into six types based on the identity of the figures enshrined. The controls are the same as those used in column 2 of Table 1. Standard errors in parentheses are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

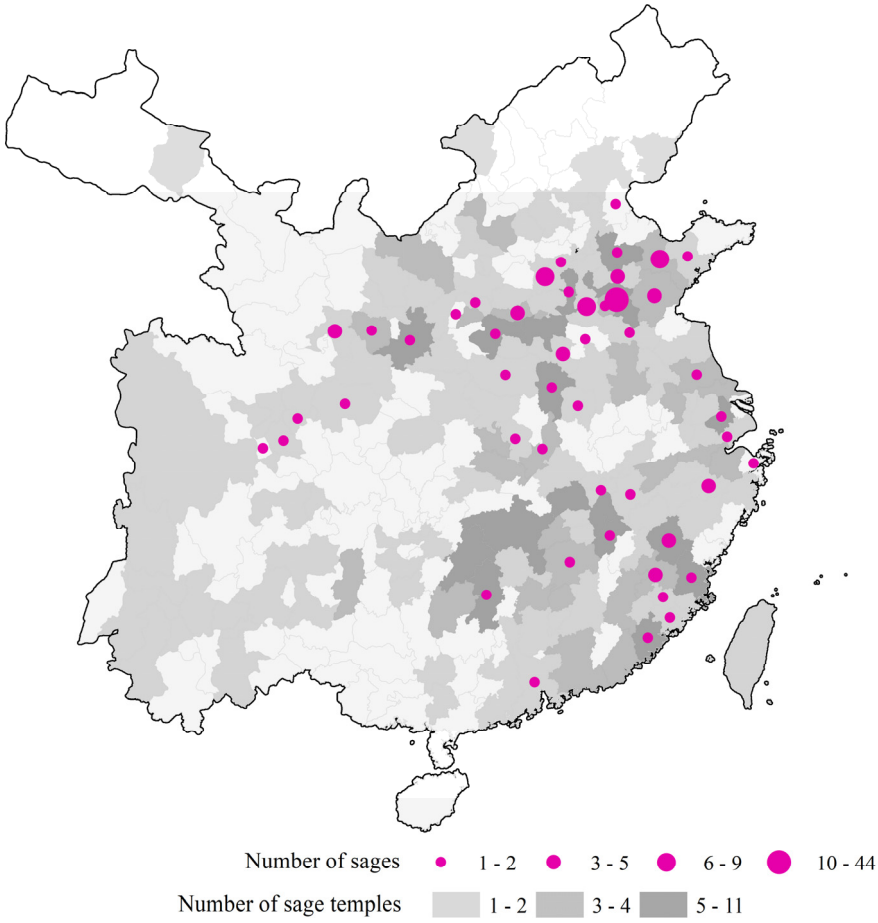


Figure 5. Distribution of the Sages and Their Temples

Notes: Sages refer to the acknowledged masters of classical learning who lived between the 7th century BC and 1630; before 1820 the imperial authorities formally conferred their sanctity. Sage temples are the same as those depicted in Figure 1. The map includes 269 prefectures of China proper based on the Qing Dynasty administration in 1820 (CHGIS, version 6).

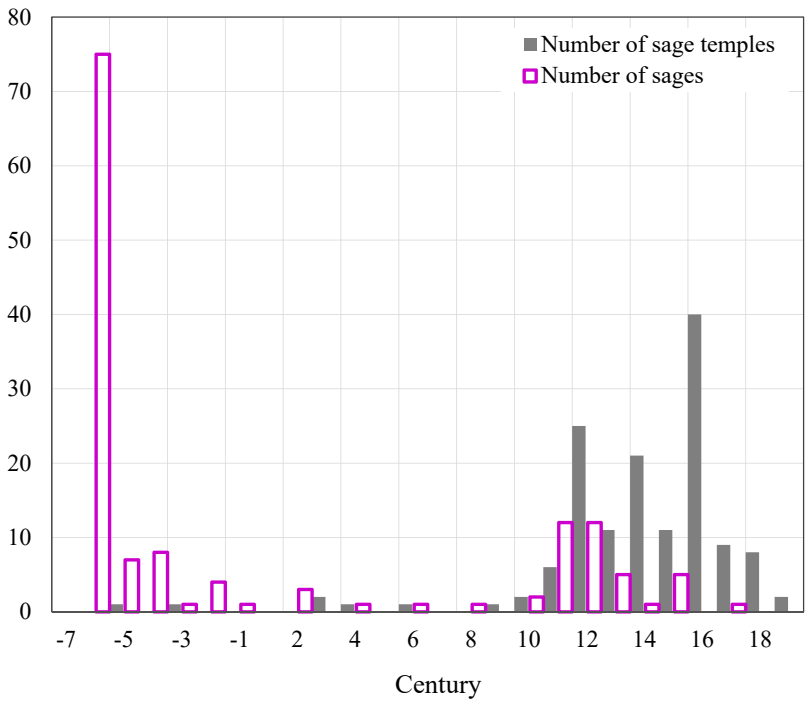


Figure 6. Times of the Sages and Their Temple Building

Notes: The figure displays in which centuries the sages lived and when sage temples were built. The year of construction is available for 42% of the temples in the sample. See the text for data sources.

Table 1. Classical Worship and Industrial Development: Additional Controls

	Industrial firms 1858–1927	Industrial firms 1858–1927	Industrial firms 1858–1927	Industrial firms 1906–1927 classical education abolished
	OLS	OLS	Poisson	OLS
	(1)	(2)	(3)	(4)
Sage temples	-3.821**	-4.654**	-0.350***	-3.134**
	(1.804)	(2.137)	[0.114]	(1.546)
Non-sage temples	1.166***	0.528	0.026	0.665*
	(0.395)	(0.589)	[0.017]	(0.395)
Population in 1820 (log)		-7.718*	0.067	-5.588*
		(3.987)	[0.408]	(3.082)
Treaty port		33.499**	1.957***	22.917*
		(16.137)	(0.326)	(12.310)
Degree holders (log)		-0.545	0.360***	0.012
		(1.458)	[0.133]	(1.037)
Exam quota		0.210*	0.008***	0.098***
		(0.116)	[0.003]	(0.036)
Geographic controls	Yes	Yes	Yes	Yes
Observations	269	269	269	269
R-squared	0.128	0.193		0.173
Mean of DV	10.82	10.82	10.82	8

Notes: The table reports the cross-prefectural estimates of Equation (2) with additional economic and human capital controls. Economic controls include pre-industrial prosperity measured by the population in 1820, and a treaty port dummy indicating whether a prefecture had a treaty port by 1927. Classical human capital is measured by the number of degree holders (*jinshi*) in the imperial examination born in each prefecture between 1371 and 1820, and the examination quota assigned to each prefecture by 1905. Column 4 examines the effect of classical worship after the rewards from the classical education/examination were gone. Geographical controls include the log distance to the coast, log distance to the nearest navigable river, terrain ruggedness index, log land area, and agricultural suitability index for planting wheat, rice, maize, and potatoes. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). Robust standard errors are in [brackets]. *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Table 2. Number of Sages (IV), Classical Worship, and Industrial Firms

	Sage temples	Sage temples	Non-sage temples	Non-sage temples	Industrial firms 1858–1927	Industrial firms 1858–1927	Industrial firms 1858–1927
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of sages (IV)	0.181***	0.145***	0.377	0.030	-0.610*	-0.609*	0.067
	(0.048)	(0.029)	(0.242)	(0.074)	(0.323)	(0.324)	(0.251)
Non-sage temples						0.345	0.529
						(0.627)	(0.587)
Sage temples							-4.692**
							(2.214)
Population 1393/1820 (log)		0.192*		1.449**	-6.875*	-7.126*	-7.745*
		(0.098)		(0.636)	(3.826)	(3.885)	(4.009)
Treaty port					33.971**	33.218**	33.545**
					(15.686)	(15.787)	(16.166)
Degree holders (log)		0.290***		2.834***	-0.927	-1.120	-0.540
		(0.078)		(0.579)	(1.627)	(1.595)	(1.455)
Exam quota					0.217**	0.185	0.210*
					(0.085)	(0.114)	(0.117)
Geographic controls		Yes		Yes	Yes	Yes	Yes
Observations	269	269	269	269	269	269	269
R-squared	0.093	0.291	0.010	0.419	0.176	0.179	0.193

Notes: The instrumental variable is the number of sages born in each prefecture between 580 BC and 1630. Geographic controls are the same as those in Table 1. Columns 2 and 4 control for the population in 1393 in accordance with the period of temple building. All columns are OLS estimates. Standard errors in parentheses are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Table 3. Using the Number of Sages to Instrument the Effect of Classical Worship on Industrial Development

	Industrial firms 1858–1927	Industrial firms 1858–1927	Industrial firms 1858–1927	Industrial firms 1906–1927, classical education abolished
	(1)	(2)	(3)	(4)
Sage temples	-5.776**	-4.226**	-4.268**	-3.866**
	(2.796)	(1.908)	(2.077)	(1.720)
Non-sage temples	1.303***	0.511	0.535	0.702*
	(0.441)	(0.609)	(0.597)	(0.381)
Geographic controls	Yes	Yes	Yes	Yes
Economic conditions		Yes	Yes	Yes
Classical education		Yes	Yes	Yes
State capacity			Yes	Yes
Observations	269	269	269	269
R-squared	0.125	0.193	0.197	0.174
K-P *F*-statistic	28.86	31.05	31.13	31.13

Notes: The table reports the two-stage least squares (2SLS) estimates at the prefectural level. Controls are the same as those in column 2 of Table 1, and additionally include the number of counties and the number of post offices as proxies for state capacity. Standard errors are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Table 4. Classical Worship and Modern Journals

	Modern journals 1872–1927	Modern journals 1872–1927	Modern journals 1872–1927	Modern journals 1906–1927, classical education abolished
	OLS	Poisson	IV	IV
	(1)	(2)	(3)	(4)
Sage temples	-0.897*	-0.465***	-1.202**	-1.116**
	(0.481)	[0.125]	(0.530)	(0.495)
Non-sage temples	0.255*	0.049***	0.267*	0.244*
	(0.142)	[0.010]	(0.142)	(0.135)
Population 1820 (log)	-1.907*	1.142*	-1.932*	-1.782*
	(1.017)	[0.688]	(1.004)	(0.944)
Treaty port	3.365	2.273***	3.355	3.212
	(2.630)	[0.474]	(2.646)	(2.442)
Degree holders (log)	-0.725*	-0.054	-0.687*	-0.643*
	(0.372)	[0.305]	(0.359)	(0.341)
Exam quotas	0.053**	0.018***	0.055**	0.052**
	(0.022)	[0.005]	(0.022)	(0.021)
Geographic controls	Yes	Yes	Yes	Yes
Observations	269	269	269	269
R-squared	0.237		0.235	0.237
Mean of DV	1.58	1.58	1.58	1.48

Notes: Modern journals refer to the number of journals on science and technology founded in each prefecture between 1872 and 1927. Sage temples are predicted by the number of sages in columns 3 and 4. Geographic controls are the same as those in Table 1. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). Robust standard errors are in [brackets]. *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Table 5. Classical Worship and Modern Human Capital

	Engineers born in 1880–1920 (log)		Modern school enrollment, 1907–1914 (log)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Sage temples	-0.078*	-0.266***	-0.083***	-0.176***
	(0.043)	(0.053)	(0.031)	(0.043)
Non-sage temples	0.009	0.016	-0.012	-0.008
	(0.010)	(0.012)	(0.010)	(0.010)
Population 1820 (log)	-0.072	-0.087	-0.729***	-0.736***
	(0.142)	(0.138)	(0.225)	(0.226)
Treaty port	0.056	0.050	-0.206	-0.223
	(0.131)	(0.152)	(0.311)	(0.316)
Degree holders (log)	0.268**	0.291***	0.385***	0.396***
	(0.105)	(0.101)	(0.106)	(0.106)
Exam quotas	0.004**	0.006**	0.007**	0.007***
	(0.002)	(0.002)	(0.003)	(0.003)
Geographic controls	Yes	Yes	Yes	Yes
Observations	269	269	269	269
R-squared	0.435	0.400	0.167	0.159
Mean of DV (no log)	26	26	6,408	6,408

Notes: Engineers refers to the number of engineering school graduates and notable engineering practitioners born in each prefecture from 1880 to 1920, normalized by million inhabitants in 1910. Modern school enrollment denotes the average number of students enrolled in modern primary and middle schools in 1907, 1909, and 1914 in each prefecture (normalized by million inhabitants in 1910). Sage temples are predicted by the number of sages in columns 2 and 4. Geographic controls are the same as those in Table 1. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Table 6. Correlation between Modern Human Capital and Industrial Development

	Industrial firms 1906–1927			
	OLS	Poisson	OLS	Poisson
	(1)	(2)	(3)	(4)
Modern journals 1872–1927	3.529***	0.024***		
	(1.317)	(0.002)		
Engineers born in 1880–1920 (log)			2.706**	0.357***
			(1.301)	(0.130)
Modern school students in 1907–1914 (log)			1.098	0.504*
			(1.005)	(0.265)
Controls	Yes	Yes	Yes	Yes
Observations	269	269	269	269
R-squared	0.692		0.158	

Notes: Controls are the same as those in column 2 of Table 1. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). Robust standard errors are in [brackets]. *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Appendix

(a) Yan Hui (circa 521–481 BC), co-author of the classic book *The Analects*, and his temple in his home prefecture of Yanzhou, Shandong Province

(b) Zhu Xi (1130–1200), master of the Neo-Confucian school and author of the classic book *Notes on the Four Books*, and his temple in his home prefecture of Jianning, Fujian Province

(c) Performing traditional sacrificial ceremonies in Confucius Temple of Nanjing in 2020 (left) and in Zhu Xi Temple of Tong-An county in 2017 (right)

Figure A1. Sages, Sage Temples, and Sacrificial Activities in China

Source: (a) Wikepedia: en.wikipedia.org/wiki/Yan_Hui; (b) Wikepedia: en.wikipedia.org/wiki/Zhu_Xi; Qunar.com: travel.qunar.com/p-oi718697-wuyijingshe. (c) China Daily: www.chinadailyhk.com/article/144858; Kknews: kknews.cc/culture/b4n9jan.html.

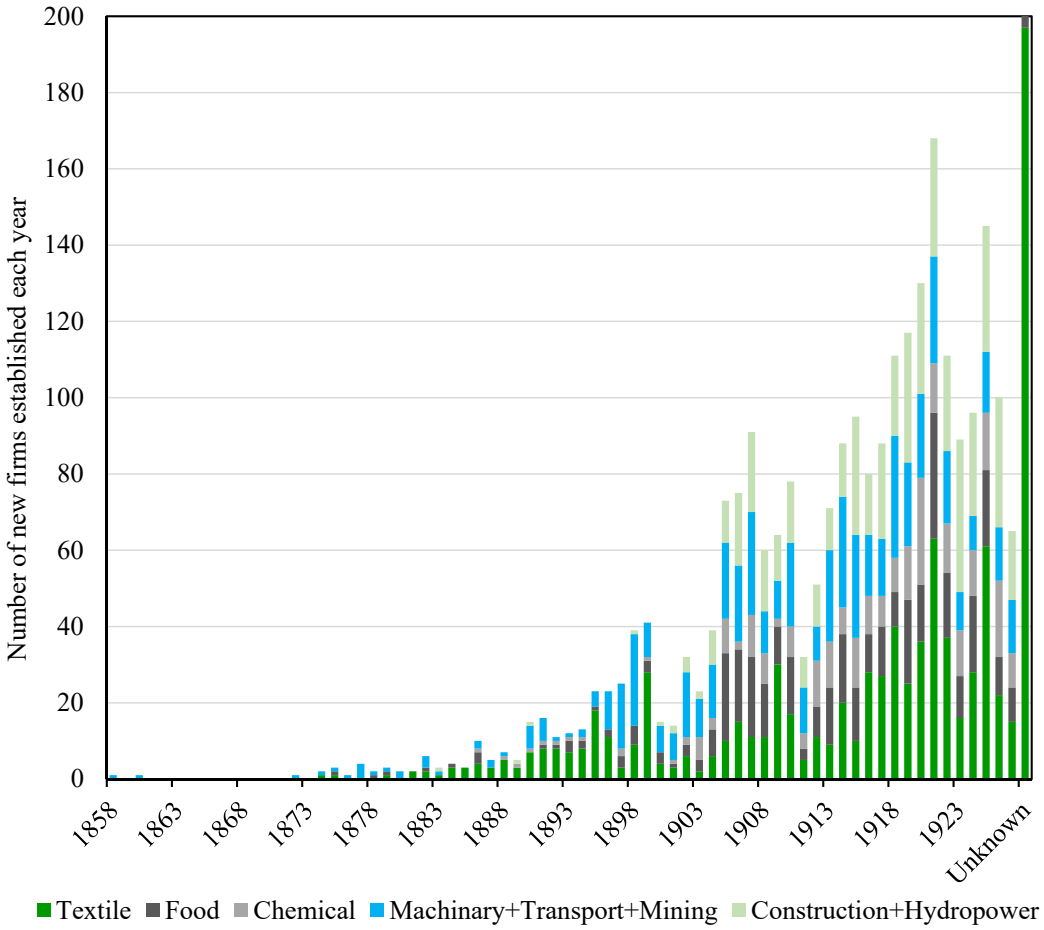


Figure A2. Number of Chinese Industrial Firms Established in Each Year, by Sector

Notes: The data are based on Du (1991); 233 (8%) of industrial firms have no record of the year of establishment (shown in the column 'Unknown').

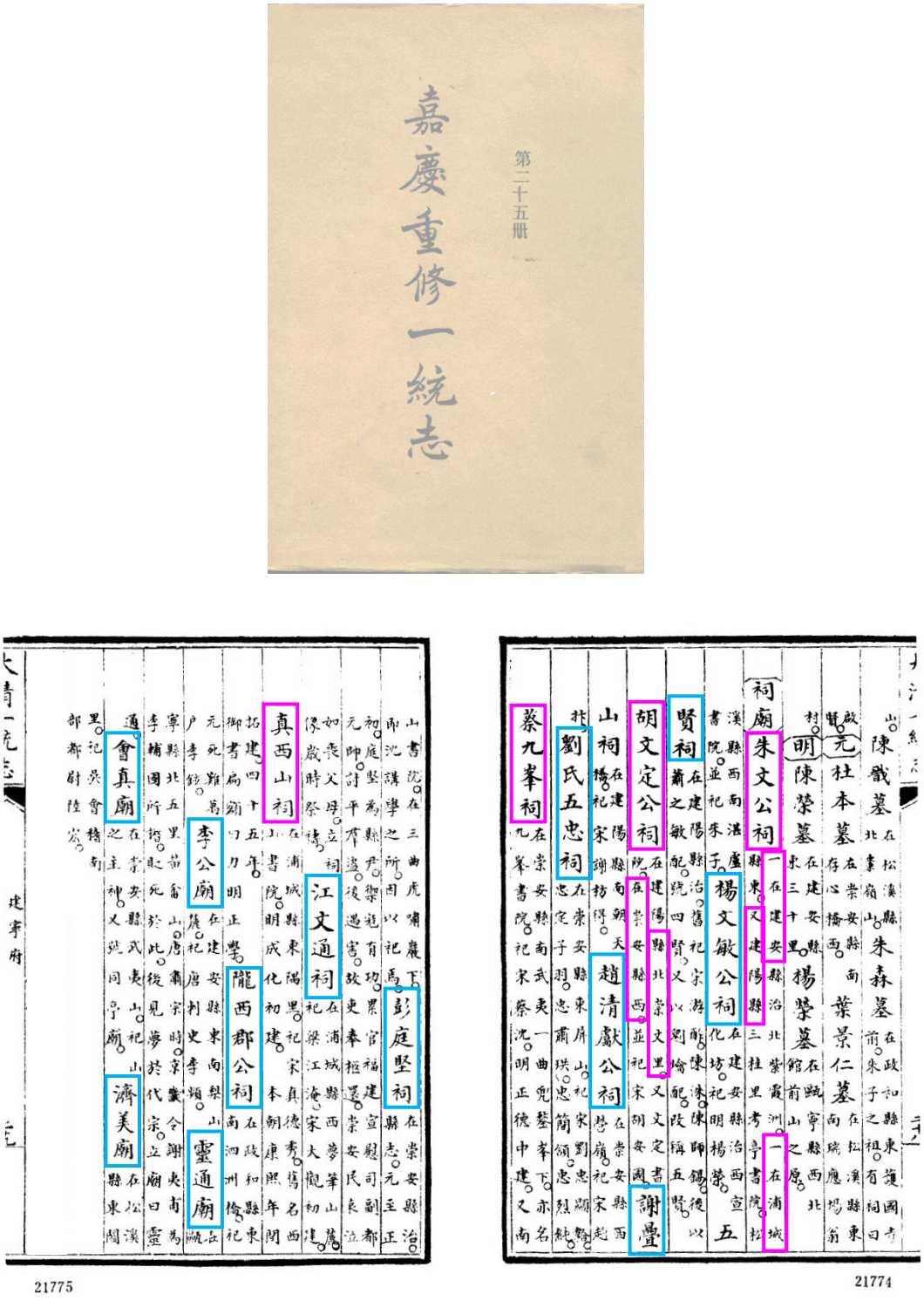
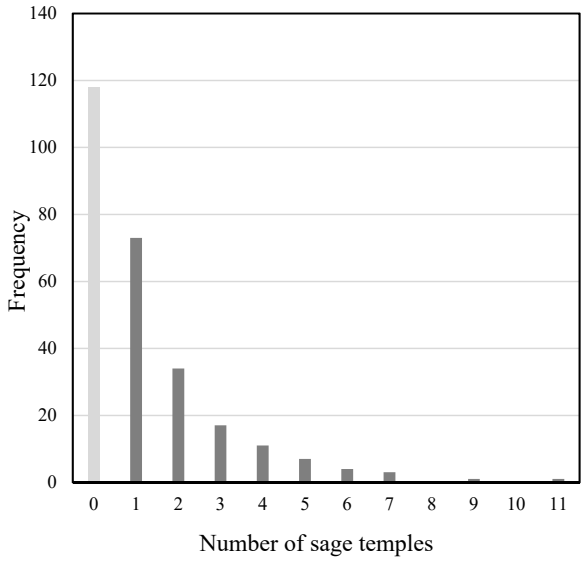
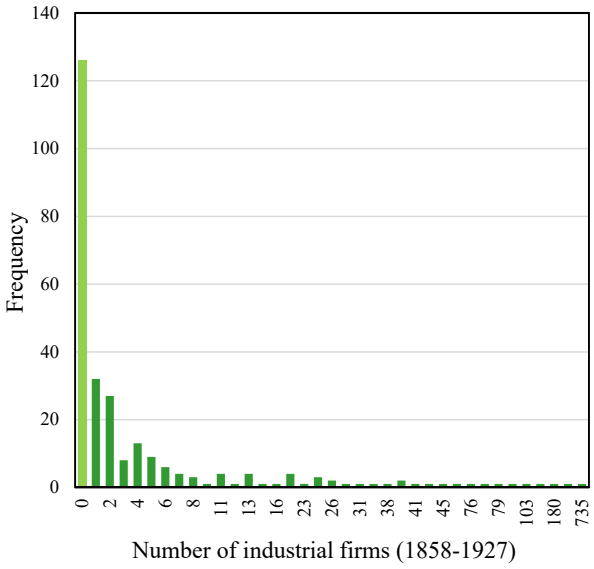


Figure A3. Records of the Temples in the *Unified Chorography of the Qing Dynasty* (*Jiaqing Chongxiu Daqing Yitong Zhi*).

Notes: The pages list some of the temples that existed in 1820 in Jianning Prefecture of Fujian Province, home of the neo-Confucian master Zhu Xi (1130–1200) who was first conferred as a sage in 1241. Temples enshrining sages (non-sages) are indicated in pink (blue).



(a)



(b)

Figure A4. Distribution of Values in the Main Variables

Table A1. Descriptive Statistics

Variable name	Obs.	Mean	Std. Dev.	Min	Max
Variables on economic modernization					
Industrial firms 1858–1927	269	10.82	53.43	0	735
Industrial firms 1906–1927	269	8	39.86	0	600
Modern banks 1897–1927	269	2.97	8.93	0	98
Variables on traditional economic prosperity					
Population 1580 (per 1,000 people)	269	630.78	688.58	5.79	3,646
Population 1820 (per 1,000 people)	269	1,398.22	1,240.60	18	6,663
Agricultural tax 1820 (silver *liang*)	269	114,000	132,860	90.32	701,788
Silk textile center	269	0.089	0.286	0	1
Variables on classical and non-classical worship					
Sage temples	269	1.25	1.71	0	11
Non-sage temples	269	11.79	11.04	0	75
Number of sages (IV)	269	0.52	2.88	0	44
Variables on modern knowledge/human capital					
Modern journals 1872–1927	269	1.58	9.21	0	108
Engineers 1880-1920 (per million people)	269	26	47.05	0	310.64
Modern school enrollment 1907–1914 (per million people)	269	6,408	8,572.43	0	113,434.3
Control variables					
Distance to coast (km)	269	511.84	370.16	2.18	1,925.51
Distance to river (km)	269	6.93	7.39	0.03	55.72
Terrain ruggedness index	269	184.61	139.94	1.28	790.1
Land area (km^2)	269	16,149.84	19,854.16	923.68	198,269
Agricultural suitability index	269	23.98	12.80	0	58.81
Treaty port	269	0.16	0.37	0	1
Exam degree holders (*jinshi*, 1371–1820)	269	139.43	216.95	0	1192
Exam quota (late 19^{th} century)	269	92.91	64.28	0	422
Number of counties	269	5.75	3.97	0	26
Number of post offices	269	5.23	2.99	0	18

Table A2. Classical Worship and Economic Modernization in Alternative Measures

	Industrial firms 1858–1927, winsorized	Industrial firms 1858–1927, non-zero	Industrial firms 1858–1927, per million inhabitants, inverse hyperbolic sine	Industrial firms 1906–1927, per million people, inverse hyperbolic sine, classical education abolished	Modern banks 1927
	(1)	(2)	(3)	(4)	(5)
			Panel A. OLS estimates		
Sage temples	-2.618**	-6.156**	-0.052*	-0.054*	-0.860**
	(1.149)	(2.667)	(0.031)	(0.030)	(0.367)
Non-sage temples	0.585	0.512	0.027***	0.027***	0.227*
	(0.485)	(0.665)	(0.008)	(0.008)	(0.117)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	269	143	269	269	269
R-squared	0.388	0.215	0.511	0.486	0.319
			Panel B. IV estimates		
Sage temples	-3.603**	-6.962**	-0.030	-0.136**	-1.412***
	(1.694)	(2.833)	(0.049)	(0.056)	(0.427)
Non-sage temples	0.636	0.584	0.026***	0.030***	0.251**
	(0.482)	(0.648)	(0.008)	(0.007)	(0.112)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	269	143	269	269	269
R-squared	0.391	0.217	0.518	0.473	0.314
K-P F statistics	12.66	30.42	31.13	31.13	31.13

Notes: Column 1 winsorizes the number of industrial firms at 99%, column 2 excludes prefectures without industrial firms during the sample period, and columns 3 and 4 normalize the average prefectural population of 1910 and 1920. Panel A replicates the cross-prefectural estimation in column 2 of Table 1, controlling for geography (log distance to coast, log distance to the nearest navigable river, terrain ruggedness index, log land area, and agricultural suitability index for planting wheat, rice, maize, and potatoes), economic conditions (log population in 1820, treaty port), and traditional human capital (exam degree holders and quota). Panel B replicates the 2SLS cross-prefectural estimation in column 3 of Table 3, using the same controls as those of Panel A but also including the number of counties and post offices. Column 1 also winsorizes the number of sages at 99%. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively

Table A3. Classical Worship and Industrial Development by Sector

	Textile	Food processing	Chemical industry	Machinery + transport + mining	Construction + water + electricity
	(1)	(2)	(3)	(4)	(5)
			Panel A. OLS estimates		
Sage temples	-2.157**	-0.684*	-0.320*	-0.797**	-0.364*
	(1.092)	(0.390)	(0.192)	(0.369)	(0.216)
Non-sage temples	0.005	0.227	0.036	0.115	0.069
	(0.309)	(0.140)	(0.035)	(0.089)	(0.057)
			Panel B. Poisson estimates		
Sage temples	-0.647***	-0.380**	-0.295**	-0.292***	-0.125*
	[0.157]	[0.149]	[0.146]	[0.103]	[0.065]
Non-sage temples	0.024	0.061***	0.019	0.031**	0.014
	[0.023]	[0.022]	[0.013]	[0.015]	[0.013]
Controls	Yes	Yes	Yes	Yes	Yes
Observations	269	269	269	269	269
Mean of DV	3.35	1.57	1.03	2.18	1.96

Notes: Panel A replicates column 2 of Table 1, and Panel B replicates column 3 of Table 1; both divide the number of industrial firms by sector. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). Robust standard errors are in [brackets]. *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Table A4. Number of Sages and Prefectural Characteristics

	Distance to coast (log)	Distance to river (log)	Terrain ruggedness index (log)	Agricultural suitability index	Population in 1820 (log)	Exam degree holders 1393–1820 (*jinshi*, log)	Number of clans in 1857 (genealogy books)	Number of counties	Number of post offices
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of sages	-0.025*	-0.008	-0.060***	0.313*	0.028**	0.010	0.636	0.053***	0.050***
	(0.015)	(0.026)	(0.021)	(0.165)	(0.013)	(0.012)	(2.030)	(0.018)	(0.018)
Population 1820 (log)						1.510***	44.809**	2.420***	2.049***
						(0.134)	(18.522)	(0.319)	(0.239)
Geographic controls					Yes	Yes	Yes	Yes	Yes
Observations	269	269	269	269	269	269	269	269	269
R-squared	0.004	0.000	0.016	0.005	0.567	0.670	0.170	0.516	0.513

Notes: The table reports OLS estimates on the correlation between the number of sages and prefectural characteristics. In column 7, clans are measured by genealogy books that had been compiled by 1857 (before the first industrial firm appeared in China) based on the data of Chen, Ma, and Sinclair (2022). The number of counties is based on CHGIS 1820 from the Qing administration. The number of post offices is obtained from Lin et al. (2021). Geographic controls are the same as those in Table 1. Standard errors in (parentheses) are clustered within a radius of 136 km to account for possible spatial correlation among neighboring prefectures based on Colella et al. (2019). *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.