Online Appendix

Long Live *Keju*! The Persistent Effects of China's Civil Examination System

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A. The Hierarchy (Degrees) of the *Keju* System

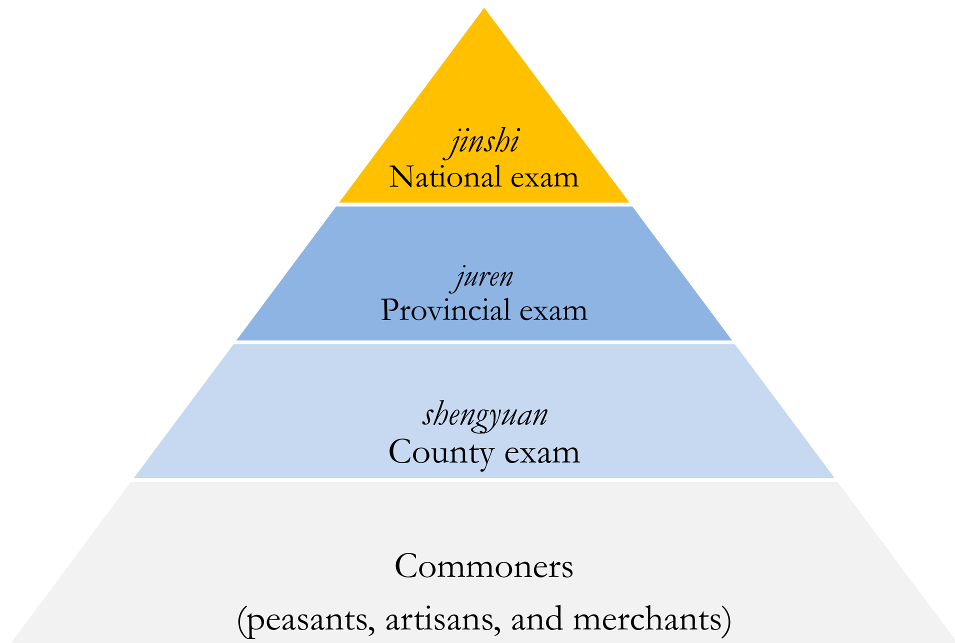

Figure A1. *Keju* Hierarchy

B. Regional Distributions of *Keju* Degree Holders in the Ming-Qing Period

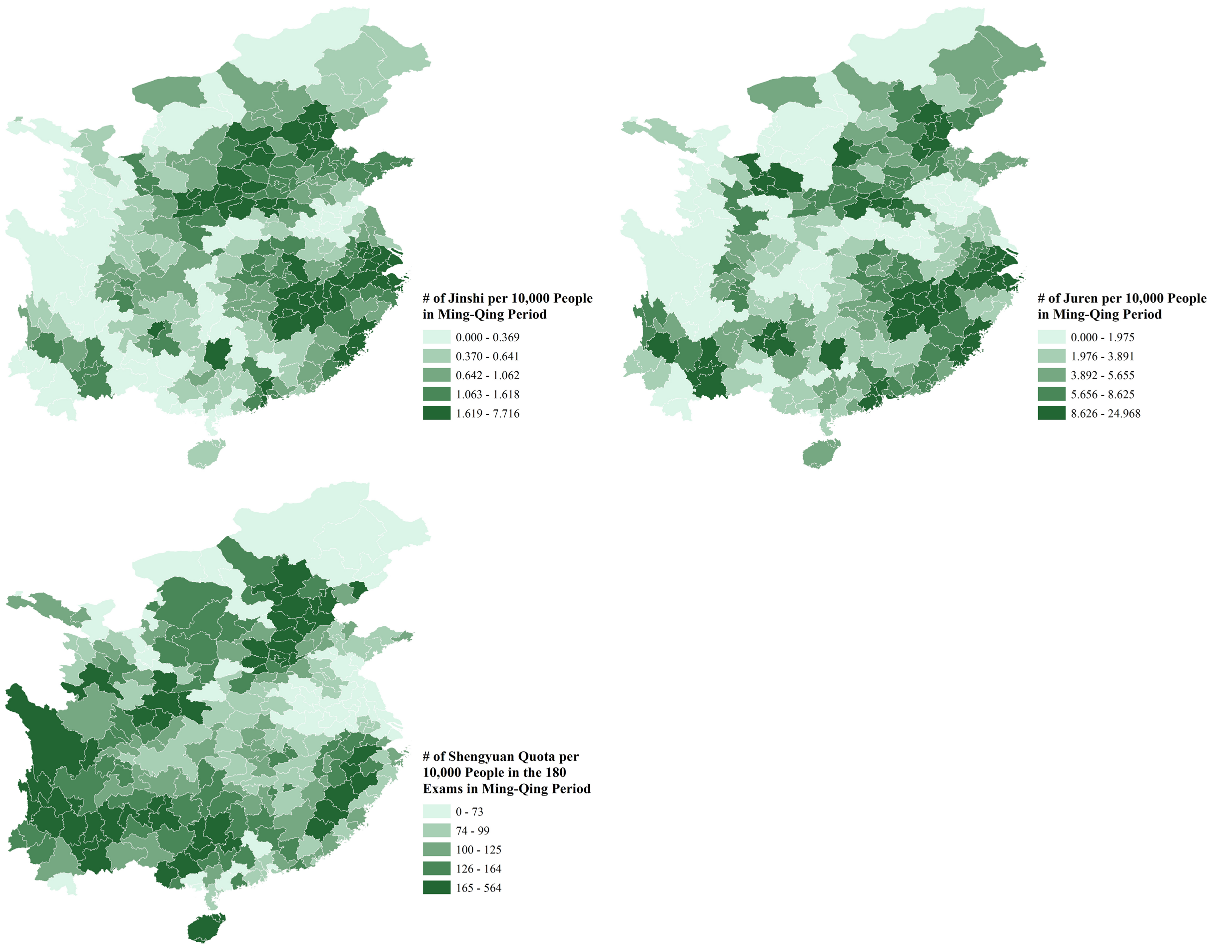

Figure A2. Regional Distributions of *Jinshi*, *Juren* and *Shengyuan* Quota Densities in the Ming-Qing Period

C. Testing for Spatial Autocorrelation

Following Kelly (2019), we examine whether the long-term effect of historical *jinshi* density on contemporary schooling may be driven by the spatial autocorrelation in the residuals. To do so, we conduct the Moran test for spatial autocorrelation in the regression residuals for columns (1) and (4) of Table 2. The Moran statistic is a spatial analogue of the Durbin-Watson test formulated to examine potential misspecification in regressions. Restricting the Moran test to the five nearest neighbors of each prefecture, the z-score of the Moran test ranges from -0.659 (in column (1)) to -0.486 (in column (4)). With Moran's I statistic estimated to be -0.013 (p-value of 0.255, column (1)) and -0.007 (p-value of 0.313, column (4)), the spatial autocorrelation hypothesis is rejected at the 5% level of significance.[1]

We then examine the extent to which the artificial spatial noise may account for the years of schooling in 2010 (the dependent variable), and the extent to which noise can be attributed to *jinshi* density (the independent variable). Following Kelly (2019), we assume a spatial interpolation that is normally distributed with the covariance matrix $\sum ij = Cov(x_i x_j) = \sigma^2 \rho(||h||/\phi)$, where ρ is the correlation function, $||h||$ is the distance between points i and j, and the range parameter ϕ determines how fast the correlation decays with distance. We adopt the widely used Matèrn function with the shape parameter κ to be the covariance matrix. We then use maximum likelihood to estimate the simulation parameters in this covariance matrix based on China's per capita GDP in 2010 at the prefectural level. We also set $\kappa = 1$ and allow ϕ to range between three and five degrees.[2] We then simulate the spatial noise randomly 500 times based on these parameters. After preparing a set of spatial noise variables for each range parameter, we replace the explanatory variable (*jinshi* density) and the dependent variable (years of schooling) with the spatial noise variables to check if the persistence results are driven by spatial autocorrelation.

Table A1 reports the results of these exercises. Each cell shows the fraction of the simulated noise variables under different levels of significance (ranging from 0.05 to 0.0001) out of 500 simulations. Column (1) of Table A1 summarizes the proportion of time when a noise variable's explanatory power outperforms that of the original persistence variable. Columns (2) - (5) report the effect of simulated spatial noise on years of schooling in 2010, whereas columns (6) - (9) the effect of *jinshi* density on noise.

The results clearly show that the noise variables rarely outperform the *jinshi* density variable in terms of explanatory power. For example, at the 0.05 level of significance, the

[1] In fact, if we do not control for the provincial fixed effects in Table 2, the Moran z-score is 15.637 and Moran's I statistic is 0.21 at the 0.1% level of significance, suggesting that spatial autocorrelation can already be mitigated simply by controlling for the provincial fixed effects.

[2] We use the same correlation parameter range between three and five for China as Kelly did for his exercises on Europe.

noise variable has only a 5.4% chance of accounting for the years of schooling in 2010 (column (2), Panel A of Table A1). Similarly, when noise is treated as the dependent variable, it has only a 4.8% chance of being explained by *jinshi* density (column (6), Panel A). Moreover, inclusion of the control variables further reduces the odds of noise accounting for the years of schooling in 2010 to 5.2% (column (2) of Panel B), while boosting its odds of accounting for *jinshi* density to 6% (columns (6) of Panel B). More generally, the odds become systematically smaller as the level of significance of the noise variable increases (columns (3) - (5) and (7) - (9)). In all, the above results suggest that the likelihood of the persistent effect of *jinshi* density being driven by the spatial autocorrelation in the residuals is low.

Table A1. Testing the Probable Effect of Spatial Noise on Key Explanatory and Dependent Variables in Table 2

		Explanatory Noise				Dependent Noise			
Correlation Range	Outperformce	p=0.05	p=0.01	p=0.001	p=0.0001	p=0.05	p=0.01	p=0.001	p=0.0001
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: without Control Variables (Column (1) of Table 2)									
3	0.00%	5.40%	1.20%	0.60%	0.00%	4.80%	1.00%	1.00%	0.00%
4	0.00%	4.80%	1.40%	0.60%	0.00%	4.80%	1.60%	0.40%	0.00%
5	0.00%	5.40%	0.60%	0.80%	0.00%	5.20%	2.00%	0.20%	0.00%
Panel B: with Control Variables (Column (4) of Table 2)									
3	0.00%	4.60%	1.60%	0.20%	0.00%	5.80%	1.20%	0.00%	0.20%
4	0.00%	5.20%	2.00%	0.40%	0.00%	6.00%	1.40%	0.00%	0.20%
5	0.00%	5.80%	2.20%	0.40%	0.00%	6.20%	1.40%	0.00%	0.20%

D. Prefectures in the Restricted Sample

Table A2. Impact of *Jinshi* Density on Contemporary Human Capital Outcomes: Excluding Prefectures in the Yangtze River Delta Region

	Average Years of Schoolings (logged)				Share of Population with (*100, logged)			
					No Education	Elementary and Secondary School	High School	University and Above
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jinshi Density (logged)	0.094***	0.062***	0.074***	0.068***	-0.220***	-0.091***	0.148***	0.534***
	(0.009)	(0.011)	(0.011)	(0.021)	(0.052)	(0.020)	(0.034)	(0.119)
Nighttime Light Luminosity (logged)		0.054***	0.064***	0.072***	-0.239***	-0.020	0.149***	0.312***
		(0.011)	(0.011)	(0.008)	(0.037)	(0.017)	(0.022)	(0.094)
Distance to Coast (logged)		0.012	0.012	0.008	-0.017	0.008	0.023	-0.068
		(0.014)	(0.012)	(0.011)	(0.065)	(0.010)	(0.032)	(0.074)
Terrain Ruggedness		0.054	-0.126*	-0.053	0.791*	-0.250***	-0.231	1.165**
		(0.071)	(0.068)	(0.081)	(0.441)	(0.081)	(0.195)	(0.518)
Agricultural Suitability			0.004	-0.005	-0.016	0.008	-0.005	-0.037
			(0.014)	(0.015)	(0.095)	(0.010)	(0.030)	(0.075)
Ming-Qing Population Density (logged)			-0.051***	-0.040***	0.134**	0.023	-0.132***	-0.245***
			(0.012)	(0.013)	(0.065)	(0.017)	(0.026)	(0.072)
Ming-Qing Urbanization Rates			-0.304	0.140	-0.691	-0.474	0.692	0.357
			(0.261)	(0.289)	(1.726)	(0.380)	(0.778)	(2.055)
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	240	240	240	240	240	240	240	240
Adjusted R-squared	0.643	0.731	0.759	0.705	0.730	0.585	0.702	0.553

Note: All results are OLS estimates. Robust standard errors adjusted for clustering at the province level are given in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

E. Testing Exclusion Restrictions of the Instrumental Variable

Table A3. Exclusion Restrictions

Panel A	Commercial Centers in Ming-Qing	Tea Centers in Ming-Qing	Silk Centers in Ming-Qing	Population Density in Ming (logged)	Population Density in Qing (logged)	Population Density in 1953 (logged)	Urbanization Rate in Ming-Qing	Urbanization Rate in 1920
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
River Distance to Pine/Bamboo	-0.006	-0.007	-0.008	0.007	-0.020	-0.021	-0.001	-0.020
(logged)	(0.005)	(0.005)	(0.007)	(0.045)	(0.019)	(0.017)	(0.001)	(0.024)
Observations	274	274	274	274	274	269	274	274
Adjusted R-squared	0.309	0.216	0.153	0.534	0.624	0.540	0.664	0.296
Panel B	Suitability (Rice)	Suitability (Wheat)	Suitability (Economic Crops)	Suitability (Maize)	Suitability (Sweet Potato)	Terrain Ruggedness	Droughts	Floods
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
River Distance to Pine/Bamboo	-0.335	-0.101	-0.016	-0.115	0.004	0.003	-0.001	-0.001
(logged)	(0.216)	(0.133)	(0.041)	(0.097)	(0.064)	(0.002)	(0.001)	(0.001)
Observations	274	274	274	274	274	274	274	274
Adjusted R-squared	0.698	0.619	0.621	0.658	0.834	0.736	0.728	0.685
Panel C	Distance to Commercial Centers in Ming-Qing (logged)	Distance to Silk Centers in Ming-Qing (logged)	Distance to Tea Centers in Ming-Qing (logged)	Distance to Large Cities 1920 (logged)	Distance to National Capital (logged)	Distance to Provincial Capital (logged)		
	(17)	(18)	(19)	(20)	(21)	(22)		
River Distance to Pine/Bamboo	0.091	0.110	0.091	0.028	0.003	0.021		
(logged)	(0.056)	(0.086)	(0.065)	(0.018)	(0.003)	(0.015)		
Observations	274	274	274	274	274	274		
Adjusted R-squared	0.416	0.286	0.362	0.293	0.975	0.266		

Note: All results are OLS estimates. Robust standard errors adjusted for clustering at the province level are given in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

F. Testing the Cultural Transmission Channel using the Rare Surname Sample

Table A4. Testing the Cultural Transmission Channel: Rare Surname Sample

Panel A	Full Sample			Parent Sample		
	Whether education is the most important determinant of social status	Whether the government should prioritize spending on education to achieve	Years of schooling parents expected their children	Frequently give up watching TV	Hours spent weekly on tutoring children's homework	Whether parents communicate frequently with children
	(1)	(2)	(3)	(4)	(5)	(6)
Patrilineal *Jinshi* Ancestor Density	0.314***	0.095**	0.081**	0.061*	0.035***	0.058*
(logged)	(0.069)	(0.038)	(0.028)	(0.032)	(0.006)	(0.028)
Matrilineal *Jinshi* Ancestor Density	0.094**	0.081**	0.029*	0.088	0.075***	0.075***
(logged)	(0.034)	(0.028)	(0.015)	(0.101)	(0.019)	(0.019)
Memory Test Score	0.077***	0.080***	0.063***	0.033	0.039	0.030**
(logged)	(0.009)	(0.008)	(0.010)	(0.022)	(0.051)	(0.015)
Logic Test Score	0.044**	0.038	0.003	0.004	0.009	0.008
(logged)	(0.020)	(0.022)	(0.015)	(0.103)	(0.009)	(0.033)
Years of Education	0.049*	0.051*	0.047**	0.046**	0.046**	0.041**
(logged)	(0.027)	(0.028)	(0.021)	(0.020)	(0.018)	(0.019)
Annual Household Income	0.087**	0.026	0.011	0.353***	0.089	0.070***
(logged)	(0.032)	(0.018)	(0.024)	(0.055)	(0.198)	(0.007)
Individual Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	6157	6157	784	784	784	784
Adj. R-squared	0.454	0.234	0.751	0.750	0.294	0.153

Panel B	Child Sample (7<Age<=16)						
	Word Ability Test (logged)	Math Ability Test (logged)	Word Ability Test (logged)	Math Ability Test (logged)	Class (Exam) Ranking	Absenteeism Last Month	Time Spent on Studying per Week
	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Patrilineal *Jinshi* Ancestor Density	0.029*	0.025	0.011	0.028	0.047**	-0.062***	0.059*
(logged)	(0.015)	(0.016)	(0.024)	(0.019)	(0.021)	(0.016)	(0.032)
Matrilineal *Jinshi* Ancestor Density	0.063***	0.002**	0.016	0.065***	0.051**	-0.050**	0.087**
(logged)	(0.015)	(0.001)	(0.034)	(0.016)	(0.019)	(0.022)	(0.033)
Memory Test Score			0.040	0.023***	0.062***	-0.004	0.007
(logged)			(0.049)	(0.005)	(0.021)	(0.024)	(0.023)
Logic Test Score			0.036	0.001	0.037	-0.002	0.014
(logged)			(0.033)	(0.002)	(0.036)	(0.029)	(0.032)
Parents' Years of Education			0.062***	0.064*	0.004	-0.036	0.052*
(logged)			(0.009)	(0.032)	(0.033)	(0.022)	(0.029)
Annual Household Income			0.075	0.011	0.069**	-0.017	0.054**
(logged)			(0.065)	(0.027)	(0.026)	(0.027)	(0.025)
Individual Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	784	784	784	784	784	784	784
Adj. R-squared	0.761	0.761	0.738	0.585	0.711	0.592	0.425

Note: Individual control variables include age, gender, ethnicity, and residential status (rural versus urban). Robust standard errors adjusted for clustering at the province level are given in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.