Online Appendices
Knowledge Diffusion and Intellectual Change: When Chinese Literati Met European Jesuits

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A1. Propensity Score Matching

To further rule out the possible effect of the confounding prefectural factors on Chinese science, I use the propensity score to identify a control group (prefectures without Jesuit scientists) that is similar with the treatment group (prefectures with Jesuit scientists). The propensity score captures a prefecture's likelihood of being selected by the Jesuit scientists as their residence.

Among all the prefectural observables, urbanization rate in 1580 is the only significant predictor of the distribution of the Jesuit scientists (Table A4). Accordingly, I estimate the propensity scores by regressing the dummy of being a Jesuit scientist prefecture on urbanization rate in 1580. Then the propensity score for each prefecture is computed based on the parameters of column 1 of Table A4. Based on the propensity scores, I matched each prefecture of Jesuit scientists with its 'closest' prefecture in terms of its likelihood of being selected by the Jesuit scientists (that is, the 'closest' prefectures were likely candidates for Jesuit scientist residents, but in reality, for whatever reason, did not house a Jesuit scientist residence). By doing so the endogenous selection effect of the Jesuit scientists can be largely ruled out.

The densities of the scores are plotted for prefectures with Jesuit scientists and those without in Figure A7. There was a considerable overlap between the two types of prefectures in terms of their propensity scores. The propensity scores of the overlap (0.12–0.45) is not very high. A possible reason is that the Jesuits could not enter the big cities they wanted to enter. Instead, their entry followed a haphazard pattern (determined by coincidence) because of the principle of autarky held by the imperial authorities of China (as discussed in Section 4.3 of

the main text). That is why some prefectures have a high propensity of housing Jesuit scientists but in fact did not (the gray tail above the score 0.6 in Figure A7).

To further improve the similarity between the treatment and the control groups, I also perform the matching based on urbanization rate in 1580 but within the Jesuit prefectures only. That is, I matched each prefecture of Jesuit scientists with its 'closest' counterpart in terms of its likelihood of being selected by the Jesuit scientists (although in actuality it was not so selected) among the prefectures where there were Jesuit priests. By doing so, the propensity scores of the overlap between the two types of prefectures are improved (Figure A8).

The regression results are reported in Table A5. The positive effect of the Jesuit scientists on the number of Chinese scientific works remains robust. The magnitudes of the coefficients are close to those of the full sample. This supports the conclusion on the importance of Jesuit knowledge diffusion in the development of Chinese science.

A2. Instrumented Results

To strengthen the finding of the causal effect of the Jesuit's knowledge diffusion on Chinese science production, I employ an instrumental variable approach, using a prefecture's shortest great circle distance to the early missionary route explored by Matteo Ricci between 1582 and 1601 to instrument the prefectural distribution of the Jesuits.

Matteo Ricci. Matteo Ricci was the pioneer and early leader of the Jesuit China mission. The route taken by him played an important role in directing the entry and expansion of the later Jesuits. Despite their religious enthusiasm, the Jesuits found it difficult and hazardous to preach in China. As introduced in sub-section 4.3, at the time when the Jesuits arrived in China, China had a strict 'sea ban' policy that prohibited contact between Chinese and foreigners. By virtue of his passion and outstanding communication skills, Matteo Ricci successfully entered China and established five missionary residences. He first arrived in Zhaoqing in Guangdong

Province in 1582.[1] With the help of friends who were officials, Ricci successfully expanded the mission northward, and established new residences in Shaozhou in northern Guangdong (1589), Nanchang in Jiangxi Province (1595) and Nanjing in Nanzhili (Jiangsu) Province (1598), before he finally entered the imperial capital of Beijing in 1601. We connect these five residences using straight lines and refer to it as the Ricci route (Figure A9, a).[2]

After Ricci, the Jesuits entered China along the 'Ricci route'. This is because the Jesuits now had more information and knowledge about the places along the Ricci route. Moreover, thanks to the political connections that Ricci had cultivated, local officials and other members of the elite along the Ricci route were more likely to be hospitable to the missionaries who came after him. In particular, after Ricci was called by the emperor and was allowed to live in the imperial capital, Ricci won greater prestige among these local notables, and thus further facilitated the Jesuit mission in China (Ricci and Trigault 1953 [1615]; Brockey 2007).[3]

Along the Ricci route, the Jesuits managed to expand their mission to nearby regions (Figure A9, b). For example, around Nanjing, Lazzaro Cattaneo (1560–1640) established a new missionary station in nearby Songjiang (Shanghai) in 1608 with the help of Xu Guangqi, and then in Hangzhou three years later with the help of Li Zhizao and Yang Tingyun (1557–1627). Moreover, throughout the Jesuit era in China, the Ricci route performed the courier function of

[1] Zhaoqing was the first Jesuit residence in mainland China. Its existence was indebted to another Jesuit pioneer, Michele Ruggieri (1543–1607). After Ruggieri was allowed to live in Zhaoqing, he took Matteo Ricci to Zhaoqing in 1582 (Brockey 2007).

[2] Certainly, the actual route Ricci took did not necessarily follow a straight line. I use the hypothetical straight line to attenuate the effect of transportation.

[3] For example, when the Jesuit Jean de Rocha (1566–1623) entered Nanjing, Ricci had already left Nanjing for Beijing. But Jean de Rocha was still welcomed and protected by the local officials. He said that the Jesuits' reputation among and relationship with local officials had been established by Ricci, and was crucial for the Jesuits' residence and development in Nanjing. Likewise, the Jesuit Alexandre Valignani (1538/9–1606) was aided in his China journey by Matteo Ricci, who had his friend, the official Xu Guangqi, write to the local officials along the route from Macau to Beijing to seek their protection and assistance for Valignani (Ricci and Trigault 1953 [1615]).

delivering information and logistical supplies from the Jesuits' Macau base to the inland missionary stations. For example, Nanchang in Jiangxi Province was a major transfer station for this purpose. Jesuit correspondence between Macau and the mainland missions was mainly delivered through Nanchang (Tang 2002). We thus expect a positive relationship between proximity to the Ricci route, on the one hand, and the presence of Jesuits, on the other. Indeed, Panel A of Table A6 shows that the distance to the Ricci route has a significantly negative correlation with the distribution of Jesuit scientists in 1581 to 1720, in spite of whether or not I control for other prefectural correlates. Likewise, the distribution of the Jesuit priests was also negatively affected by the distance to the Ricci route (Panel B).

The distance to the Ricci route is arguably orthogonal to Chinese scientific production. This is evidenced by the reduced-form regressions of Chinese scientific works on the distance to the Ricci route (Panel C, Table A6). The distance to the Ricci route had no effect on Chinese scientific works before 1580 (column 2), suggesting that the Ricci route did not play a role in knowledge diffusion prior to the arrival of the Jesuits. The distance to the Ricci route came to have a significantly negative effect on Chinese scientific works after 1580 (column 3), suggesting that the Ricci route promoted Chinese science through facilitating the expansion of the Jesuit presence. This is reinforced by column 4, where the effect of the Ricci route on Chinese science disappears after I control for the number of Jesuits.

However, a possible violation of exclusion restriction is that the Ricci route connected two important cities in Ming China: Macau as a trade port and Beijing as the imperial capital. To rule out the possibility of economic or cultural spillover from the two cities, I control for the distance to Macau and the distance to Beijing. Another potential violation is that the Ricci route may capture the transportation effect. Indeed, the Ricci route was close to the major courier routes in Ming-Qing China (Figure A10). To rule out the possible effect of transportation, I control for a prefecture's shortest distance to the nearest courier route.[4]

[4] A related concern is that the Ricci route was located in eastern China. The distance to the Ricci route may just reflect China's striking east-west difference in scientific production rather than a real Ricci effect. To address this concern, I exclude the five provinces in western China: Gansu, Shaanxi, Sichuan, Guizhou, and

Instrumented Results. In accordance with the panel fixed-effects regressions, I use the interaction term between the distance to the Ricci route and the post-1580 dummy as the instrumental variable of the interaction term between the Jesuit scientists and the post-1580 dummy. I also control for the interaction term between the Jesuit priests and the post-1580 dummy, reasoning that the distribution of the priests is also correlated with the proximity to the Ricci route and the distribution of the Jesuit scientists.

The two-stage least squares (2SLS) regression results are reported in Table A7. As with the OLS estimations, I first exclude the covariates before fully including them (interacted with post-1580 dummy) into regressions. Jesuit scientist presence, which is predicted by the distance to Ricci route, had a significantly positive effect on Chinese scientific works after 1580 (columns 1 and 2). The instrumented effect is five times greater than that of the OLS estimate (in column 2 of Table 2); a prefecture with Jesuit scientists would produce 0.65 more books per decade than a prefecture without Jesuit scientists after 1580 (column 2). The results remain robust when I use the number of and the distance to Jesuit scientists as an alternative measure of the Jesuit effect (columns 3–6).

A3. The Interaction between the Jesuits and the Literati

This section examines whether the Jesuit effect on Chinese science worked through stimulating literati interest in studying science. Historical accounts suggest that the communication with the Jesuits was crucial to the scientific achievements of Chinese scholars, who received systematic, nuanced instruction in the novel European sciences from their Jesuit friends. Empirically, if this was the case, the effect of the Jesuit scientists on Chinese scientific production should be greater in prefectures where there was a stronger presence of the literati. In contrast, in areas with very few literati, the effect of the Jesuit scientists should be limited because of the lack of knowledge 'receivers'.

Yunnan. By doing so, I examine the effect of the distance to the Ricci route in a relatively homogenous (eastern) region. The results are consistent with that of the full sample and thus are not reported separately.

The strength of literati in a prefecture is measured by the number of degree holders who had received the highest qualification (*jinshi*) in the imperial examinations in the past 30 years. Figure A11 depicts the prefectural distributions of *jinshi* and the Jesuit scientists between 1581 and 1720. In the prefectures with Jesuit scientists, there is obvious regional variation in the number of *jinshi*. This allows us to effectively examine the interactive effect between the Jesuit scientists and the *jinshi* on Chinese scientific production.

I regress the number of Chinese scientific works on the interaction term between the Jesuit scientist entry dummy and the number of *jinshi*. By doing so, I examine whether the *jinshi* would produce more scientific works after the Jesuit scientists entered their prefectures. The results show that the number of *jinshi* had no effect on the number of Chinese scientific works before the arrival of the Jesuit scientists (Table A10). After the Jesuit scientists entered a prefecture, the *jinshi* there began to write more scientific works. On average, a doubling of the number of *jinshi* would bring about 0.089 more scientific publications after the entry of the Jesuit scientists (column 1). This effect remains robust to the inclusion of the interaction terms between decade dummies and a full set of prefectural controls (column 2) and to restrict the sample to within the Jesuit prefectures (columns 3 and 4). These results coincide with historical narratives on the importance of communication with the Jesuits in literati scientific production.

A4. Tables and Figures

TABLE A1
THE EFFECT OF THE JESUIT SCIENTISTS ON CHINESE SCIENCE: ALTERNATIVE MEASURES OF JESUIT SCIENTIST NUMBER

	Chinese Scientific Works	
	Full sample	Jesuit prefectures
	1	2
Panel A.		
Post1580 × Jesuit scientist number (log)	0.017***	0.017***
	(0.007)	(0.006)
R-squared	0.157	0.208
Panel B.		
Post1580 × Jesuit scientist number (inverse hyperbolic sine)	0.108***	0.109***
	(0.037)	(0.032)
R-squared	0.162	0.215
Post1580 × Controls	Y	Y
Prefecture and decade FE	Y	Y
Observations	5,588	1,782

Notes: All columns report the OLS estimates at the prefecture-decade level between 1501 and 1720. Dependent variable is the decadal number of Chinese scientific works at the prefectural level. Jesuit scientist number is the aggregation of the decades of presence of all the Jesuit scientists in each prefecture between 1581 and 1720. It takes the natural log plus a small number, i.e., ln(Jesuit scientist number+0.001) in Panel A and the inverse hyperbolic sine transformation in Panel B. Controls include urbanization rate in 1580, agricultural suitability, log distance to coast, log distance to river, log distance to Macau, latitude, longitude, and log land area,. Standard errors in parentheses are clustered at the prefectural level by pre- and post-1580 periods. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A2
THE EFFECT OF THE JESUIT SCIENTISTS ON CHINESE SCIENCE: ALTERNATIVE MEASURES OF CHINESE SCIENCE

	1	2	3	4	5	6
	Full sample			Jesuit prefectures		
Panel A.	Dependent variable is the ordered number of Chinese scientific works (0–1–2)					
Post1580 × Jesuit scientist presence	0.056**			0.045*		
	(0.024)			(0.026)		
Post1580 × Jesuit scientist number		0.009***			0.008**	
		(0.004)			(0.004)	
Post1580 × Jesuit scientist distance			-0.009**			-0.010**
			(0.004)			(0.005)
R-squared	0.212	0.214	0.212	0.232	0.234	0.233
Panel B.	Dependent variable is the number of Chinese scientific works in *Chouren Zhuan*					
Post1580 × Jesuit scientist presence	0.073***			0.064**		
	(0.028)			(0.030)		
Post1580 × Jesuit scientist number		0.009***			0.008**	
		(0.003)			(0.004)	
Post1580 × Jesuit scientist distance			-0.011**			-0.011*
			(0.005)			(0.006)
R-squared	0.100	0.100	0.099	0.110	0.110	0.110
Panel C.	Dependent variable is the number of Chinese astronomical works in *Siku Quanshu*					
Post1580 × Jesuit scientist presence	0.012			0.023**		
	(0.010)			(0.011)		
Post1580 × Jesuit scientist number		0.002			0.003*	
		(0.001)			(0.002)	
Post1580 × Jesuit scientist distance			-0.002			-0.004**
			(0.002)			(0.002)
R-squared	0.092	0.092	0.092	0.118	0.118	0.117
Post1580 × Controls	Y	Y	Y	Y	Y	Y
Prefecture and decade FE	Y	Y	Y	Y	Y	Y
Observations	5,588	5,588	5,544	1,782	1,782	1,782

Notes: All columns report the OLS estimates at the prefecture-decade level between 1501 and 1720. The dependent variable of Panel A is the same with that in Table 2 except that the number of Chinese scientific works is now graded on a scale of 0, 1 and 2, in which 2 includes all the observations whose value is greater than one. The dependent variable in Panel B is the number of Chinese scientific works obtained from *Chouren Zhuan* compiled in the late 18th to late 19th centuries. The dependent variable in Panel C is the number of Chinese astronomical works obtained from *Siku Quanshu* compiled between 1773 and 1784. Measures of Jesuit scientist and the controls are the same as those of Table 2. Standard errors in parentheses are clustered at the prefectural level by pre- and post-1580 periods. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A3
COMPARISON BETWEEN THE PREFECTURES WITH JESUIT SCIENTISTS AND THE PREFECTURES WITH JESUIT PRIESTS ONLY

	Prefectures with Jesuit scientists	Prefectures with Jesuit priests		
	Mean	Mean	Difference	*t*-statistic
Urbanization rate 1580	10.25 (1.36)	8.74 (1.52)	1.50	0.70
Agricultural suitability	18.20 (0.73)	17.42 (0.91)	0.77	0.62
Distance to coast (log)	5.05 (0.23)	5.23 (0.25)	0.19	0.53
Distance to river (log)	4.95 (0.21)	4.91 (0.21)	0.05	0.15
Distance to Macau (log)	5.70 (0.12)	5.77 (0.07)	0.07	0.54
Latitude	30.43 (0.94)	30.56 (0.75)	0.13	0.11
Longitude	114.98 (0.86)	114.01 (0.81)	0.96	0.80
Land area (log)	9.37 (0.13)	9.60 (0.10)	0.22	1.32
Chinese scientific works 1501–1580	0.56 (0.27)	0.21 (0.15)	0.35	1.18
Observations	34	47		

Notes: Standard errors are reported in parentheses.

Source: See the text.

TABLE A4
DETERMINANTS OF THE DISTRIBUTION OF THE JESUIT SCIENTISTS

	Logit	Logit	OLS	OLS
	1	2	3	4
Urbanization rate in 1580	0.073***	0.066***	0.011***	0.010**
	(0.028)	(0.024)	(0.004)	(0.004)
Agricultural suitability		0.020		0.000
		(0.039)		(0.004)
Log Distance to coast		-0.212		-0.035
		(0.166)		(0.031)
Log Distance to river		0.176		0.021
		(0.154)		(0.017)
Log Distance to Macau		-0.392		-0.015
		(0.769)		(0.100)
Latitude		0.002		-0.001
		(0.087)		(0.009)
Longitude		0.086		0.006
		(0.057)		(0.008)
Log Land area		-0.028		-0.003
		(0.339)		(0.033)
Wald Chi-Square	6.94***	24.04***		
F-statistic			7.62***	3.03***
Observations	254	254	254	254
R-squared	0.060	0.124	0.060	0.101

Notes: The dependent variable is a dummy indicating whether a prefecture had one or more Jesuit scientists between 1581 and 1720. Heteroskedasticity-robust standard errors in parentheses. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A5

RESULTS OF THE PROPENSITY SCORE MATCHING

	Chinese scientific works			
	Full sample	Full sample	Jesuit prefectures	Jesuit prefectures
	1	2	3	4
Panel A.				
Post1580 × Jesuit scientist presence	0.121**	0.181***	0.099*	0.112
	(0.054)	(0.069)	(0.056)	(0.068)
R-squared	0.215	0.235	0.215	0.241
Panel B.				
Post1580 × Jesuit scientist number	0.024***	0.024***	0.024***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)
R-squared	0.261	0.264	0.261	0.264
Panel C.				
Post1580 × Jesuit scientist distance	-0.024**	-0.035***	-0.020*	-0.026*
	(0.010)	(0.013)	(0.011)	(0.013)
R-squared	0.216	0.235	0.215	0.242
Controls × Post1580		Y		Y
Prefecture and decade FE	Y	Y	Y	Y
Observations	1,210	1,210	1,034	1,034
Number of prefectures	55	55	47	47

Notes: All columns report the OLS estimates at the prefecture-decade level between 1501 and 1720. Based on the one-by-one propensity score matching, the control group is restricted to the prefectures that had the closest likelihood of being selected by Jesuit scientists as a residence (but where such residence did not occur in reality). The propensity score is computed based on the urbanization rate in 1580. Columns 3 and 4 further exclude prefectures without Jesuits at any time from 1581 to 1720 when doing the propensity score matching. Measures of Jesuit scientists and the controls are the same as those in Table 2. Standard errors in parentheses are clustered at the prefectural level by pre- and post-1580 periods. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A6
THE FIRST-STAGE AND THE REDUCED-FORM ESTIMATIONS ON THE INSTRUMENTAL VARIABLE

	1	2	3	4
Panel A.	Jesuit scientist presence	Jesuit scientist presence	Jesuit scientist number	Jesuit scientist number
Log distance to Ricci route	-0.071***	-0.057**	-1.484***	-2.170***
	(0.016)	(0.023)	(0.249)	(0.328)
Controls		Y		Y
R-squared	0.070	0.123	0.125	0.260
Panel B.	Jesuit priest presence	Jesuit priest presence	Jesuit priest number	Jesuit priest number
Log distance to Ricci route	-0.085***	0.002	-1.748***	-1.016**
	(0.022)	(0.028)	(0.362)	(0.487)
Controls		Y		Y
R-squared	0.057	0.243	0.085	0.199
Panel C.		Chinese Scientific Works 1501–1580	Chinese Scientific Works 1581–1720	Chinese Scientific Works 1581–1720
Log distance to Ricci route		-0.014	-0.965***	-0.245
		(0.056)	(0.190)	(0.170)
Jesuit scientist number				0.331***
				(0.031)
Jesuit priest number				-0.016
				(0.070)
Controls		Y	Y	Y
R-squared		0.097	0.147	0.483
Observations	252	252	252	252

Notes: All are OLS estimates at the prefectural level. 'Distance to Ricci route' refers to a prefecture's shortest distance to the Jesuit pioneer Matteo Ricci's missionary route in China in 1582–1601. Controls include urbanization rate in 1580, agricultural suitability, log distance to coast, log distance to river, log distance to Macau, latitude, longitude, and log land area. Heteroskedasticity-robust standard errors in parentheses. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A7
THE EFFECT OF THE JESUIT SCIENTISTS ON CHINESE SCIENCE: INSTRUMENTED RESULTS

	Chinese Scientific Works					
	1	2	3	4	5	6
Post1580 × Jesuit scientist presence	0.712	0.652				
	(0.196)***	(0.312)**				
	[0.234]***	[0.280]**				
Post1580 × Jesuit scientist number			0.034	0.065		
			(0.009)***	(0.031)**		
			[0.010]***	[0.036]*		
Post1580 × Jesuit scientist distance					-0.095	-0.095
					(0.026)***	(0.044)**
					[0.030]***	[0.033]***
Post1580 × Controls		Y		Y		Y
Prefecture and decade FE	Y	Y	Y	Y	Y	Y
K.P. F-statistic	218.16	42.58	59.78	23.75	646.32	135.49
Observations	5,544	5,544	5,544	5,544	5,544	5,544
Number of prefectures	252	252	252	252	252	252

Notes: All are 2SLS estimates at the prefecture-decade level between 1501 and 1720. Variables related to Jesuit scientists are instrumented by a prefecture's shortest distance to the Jesuit pioneer Matteo Ricci's missionary route in China in 1582–1601 (in log). Controls include urbanization rate in 1580, agricultural suitability, log distance to coast, log distance to river, log distance to Macau, latitude, longitude, log land area, Jesuit priests (presence, number or distance), log distance to courier route, and log distance to Beijing. Robust standard errors are given in parentheses. Standard errors in brackets are arbitrarily clustered within a radius of 136 kilometers and within a time window of a century to account for possible spatial and temporal correlation based on Colella et al. (2019). *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A8
THE JESUITS' ENTRY INTO CHINA

No.	Prefecture	Year of entrance	Means of entrance
1	Macau	1562	After Macau was occupied by the Portuguese in 1557, the Jesuits Baltasar Gago, Andre Pinto, and Giovanni De Monte entered Macau to establish the first Jesuit base in China in 1562.
2	Zhaoqing	1582	By following Portuguese merchants, Michele Ruggieri arrived in Guangzhou in 1580, and established a friendship with the provincial governor of Guangdong. In 1582, Ruggieri was allowed to reside in Zhaoqing.
3	Shaozhou	1589	The new prefect of Zhaoqing was hostile to the Jesuits. Matteo Ricci asked the provincial governor of Guangdong for another residence. The governor recommended Shaozhou.
4	Nanchang	1595	Matteo Ricci's first attempt to enter Nanjing in 1595 failed. His friend, She Li, a minister at Beijing, recommended that Ricci reside in Nanchang in Jiangxi Province.
5	Nanjing	1597	After having established himself as a renowned scholar, Ricci was supported by the local officials to reside in Nanjing, the auxiliary capital of the Ming dynasty, in 1597.
6	Beijing	1601	Because of his friendship with a prestigious eunuch from the imperial palace, Matteo Ricci followed this eunuch north, intending to enter Beijing. However, Ricci was arrested at Tianjin because his visit was illegal (i.e., not on the list of Ming tributary missions). But the Wanli emperor received Ricci's tribute of mechanical clocks and oil paintings, and then issued an imperial order allowing him to enter Beijing.
7	Songjiang	1608	Chinese literati Xu Guangqi had to return to his hometown Songjiang (Shanghai) in 1608 to mourn his deceased father for three years according to Chinese custom. As Xu's good friend, Lazzaro Cattaneo accompanied Xu to Songjiang.
8	Hangzhou	1612	Lazzaro Cattaneo was invited by his friends, the officials Li Zhizao and Yang Tingyun, to preach in their hometown of Hangzhou in Zhejiang Province.
9	Jiangzhou	1620	With the help of a Chinese Christian, Giulio Aleni entered Jiangzhou in Shanxi Province.
10	Suzhou	1622	Francesco Sambiasi was invited by the official Sun Yuanhua to his hometown of Jiading in Jiangsu Province.
11	Kaifeng	1623	Recommended by his friend, the official Wang Zheng, Giulio Aleni entered Kaifeng in Henan Province.
12	Fuzhou	1627	Recommended by his friend Ye Xianggao (a minister), Giulio Aleni entered Ye's hometown of Fuzhou in Fujian Province.
13	Taiwan	1636–1638	Inacio Lobo entered Taiwan when the Ming authorities were confronted by social unrest.
14	Wuchang	1638	António de Gouvea entered Wuchang in Hubei Province with the help of an official at Beijing who was his friend.
15	Jinan	1640	Requested by the Society of Jesus to open a new church along the Grand Canal (the main transportation route linking the imperial capital Beijing and the lower Yangtze), Nicholas Longobardi inspected the Grand Canal cities in 1637 and 1638, and finally chose Ji'nan in Shandong Province.
16	Chengdu	1640	Lodovico Buglio settled in Chengdu in Sichuan Province with the help of his local literati friends.
17	Yanping	1650s	Simão da Cunha expanded the missions to Yanping (and also Jiangning, Shaowu and Dingzhou) in Fujian Province along the rivers connected to the missionary bases of Fuzhou.
18	Ganzhou	1658	After the church at Nanchang was destroyed, Jacques Le Faure requested a residential permit in another city in Jiangxi Province. He settled in Ganzhou with the help of a military officer.
19	Jianchang	1661	Prospero Intorcetta entered Jianchang in Jiangxi Province with the help of another Jesuit, Ignatius da Costa.
20	Ningbo	1687	As the King's Mathematicians and with the permission of the Qing authorities, Jean de Fontaney, Joachim Bouvet, Jean-François Gerbillon, Louis Le Comte, and Claude de Visdelou landed at Ningbo in Zhejiang Province before going to Beijing.

Notes: This table briefly introduces the means of the Jesuits' entry into the 20 prefectures of China for which Jesuit presence is recorded, for the purpose of demonstrating the randomness of the time of entry. The locations of these 20 prefectures are shown in Figure A12.

Sources: Ricci and Trigault (1953 [1615]); Brockey (2007), Chapters 1–5.

TABLE A9
THE EFFECT OF THE CUMULATIVE NUMBER OF THE JESUIT SCIENTISTS ON CHINESE SCIENTIFIC PRODUCTION, 1501–1720

	Chinese scientific works			
	Full sample	Full sample	Jesuit prefectures	Jesuit prefectures
	1	2	3	4
Jesuit scientist number (cumulative)	0.056***	0.057***	0.058***	0.059***
	(0.007)	(0.007)	(0.006)	(0.007)
Controls × Decade dummies		Y		Y
Prefecture and decade FE	Y	Y	Y	Y
Observations	5,588	5,588	1,782	1,782
R-squared	0.199	0.222	0.280	0.347
Number of prefectures	254	254	81	81

Notes: This table takes into account the temporal change in the number of Jesuit scientists, and examines its cumulative effect on Chinese science. Jesuit scientist number (cumulative) is the cumulative number-decades of the Jesuit scientists since they first entered a prefecture. All columns report the OLS estimates. Controls include urbanization rate in 1580, agricultural suitability, log distance to coast, log distance to river, log distance to Macau, latitude, longitude, and log land area. Standard errors in parentheses are clustered at prefectural level by pre- and post-1580 period. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A10
THE INTERACTION BETWEEN THE JESUIT SCIENTISTS AND THE LITERATI, 1501–1720

	Chinese scientific works			
	Full sample	Full sample	Jesuit prefectures	Jesuit prefectures
	1	2	3	4
jinshi × Jesuit scientist entry	0.089	0.083	0.097	0.083
	(0.045)*	(0.044)*	(0.048)**	(0.037)**
jinshi	0.003	0.005	-0.006	0.002
	(0.007)	(0.009)	(0.019)	(0.026)
Jesuit scientist entry	-0.121	-0.125	-0.148	-0.108
	(0.072)*	(0.077)	(0.083)*	(0.075)
Controls × Decade dummies		Y		Y
Prefecture and decade FE	Y	Y	Y	Y
R-squared	0.161	0.186	0.205	0.286
Observations	5,334	5,334	1,701	1,701

Notes: The table examines whether the literati would be stimulated by the Jesuit scientists to study science. Jesuit scientist entry is a dummy indicating the period after the first Jesuit scientist arrived in a prefecture. *Jinshi* is measured by the prefectural number of *jinshi* degree holders in the past 30 years (in log). All columns report the OLS estimates. Controls are the same as those of Table 2. Standard errors in parentheses are clustered at the prefectural level by pre- and post-1580 period. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.

Source: See the text.

TABLE A11
THE EFFECT OF CHINESE SCIENCE ON ECONOMIC DEVELOPMENT

	OLS	2SLS	OLS	2SLS
	1	2	3	4
Panel A.	Dependent variable is log population density, 1393–1820			
Number of Chinese scientific works × Post1580	-0.002	-0.006		
	(0.004)	(0.005)		
Distance to Chinese scientific works × Post1580			-0.020	0.217
			(0.016)	(0.100)**
Controls × Post1580	Y	Y	Y	Y
Prefecture and decade FE	Y	Y	Y	Y
Observations	1,260	1,260	1,260	1,260
R-squared	0.930	0.527	0.930	0.459
K. P. F-statistic		1235.5		7.781
Panel B.	Dependent variable is log agricultural tax in 1820			
Number of Chinese scientific works	-0.007	-0.023		
	(0.016)	(0.017)		
Distance to Chinese scientific works			-0.013	-0.135
			(0.027)	(0.164)
Controls	Y	Y	Y	Y
Observations	251	251	251	251
R-squared	0.262	0.259	0.262	0.220
K. P. F-statistic		1390.7		5.468

Notes: Population density is measured at the prefectural level and spans five time points of 1393, 1580, 1630, 1776, and 1820. Agricultural tax is measured at the prefectural level in 1820, with the unit in silver *liang* per *mu*. 'Number of Chinese scientific works' refers to the total number of Chinese scientific book titles produced in each prefecture during the Jesuit period (1581–1773). It was instrumented by the number of Jesuit scientists in 1581 to 1720 in column 2. 'Distance to Chinese scientific works' refers to a prefecture's shortest (great circle) distance to the nearest prefecture where there were Chinese scientific works between 1581 and 1773. It was instrumented by the distance to the nearest prefecture with Jesuit scientists in 1581 to 1720 in column 4. Controls are the same as those of Table 2. Standard errors in parentheses are clustered at the prefectural level in Panel A and are robust in Panel B. *, ** and *** indicate the level of significance at 10%, 5% and 1%, respectively.
Source: See the text.

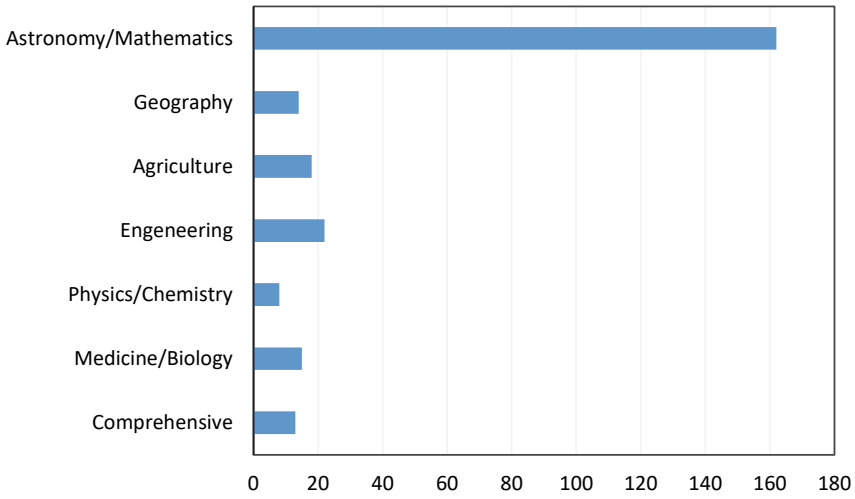


FIGURE A1
NUMBER OF CHINESE SCIENTIFIC WORKS BY DISCIPLINE, 1581–1780

Notes: The data are based *Zhongguo Kexue Jishu Dianji Tonghui* compiled by the Institute for the History of Natural Science of the Chinese Academy of Sciences (1994).
Source: See the text.

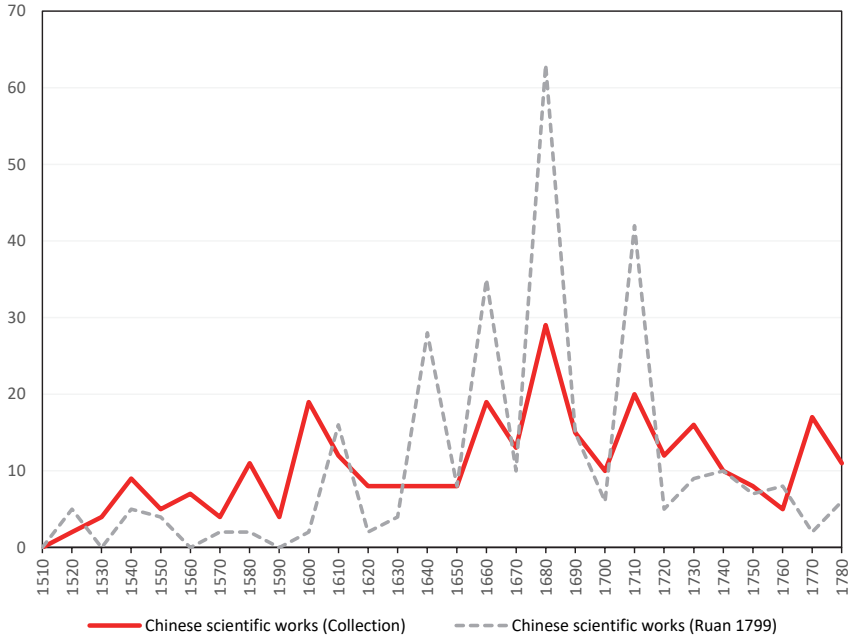
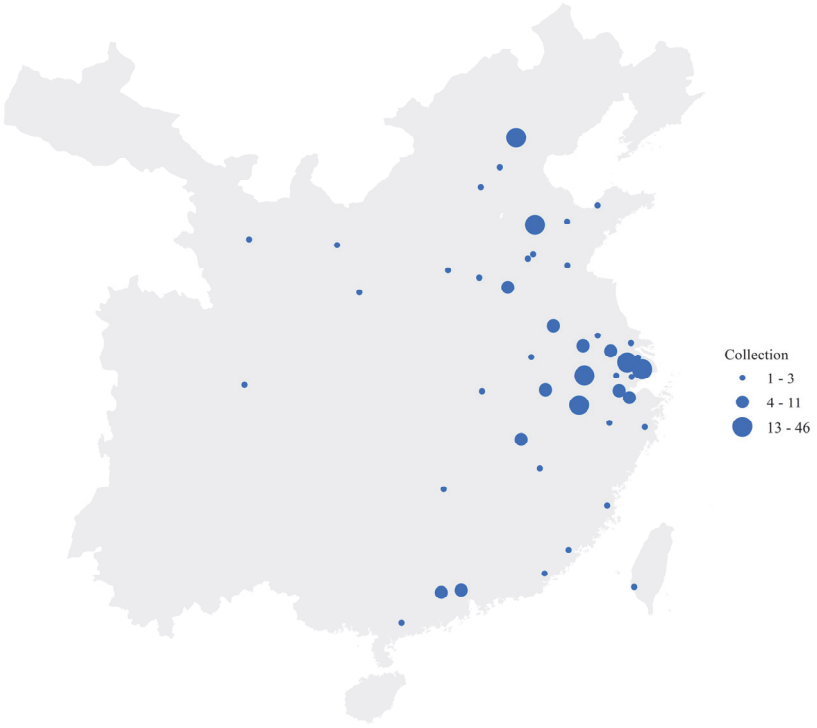
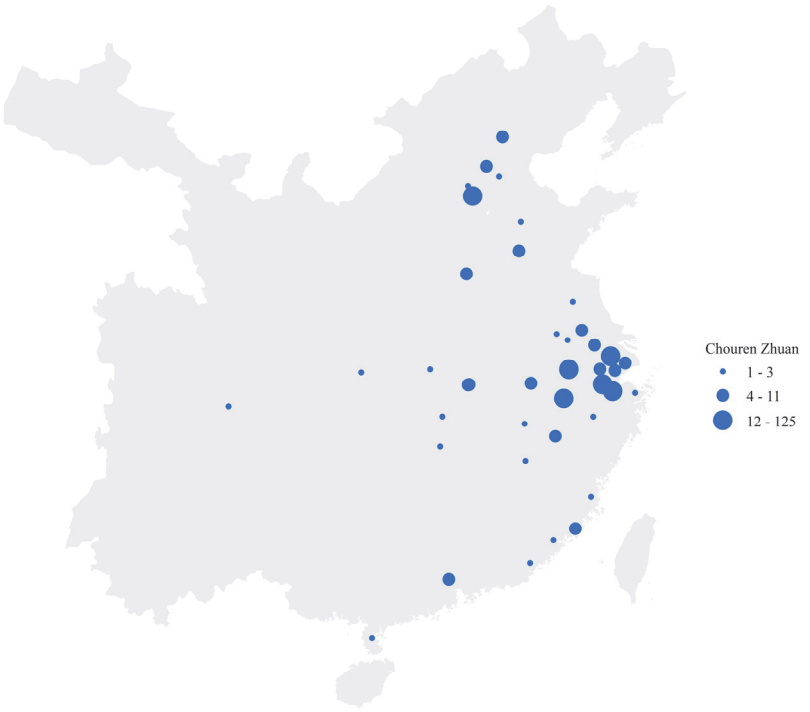


FIGURE A2
NUMBER OF CHINESE SCIENTIFIC WORKS BY DECADE AND SOURCE

Notes: 'Chinese scientific works' refers to the number of book titles on sciences written by Chinese. The data shown in red is obtained from the *Zhongguo Kexue Jishu Dianji Tonghui*. The data in the dashed line is obtained from *Chouren Zhuan* (Biographies of Astronomers) compiled by Ruan Yuan (1955 [1799]).
Source: See the text.



(a) Works in *Zhongguo Kexue Jishu Dianji Tonghui* (the Collection)



(b) Works in *Chouren Zhuan*

FIGURE A3
DISTRIBUTION OF THE NUMBER OF CHINESE SCIENTIFIC WORKS, 1581–1780

Notes: Data sources are the same as those of Figure A1.

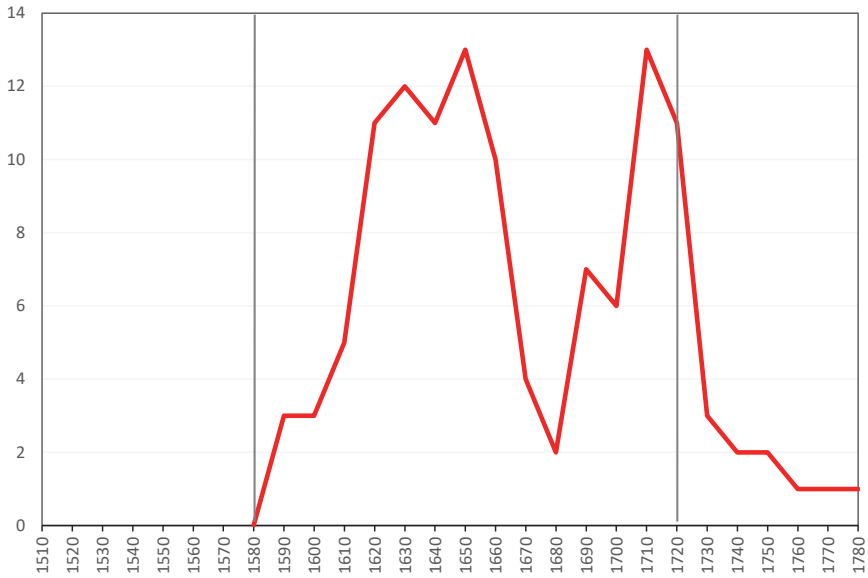


FIGURE A4
NUMBER OF PREFECTURES WITH JESUIT SCIENTISTS

Notes: 'Jesuit scientists' refers to the Jesuits who were involved in scientific activities in China. The data is based on Dehergne (1973) and Li and Zha (2002).
Source: See the text.

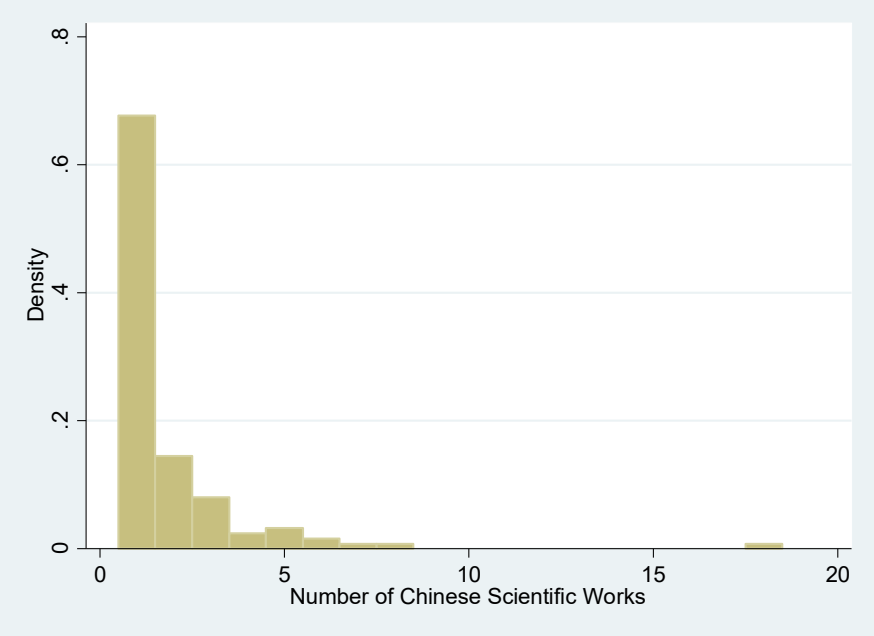


FIGURE A5
DISTRIBUTION OF POSITIVE VALUES IN THE NUMBER OF CHINESE SCIENTIFIC WORKS

Source: See the text.

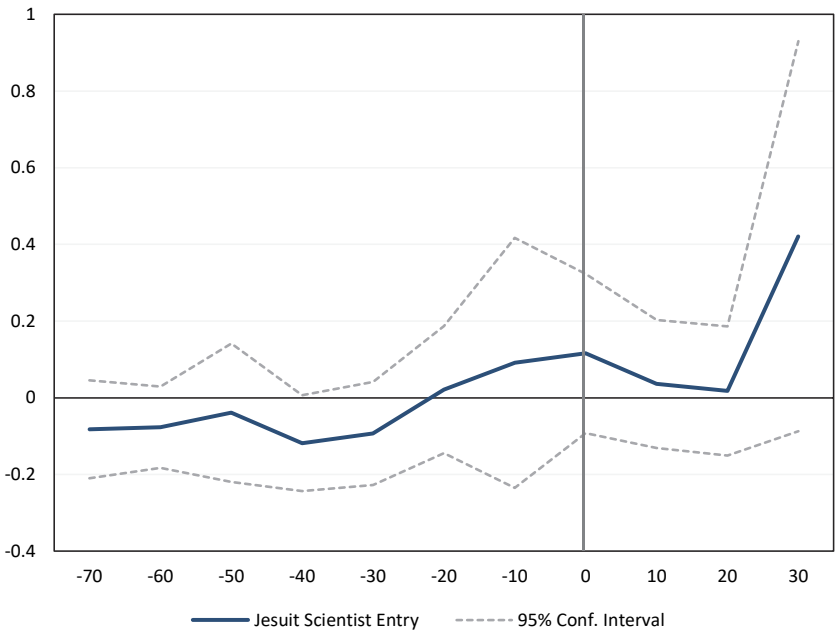


FIGURE A6
CHINESE SCIENTIFIC WORKS BEFORE AND AFTER THE ENTRIES OF JESUIT SCIENTISTS

Notes: The entry time of Jesuit scientists varied by prefecture between 1581 and 1720. The horizontal axis measures the decades before and after the Jesuit scientists first entered a prefecture. The solid line indicates the difference between prefectures with Jesuit scientists and those without in terms of the number of Chinese scientific works, conditional on the prefectural and decade fixed-effects and the interaction terms between decade dummies and prefectural factors as used in Table 2. The dashed lines refer to the 95% confidence intervals. The pre-trend has seven decades because the earliest Jesuit scientists entered China in the 1580s. The post-Jesuit trend is limited to three decades because the latest first entry occurred in the 1690s.
Source: See the text.

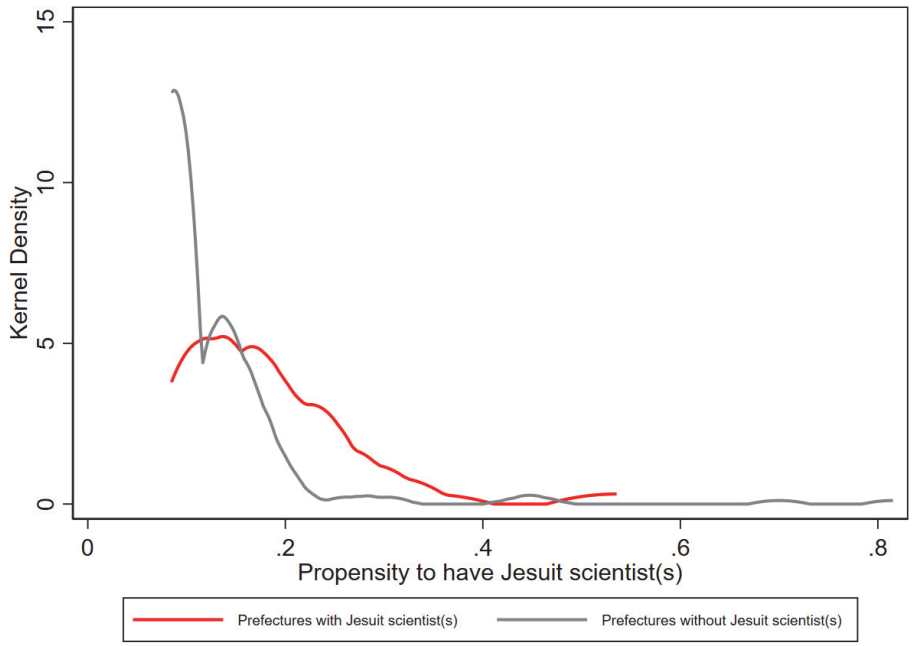


FIGURE A7
PROPENSITY SCORE DENSITIES OF THE FULL SAMPLE

Notes: This figure shows the distribution of propensity scores on the likelihood of being a prefecture where there were Jesuit scientists. The scores are estimated by the Logit regression of the binary variable indicating whether a prefecture has Jesuit scientists on urbanization rate in 1580.
Source: See the text.

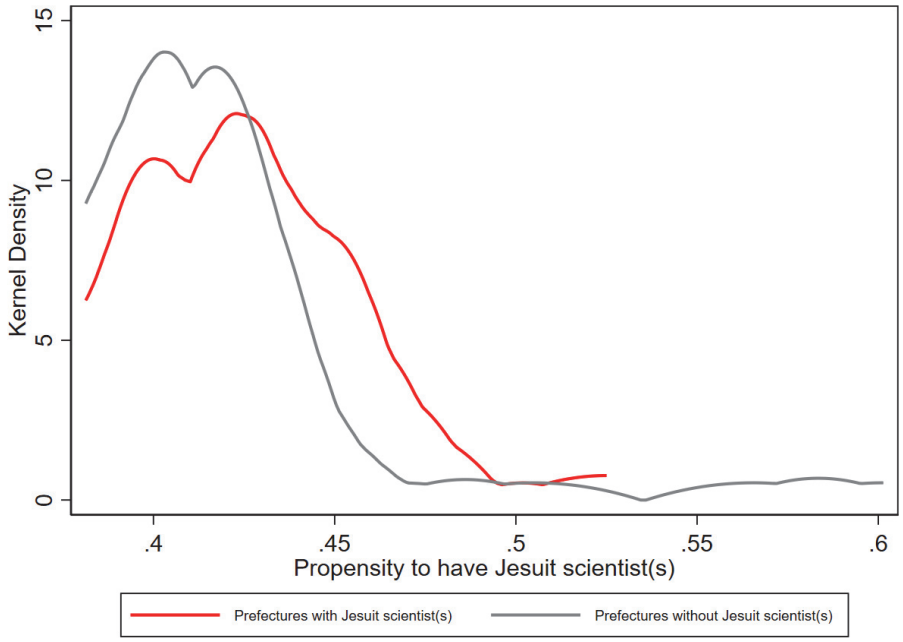
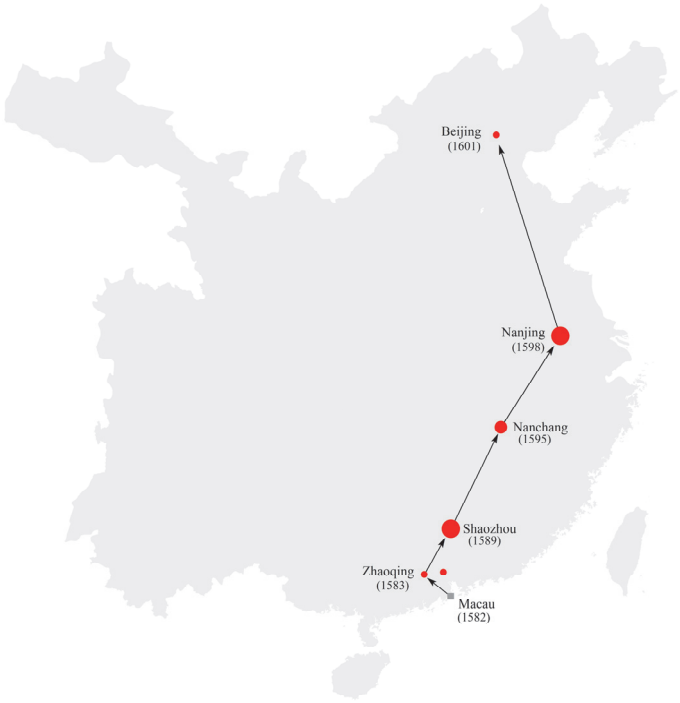


FIGURE A8
PROPENSITY SCORE DENSITIES OF THE JESUIT PREFECTURES

Notes: Same as Figure A7 except that the propensity scores are estimated within the prefectures where there was at least one Jesuit between 1581 and 1720.
Source: See the text.



(a) 1601

(b) 1700

Number of Jesuits 1 2 - 3 4 - 20 Matteo Ricci's missionary route

FIGURE A9
MATTEO RICCI'S MISSIONARY ROUTES AND THE DISTRIBUTION OF THE JESUITS

Notes: The residences of Matteo Ricci are marked with the year of arrival in parentheses.
Source: See the text.

FIGURE A10
THE COURIER ROUTES AND MATTEO RICCI'S MISSIONARY ROUTE

Notes: The residences of Matteo Ricci are marked with the year of arrival in parentheses.
Source: See the text.

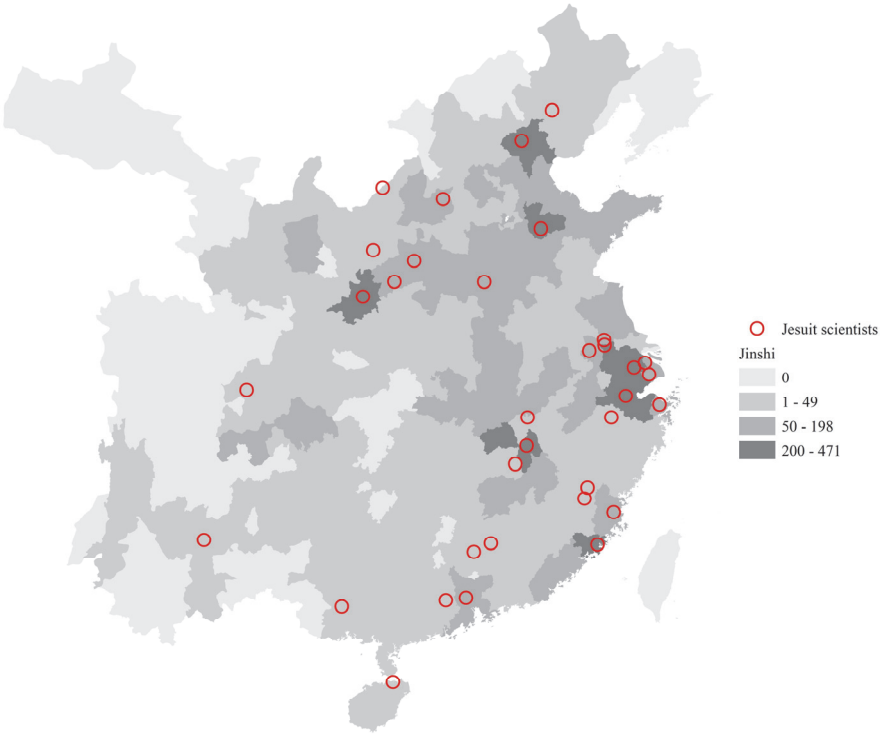


FIGURE A11
DISTRIBUTIONS OF THE LITERATI (*JINSHI*) AND THE JESUIT SCIENTISTS, 1581–1720

Notes: The literati are measured by the total number of *jinshi* between 1581 and 1720. The data for *jinshi* were obtained from Zhu and Xie (1980). The data for Jesuit scientists were obtained from Dehergne (1973) and Li and Zha (2002).
Source: See the text.

FIGURE A12
THE ENTRY OF THE JESUITS INTO CHINESE PREFECTURES

Notes: This figure shows the locations of the 20 prefectures for which the means of Jesuit entry were recorded. The numbers correspond to those in Table A8, in which the means of entry into each prefecture is introduced.
Source: See the text.

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