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

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Motivation

- Long-term persistence: historical institutions can generate long-term persistence in the development process

- "The Colonial Origins of Comparative Development: An Empirical Investigation", D. Acemoglu, S. Johnson, J. Robinson, *The American Economic Review* 91 (5): 1369-1401, 2001.

  - How to account for the large differences in income per capita across countries?

  - Effects of institutions and property rights on performance are unreliably estimated

  - Types of colonization policies: "Extractive" versus "Neo-Europe" to provide exogenous variations in institutions

  - "Disease environment" → settlement → early (colonial) institutions → current (post-colonial) institutions → current economic performance

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Motivation

- ▸ Long-term persistence: historical institutions can generate long-term persistence in the development process

  - ▫ Dell (2010): *mita*, a forced mining labor system in Peru and Bolivia between 1573 to 1812, lowered household consumption and increased the prevalence of children stunted growth in today's *mita* regions

  - ▫ Michalopoulos and Papaioannou (2013): pre-colonial political centralisation among ethnic groups shaped contemporary economic performance within Africa countries

  - ▫ Guiso, Sapienza and Zingales (2015): Italian cities that experienced self-government in the Middle Ages have higher level of civic capital today

Motivation

- Possible legacies of China's most important and long-lasting institution—the imperial examination system or *keju*
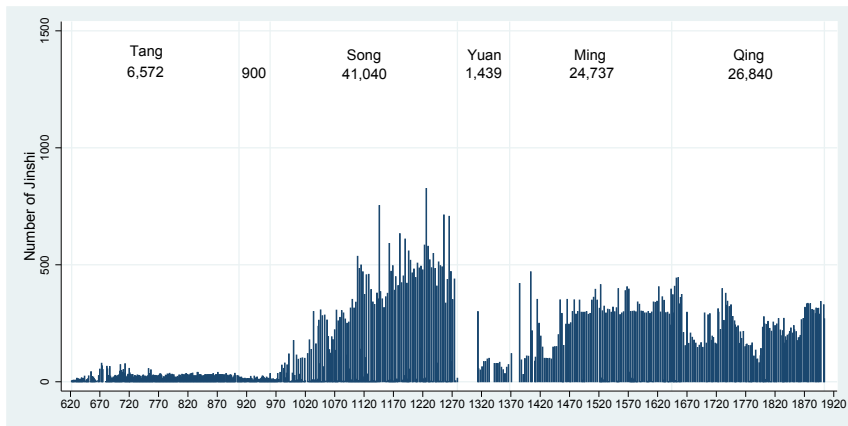

Figure 1. Annual Number of *Jinshi* over A millennium

Motivation

- *Keju* institution is important for at least two reasons:

  - As the world's first meritocratic bureaucracy designed to recruit competent talents to serve as government officials, keju provided social mobility to essentially all (males)

  - Ping-ti Ho, an eminent historian of China, finds that in the Qing dynasty as many as 45.1% of *juren* and 37.6% of *jinshi* came from the commoner families (Ho, 1962)

Ho Ping-ti (1917-2012)

Motivation

- *Keju* also bore significantly upon political stability

  - Abolition of keju in 1905 induced uprisings and political participation, hastened the decline of dynastic rule (Bai and Jia, 2015)

- A third possible reason: persistence effect of *keju* on long-term human capital accumulation

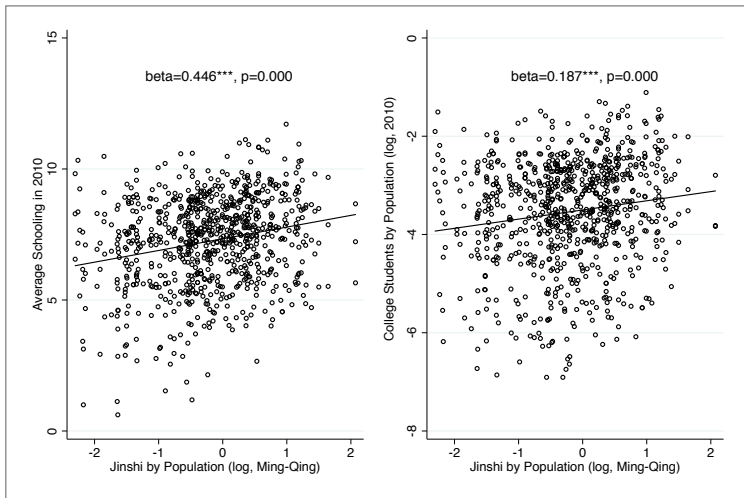▶ A third possible reason: persistence effect of *keju* on long-term human capital accumulation

Figure 2. Historical Success in China's Civil Exam (*keju*) and Average Years of Schooling in 2010

Two Channels for *Keju* Persistence

- ▸ Human capital channel: parents can transmit their own human capital—genetically and through parenting—to their offspring (Becker, 1991; Becker and Tomes, 1979)

    - □ With a premium placed upon literacy, bookishness, and education, for instance, the Jews have most persuasively demonstrated this process of passing skills and attitudes on to later generations (Botticini and Eckstein, 2012)—otherwise known as "vertical transmission" (Bisin and Verdier, 2000)

Two Channels for *Keju* Persistence

- Culture channel: by shaping people's beliefs and preference, institutions may have bred and fostered a culture over time (Alesina and Giuliano, 2015)

    □ Through the culture channel, historical institutions impact upon the behavior of individuals (e.g. Alesina and Fuchs- Schündeln, 2007; Becker et al., 2015; Grosjean, 2014)

    □ Once established, culture tends to endure through the ages (Nunn and Wantchekon, 2011; Voigtländer and Voth, 2012)

    □ In its long period of existence, *keju* may have nurtured and fostered a culture of valuing education and willingness to invest in education, for which effect may last till today

- *"At any rate, for good or evil, the examination system profoundly affected the civilization of China. Among its good effects were a widely-diffused respect for learning..."* (Bertrand Russell, 1922, p. 46)

Motivation

▸ Abundant anecdotal evidences

- Students from East Asia spent more time studying, and invested more resources in private tutoring than their European or American counterparts (Stevenson and Lee, 1990)

- Within China, the share of family income spent on education in 2006 was 13% on average, with distinctly higher percentages (about 18%) in provinces that produced significantly more *jinshi* historically (Jiangsu, Fujian, Jiangxi, Shandong, and Shanxi) (CGSS 2006)

Research Questions

▶ Whether *keju* has a positive effect on human capital outcomes in the long run?

▶ Through what channel(s) does such persistence occur?

▶ We also examine the mechanisms and conditions of persistence

　□ "A key challenge in cultural economics is to explain when norms and beliefs persist and when they are malleable" (Voigtländer and Voth, 2012)

Roadmap

1. **Background**

2. The Effect of *Keju* on Contemporary Human Capital

   1. Baseline Results

   2. Identifying the Causal Effect of *Keju*: the Role of Printing

3. Accounting for the Channels of *Keju* Persistence

   1. Human Capital Persistence

   2. The Culture Channel

4. Conditions of cultural transmission

5. Conclusion

The Chinese Imperial Exam System (*Keju*)

- ▶ Consolidated in the Song dynasty (970-1279), civil exam aimed to recruit learned talents into government bureaucracy regardless of social background

- ▶ Under lasting influence of Confucianism, government job was the most honorable and worthwhile occupation of all (officials 士> peasants 农> artisans 工> merchants 商)

- ▶ Three levels of the civil exam: *shengyuan* ⟶ *juren* ⟶ *jinshi* Figure 4A
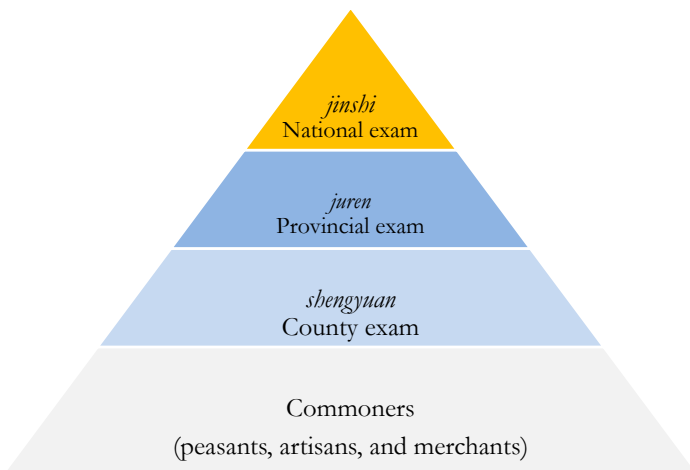
Figure 4A. Hierarchy of Civil Exam System in Ming-Qing China
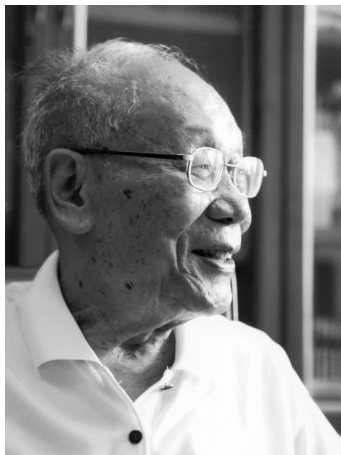
Education the Key to Social Mobility

- Extraordinary returns to the *jinshi* degree holders

    - 2% of population, gentry class accounted for 24% of wealth (Chang, 1955)

    - A gentry's income was 16 times that of a commoner (Chang, 1955)

    - Salaried income only a fraction of *jinshi*'s overall income (Chang, 1962) Table 1

Table 1. The Annual Gentry Income in the Late
19th Century, According to Sources

Income Sources	Size (10,000 Tael Silver)
Officeholding	12100
Gentry Services	11100
Secretarial Services	905
Teaching	6157.5
Other Services	900
Land Rent	22000
Mercantile Actitivies	11360
Total	64522.5

Source: Chang (1962), *The Income of the Chinese Gentry*, p.197

The late Chang Chungli (1920-2015) is famous
for his studies on the Chinese gentry

Education the Key to Social Mobility

- ▶ Nonpecuniary benefits
  - □ Exemption from cor'vee labor, poll tax, and corporal punishment (Chang, 1955)
  - □ Recognition by the community (Chaffe, 1995; Chang, 1955; Ho, 1962)
    - ⋆ *Jinshi* included in local gazetteer and genealogy
    - ⋆ Name carved on monument of local county school and Confucian Temple (太学) in Beijing Commerated in *Timingbei*
    - ⋆ Erection of arches, gateways, and temples
- ▶ Intense competition for *jinshi*—the highest degree in *keju* exam Figure 4B
  - □ A learned man devoted about 60% of their lives to studying for the *keju* exam (median age of passing the exam is 34/average lifespan of gentry in Qing is 58) (Chang, 1955)

Confucian Temple and *Timingbei* in Beijing

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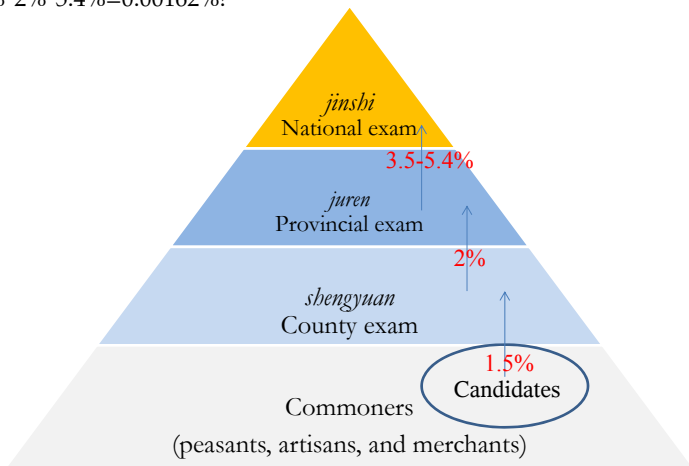
- 1.5%*2%*5.4%=0.00162%!

Figure 4B. Hierarchy of Civil Exam System in Ming-Qing China

Roadmap

1 Background

2 **The Effect of *Keju* on Contemporary Human Capital**

    1 **Baseline Results**

    2 Identifying the Causal Effect of *Keju*: the Role of Printing

3 Accounting for the Channels of *Keju* Persistence

    1 Human Capital Persistence

    2 The Culture Channel

4 Conditions of cultural transmission

5 Conclusion

2.1.1. Sample

▶ 269 prefectures covering Ming-Qing China Proper (18 provinces), matched to 284 municipalities in today's China

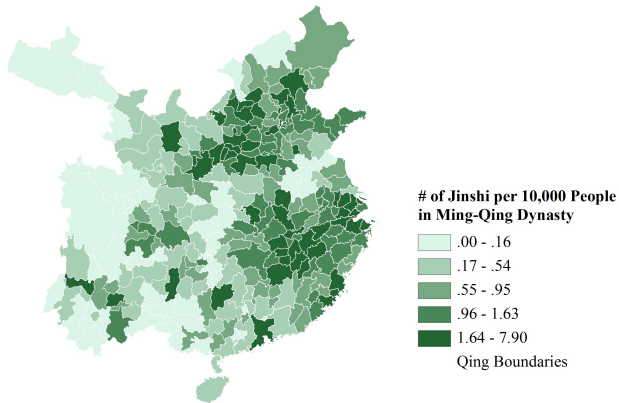▶ The average *jinshi* per 10,000 people in Ming-Qing Dynasty is 1.034

# of Jinshi per 10,000 People in Ming-Qing Dynasty

.00 - .16
.17 - .54
.55 - .95
.96 - 1.63
1.64 - 7.90
Qing Boundaries

Matching

Figure 5. Sample of Prefectures covering Ming-Qing China Proper

2.2. Empirical Model and Variables

▸ Years of schooling (Census 2010)

$$y_i = \beta keju_i + \gamma X_i + \upsilon_i$$

2.1.2. Empirical Model and Variables

$$y_i = \beta keju_i + \gamma X_i + \upsilon_i$$

- Total number of *jinshi* in a given prefecture (normalized by population) in 1368-1905
- Source: *Mingqing jinshi Timinglu Suoyin* (Directory of Ming-Qing Imperial Exam Graduates)

2.1.2. Empirical Model and Variables

Historical Controls:

- ▶ Economic Prosperity
    - ▫ Population Density in Ming-Qing Dynasty
    - ▫ Urbanization Rate in 1393
    - ▫ Urbanization Level in 1920s
- ▶ *keju* Institutions
    - ▫ Exam Quotas for *Shengyuan*
    - ▫ Regional Fixed Effects (南中北榜)
- ▶ Negative Shocks
    - ▫ Frequency of Wars

Contemporary Controls:

- ▶ Economic Prosperity
    - ▫ GDP Per Capita (2000-2010)
    - ▫ Fiscal Expenditure on Education (2000-2010)
- ▶ Geography
    - ▫ Agricultural suitability
    - ▫ Distance to Coast
    - ▫ Terrain Ruggedness Index

$$y_i = \beta keju_i + \gamma X_i + \upsilon_i$$

Table A1. Summary Statistics

2.1.3. Baseline Results

Table 2 The Impact of *keju* on Contemporary Human Capital: OLS Estimation

	Average Years of Schooling in 2010				
	(1)	(2)	(3)	(4)	(5)
jinshi (by Population)	0.061***	0.033***			0.031***
	(0.009)	(0.008)			(0.009)
jinshi (by Area)			0.035***		
			(0.008)		
jinshi (excluding migrant candidates)				0.025***	
				(0.009)	
Confucian Academies (before 1904)					-0.001
					(0.007)
New Schools (in 1907)					0.000
					(0.005)
Private Libraries (before 1904)					0.010
					(0.011)
Control Variables	No	Yes	Yes	Yes	Yes
Regional Fixed Effects	No	Yes	Yes	Yes	Yes
Number of Observations	243	243	243	243	243
Adj. R-squared	0.205	0.503	0.507	0.489	0.499

* p<0.1; ** p<0.05; *** p<0.01. Robust standard error in parentheses. Constant added but not reported.

2.1.4. Possible Alternative Channels of *keju* Persistence

- ▸ Persistent effect of historical migration

  - ▫ Migration affects long-term human capital accumulation through diffusing knowledge and stimulating competition between the immigrants and the natives (Abramitzky et al. 2012, 2014)

  - ▫ Migration can be a channel for the persistence of *keju* if prefectures with a proven track record in *keju* had indeed attracted more capable candidates to migrate to these places

  - ▫ Exclude the migrant candidates in our *jinshi* sample Column 4, Table 2

    - ⋆ Migrant candidate: location of residence when a candidate took the *keju* exam ≠ location of hometown origin

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2.1.4 Possible Alternative Channels of *keju* Persistence

- ▶ Persistence of more (and better) educational infrastructures

    - □ Availability of educational infrastructure is positively correlated with enrollment and schooling outcomes (Deaton, 1996; Duflo, 2001)

    - □ Historically, the more successful regions may have established more (and better) educational infrastructure—schools and libraries

    - □ Control for private libraries before 1904, new schools in 1907 and the number of Confucian academies before 1904 Column 5, Table 2

Historical Educational Infrastructures

- **Private libraries before 1904 (***Cangshulou***)**

    - In imperial China the collection of books was largely a private endeavor

    - The largest private library *Tian Yi Ge* in Ningbo Prefecture of Zhejiang Province held up to 70,000 volumes of books, a collection more than three times that of the Imperial Library *Wen Jin Ge* during the Ming dynasty (about 22,000 volumes)

    - Source: *The Famous Chinese Book Collectors and Private Libraries*

Hangzhou *Wenlange*

Hangzhou *Dingshi Baqianjuanlou*

Guian *Lushi Bisonglou*

Changshu *Qushi Tieqintongjianlou*

Historical Educational
Infrastructures

□ 1 Dot = 2
•   Cangshulou

Nanxun Liushi *Jiayetang*

Haining Jiangshi *Xijiancaotang*

Wenzhou Sunshi *Yuhailou*

Source of picture: *Wenlange* http://news.dahangzhou.com/84515.html

▶ **Confucian academies (***shuyuan***)**

- Education was mainly financed by the gentry in the form of Confucian academies (*shuyuan*), community schools (*shexue*) and charity schools (*yixue*)

- Each county or prefecture had only one public school (*Zhouxue* and *Xianxue*)

- Source: *A Compendium on the Chinese Academies*

▶ **New schools in 1907**

- In the 1901 *Gengzi Reform* Qing gov. transformed the Confucian academies into new schools (Western-style curriculum)

- After the abolition of *keju* in 1905, the Confucian academies were eventually replaced by the new school

- Source: *A Compendium on the Statistical Materials of Republican Education, Volume 1*

▶ The "Big Four" Confucian Academies originated from Song dynasty where the confucian master *Zhuxi* and *Fanzhongyan* had taught
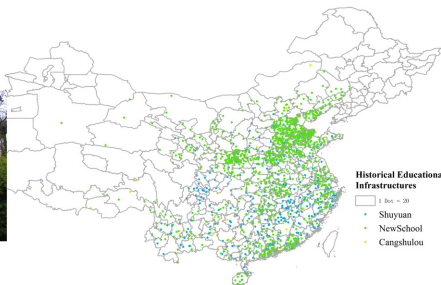
Historical Educational Infrastructures
- Shuyuan
- NewSchool
- Cangshulou

Hengyang *Shigushuyuan*

Changsha *Yuelushuyuan*

Songshan *Songyangshuyuan*

Shangqiu *Yingtianshuyuan*

Lushan *Bailudongshuyuan*

Source of Pictures: http://www.wikiwand.com/zh-mo/

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2.1.5. Validity of *jinshi* Measure

► Two concerns related to using number of *jinshi* in Ming-Qing period to account for the effect of *keju* (Figure 6)

  ▫ Ming-Qing only accounts for half of the entire history of *keju*

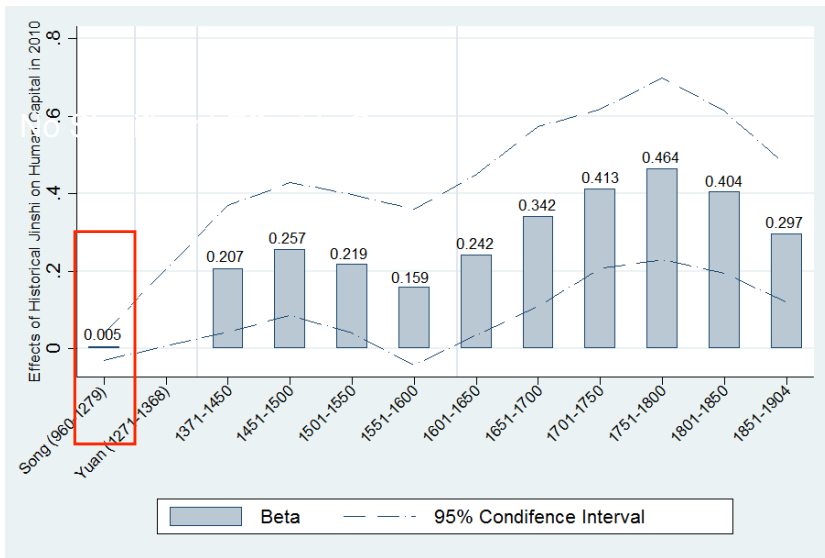 ▫ The number of *jinshi* is aggregated from over 600 years

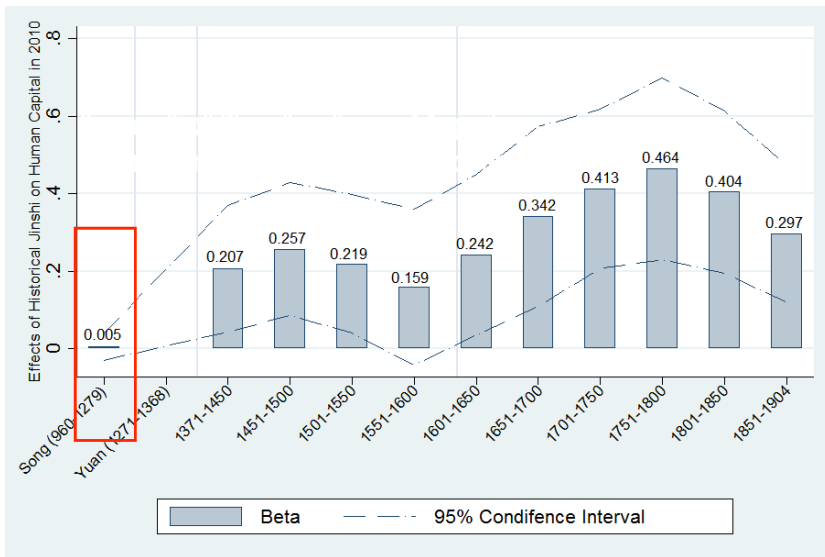Figure 6. The Impact of *keju* by Period on Contemporary Human Capital

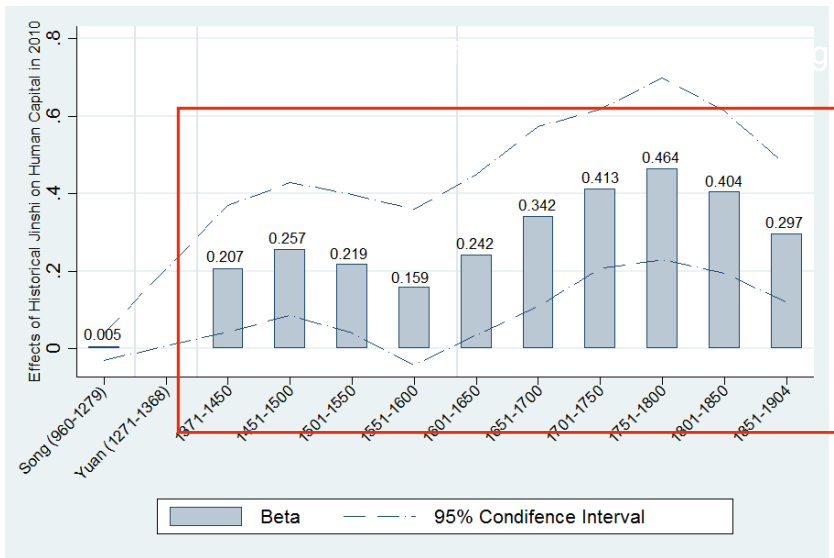Figure 6. The Impact of *keju* by Period on Contemporary Human Capital

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5. Conclusion

2.2.1. Endogenous Number of *jinshi*

- ▶ Omitted Variables: some unobserved correlates of *jinshi* may also impact directly upon contemporary human capital, e.g.

  - ▫ Region-specific endowments (natural or genetic) that persistently produce more talents in that region (地灵人杰)

- ▶ Measurement error: *jinshi* may not fully capture the diffusion of (or success in) the *keju* system in a region

  - ▫ Incomplete records on the number of *juren* (province level degree-holders) at the prefectural level and over time

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2.2.2. Printing Centers as Plausible IV

- ▶ Availability of reference books was crucial to *keju* exam success

  - □ To do well in the exam, one must consult many more reference books for nuanced, authoritative interpretations of the Confucian classics of *Four Books* and *Five Classics* (Ho, 1962; Elman, 2000; McDermott, 2006)

2.2.2. Printing Centers as Plausible IV (Cont'd)

Table 3. Contents and Related Reference Books of Civil Examination in Ming-Qing Dynasty

Contents	# of Questions	Reference Books
Provincial and Metropolitan Civil Examinations		
Four Books (stereotyped writing)	3 quotations	Scholars' interpretations of the Confucian classics (e.g. 四集); Collection of model answers from past exam papers (e.g. 近科房菁、考卷)
Five Classics (stereotyped writing)	4 quotations	
Verse Poem*	1 poem	Discourse on poetry writing (e.g.唐省、唐人五言排律)
Discourse	1 quotation	
Documentary style	3 documents	
Judicial term	5 terms	
Policy questions	5 essays	Collection of model essays for policy questions (e.g. 策纂要、策纂)
National Civil Examination		
Policy questions	1 essay	Ibid

*After 1787 by Emperor *Qianlong*. Source: Elman (2000, p. 522); Shen (2009, 2012)

2.2.2. Printing Centers as Plausible IV (Cont'd)

- ▶ Access to reference books varied enormously across prefectures

  - □ Out of the 269 prefectures there were a total of just 19 printing centers (Zhang, 2006) Figure 7A

    - ⋆ These centers accounted for 80% of the 13,050 books published in the Ming-Qing period (Du and Du, 2001, 2009)

  - □ Due to high cost of overland transportation, books shipped mainly by boats along the river tributaries of the lower Yangtze using "book boats" (Bai, 1937) Book Boats

    - ⋆ In fact, to sell books from town to town, many book vendors decked out their boats with bookshelves and some even provided desks and chairs so customers could spend time on the boats to sample their collections (Zheng, 1969)

  - □ The locations of the printing centers were determined by the availability of pine carbon (for ink production) and bamboo (for paper production)

Figure 7A Printing Centers and Number of Books Printed in the Ming-Qing Period
Sources: Zhang (2006) and Du (2001,2009)

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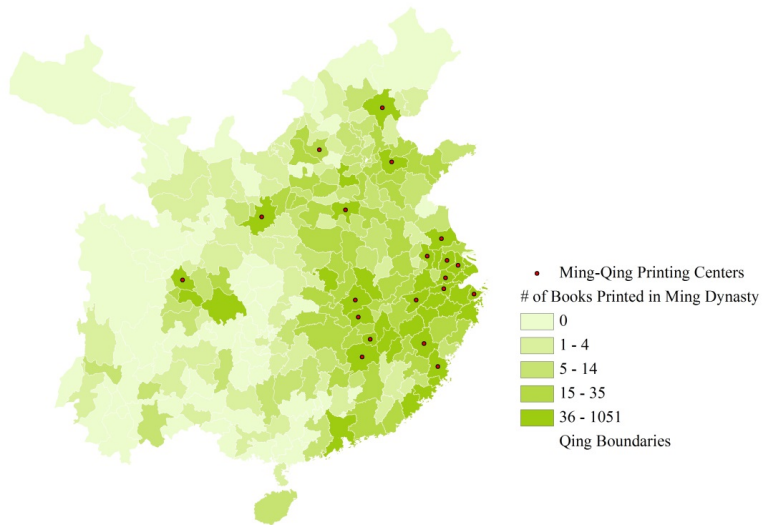
Book Boats

书船出织里及郑港、谈港诸村落。吾湖藏书之富，起于宋南渡后
——清同治中叶, 湖州府志

购书于船，由至钱塘，东南抵松江，北达京口，走士大夫之门，出书目袖
中，低昂其价，所至每以礼接之，客之未座，号为书客
——郑元庆, 湖录

湖贾书客斡乘舟，一棹烟波贩图史
——俞樾

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Figure 7B Factor Endowments for Printing

- Ming-Qing Printing Centers
- Ink
- Bamboo
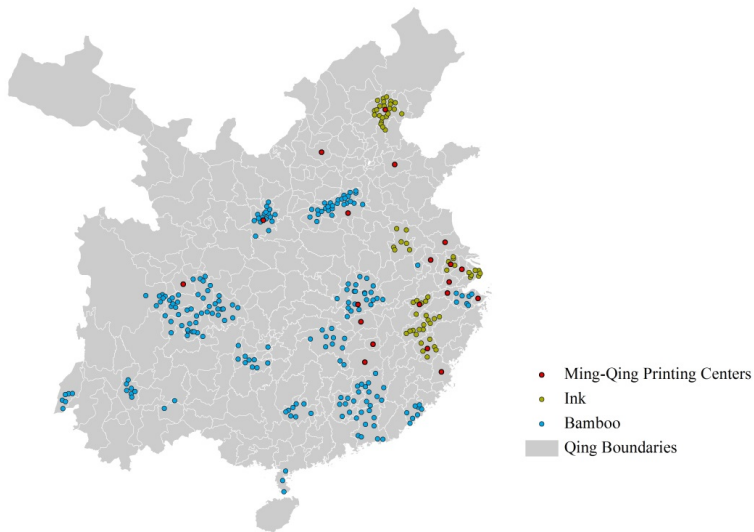- Qing Boundaries

2.2.3. Instrumental Variable

▶ Our IV is thus the distance to a prefecture's nearest printing center along
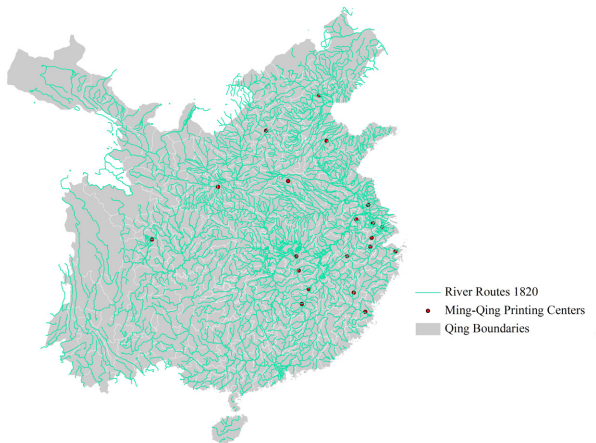the river routes

Figure 9 Printing Centers and River Routes in Ming-Qing Dynasties

2.2.4. Validity of Instrumental Variable

- Concern that the spatial distribution of the printing centers in Ming-Qing China may directly impact human capital outcome

    □ New printing technologies replaced traditional Chinese woodblock (circa 1840), with Shanghai and Tianjin replacing the 19 old printing centers
    Printing History in China and Europe

        ⋆ With Shanghai and Tianjin emerging as the new centers of modern printing technology, the previous 19 printing centers eventually went out of business (Reed, 2004)

    □ Our instrumental variable is orthogonal to human capital outcomes today
    Table 4

PRE-INDUSTRIAL AGE PRINTING

618 TO 906

WOODBLOCK PRINTING - CHINA
During the T'ang Dynasty, one of the many notable innovations include the development of woodblock printing, a technique that uses ink on blocks to print images, text, and patterns. In 868, theDiamond Sutra is printed, making it the first full-length book complete with illustrations and text.

1423

BLOCK PRINTING - EUROPE
From China, block printing reaches Europe. Europeans begin using block printing technique to produce books.

1800

IRON PRINTING PRESS - ENGLAND
Lord Stanhope, a British statesman and scientist, builds the first printing press made entirely of cast iron.

1300

WOODEN MOVABLE TYPE PRINTING - CHINA
Although China developed the first wooden movable type around 1040 AD, it was abandoned in favor of clay movable types. However, by the 1300s, a Chinese county office made 100,000 wooden movable types and printed 43 volume books.

1452

METAL PLATES - EUROPE
Europe begins using metal plates for printing. Using movable metal type, Gutenberg prints the Bible which he finishes in 1456.

1890

IRON PRINTING PRESS - CHINA
The adoption of western printing technologies had resulted in the establishment of several modern publishing companies such as Commercial Press and Chung Hwa Book Corporation, leading to the demise of traditional Chinese block printing.

2.2.4. Validity of Instrumental Variable

- Concern that the spatial distribution of the printing centers in Ming-Qing China may directly impact human capital outcome

    - New printing technologies replaced traditional Chinese woodblock (circa 1840), with Shanghai and Tianjin replacing the 19 old printing centers
    Printing History in China and Europe

        * With Shanghai and Tianjin emerging as the new centers of modern printing technology, the previous 19 printing centers eventually went out of business (Reed, 2004)

    - Our instrumental variable is orthogonal to human capital outcomes today
    Table 4

Table 4. Effect of Distance to Printing Centers on Contemporary Human Capital Outcome

| | Average Years of Schooling in 2010 (logged) | | | |
	(1)	(2)	(3)	(4)
River Distance to Printing Center	-0.001**	-0.001		
	(0.001)	(0.001)		
Jinshi		0.031***		0.027***
		(0.009)		(0.010)
Number of Printed Books (logged)			0.012***	0.006
			(0.004)	(0.005)
Control Variables	Yes	Yes	Yes	Yes
Number of Observations	243	243	243	243
Adj. R-squared	0.477	0.503	0.489	0.504

Notes: * p<0.1; ** p<0.05; *** p<0.01. All control variables are the same as in column (5) of Table 2.
Robust standard error in parentheses. Constant added but not reported.

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Robust standard error in parentheses. Constant added but not reported.

2.2.5. The Instrumented Results

Table 5 The Impact of *keju* on Contemporary Human Capital: Instrumented Results

| | Average Years of Schooling in 2010 | | | |
	2SLS (1)	2SLS (2)	2SLS (3)	2SLS (4)
jinshi by Population	0.088***	0.066**	0.070***	0.051***
	(0.020)	(0.027)	(0.013)	(0.015)
Adj. R-squared	0.163	0.465	0.216	0.461
Instruments in the first stage:				
Number of Printed Books			0.326***	0.258***
			(0.024)	(0.028)
Adj. R-squared			0.460	0.572
River Distance to Printing Center	-0.036***	-0.027***		
	(0.004)	(0.006)		
Adj. R-squared	0.216	0.461		
Control Variables	No	Yes	No	Yes
Number of Observations	243	243	243	243

$$y_i = \beta keju_i + \gamma X_i + \upsilon_i$$

$$jinshi_i = \lambda IV_i + \tau X_i + \varepsilon_i$$

* p<0.1; ** p<0.05; *** p<0.01. Columns 1-2 are the 2SLS results using river distance to the printing centers to instrument *jinshi* by Population (Ming-Qing). Columns 3-4 are the 2SLS results using number of printed books (Ming-Qing)to instrument *jinshi* by Population (Ming-Qing). All control variables are the same as Column 4 in Table 2. Robust standard error in parentheses. Constant added but not reported.

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Adj. R-squared	0.216	0.461		
Control Variables	No	Yes	No	Yes
Number of Observations	243	243	243	243

A 1% ↑ of *jinshi* ⟶ 7% ↑ of average years of schooling in 2010 (= 0.6 years when evaluated at the mean)

* p<0.1; ** p<0.05; *** p<0.01. Columns 1-2 are the 2SLS results using river distance to the printing centers to instrument *jinshi* by Population (Ming-Qing). Columns 3-4 are the 2SLS results using number of printed books (Ming-Qing) to instrument *jinshi* by Population (Ming-Qing). All control variables are the same as Column 4 in Table 2. Robust standard error in parentheses. Constant added but not reported.

2.2.6. Testing for Exclusion Restrictions

- Printing centers may also be active in trade and commerce Figure 9

  - Control for river distance to commercial centers in Ming and Qing Table 6

- IV effect may come from networks of river tributaries Figure 9

  - Randomly assign prefectures to be printing centers Table 6

Figure 9. Commercial Centers and Printing Centers in Ming-Qing

- Printing Centers in Ming
- Commercial Centers in Qing
- Commercial Centers in Ming
- Qing Boundaries
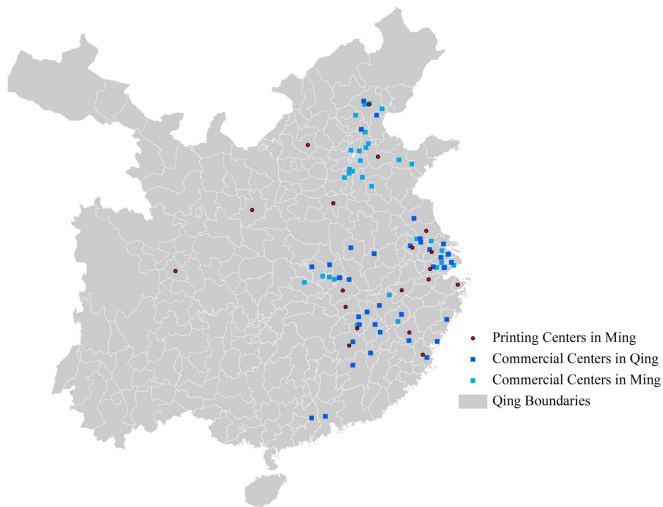
Sources: Cao (2015) and Chen (1982)

2.2.6. Testing for Exclusion Restrictions

▸ Printing centers may also be active in trade and commerce Figure 9

  ▫ Control for river distance to commercial centers in Ming and Qing Table 6

▸ IV effect may come from networks of river tributaries Figure 9

  ▫ Randomly assign prefectures to be printing centers Table 6

Table 6 The Impact of *keju* on Contemporary Human Capital: Exclusion Restrictions Test

	Average Years of Schooling in 2010		
	(1)	(2)	(3)
Jinshi (logged)	0.093**	0.099**	0.010
	(0.040)	(0.037)	(0.065)
River Distance to Commercial Center in Ming	0.002		
	(0.001)		
River Distance to Commercial Center in Qing		0.004***	
		(0.001)	
Adj. R-squared	0.392	0.401	0.476
Instruments in the first stage:			
River Distance to Printing Center	-0.021***	-0.022***	
	(0.007)	(0.006)	
Adj. R-squared	0.467	0.476	
River Distance to Random Prefecture			-0.002
			(0.001)
Adj. R-squared			0.400
Control Variables	Yes	Yes	Yes
Number of Observations	243	243	243

* p<0.1; ** p<0.05; *** p<0.01. Robust standard error in parentheses. Constant added but not reported.

2.2.6. Testing for Exclusion Restrictions

- Printing centers may also be active in trade and commerce (Figure 9)

    - Control for river distance to commercial centers in Ming and Qing (Table 6)

- IV effect may come from networks of river tributaries (Figure 9)

    - Randomly assign prefectures to be printing centers (Table 6)

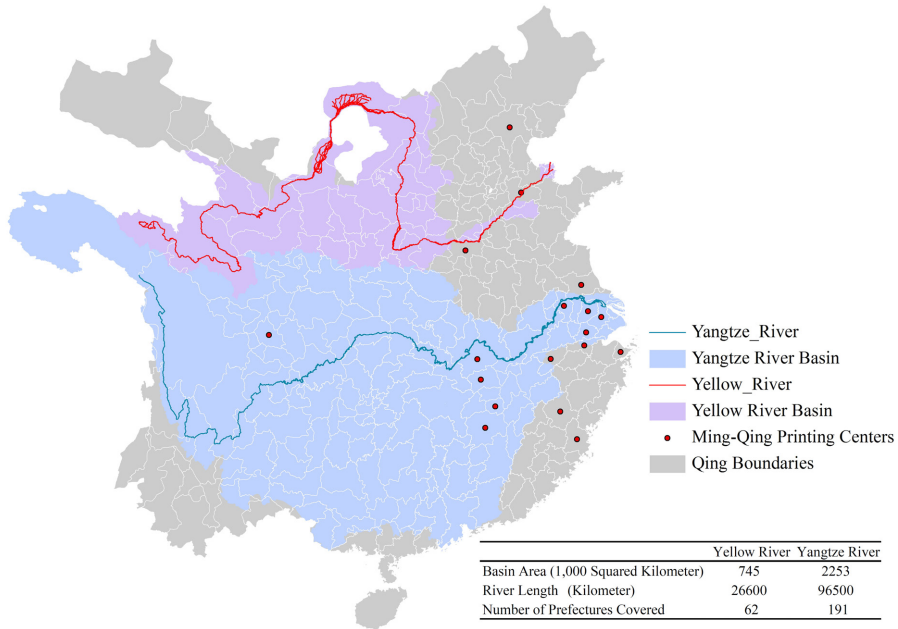|	Yellow River	Yangtze River
Basin Area (1,000 Squared Kilometer)	745	2253
River Length (Kilometer)	26600	96500
Number of Prefectures Covered	62	191

Figure 9. Printing Centers and River Routes in Ming-Qing Dynasties

2.2.6. Testing for Exclusion Restrictions

- Printing centers may also be active in trade and commerce Figure 9
    - Control for river distance to commercial centers in Ming and Qing Table 6
- IV effect may come from networks of river tributaries Figure 9
    - Randomly assign prefectures to be printing center Table 6

Table 6 The Impact of *keju* on Contemporary Human Capital: Exclusion Restrictions Test

	Average Years of Schooling in 2010		
	(1)	(2)	(3)
Jinshi (logged)	0.093**	0.099**	0.010
	(0.040)	(0.037)	(0.065)
River Distance to Commercial Center in Ming	0.002		
	(0.001)		
River Distance to Commercial Center in Qing		0.004***	
		(0.001)	
Adj. R-squared	0.392	0.401	0.476
Instruments in the first stage:			
River Distance to Printing Center	-0.021***	-0.022***	
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Adj. R-squared	0.467	0.476	
River Distance to Random Prefecture			-0.002
			(0.001)
Adj. R-squared			0.400
Control Variables	Yes	Yes	Yes
Number of Observations	243	243	243

* p<0.1; ** p<0.05; *** p<0.01. Robust standard error in parentheses. Constant added but not reported.

Roadmap

1. Background

2. The Effect of *Keju* on Contemporary Human Capital

   1. Baseline Results

   2. Identifying the Causal Effect of *Keju*: the Role of Printing

3. **Accounting for the Channels of *Keju* Persistence**

   1. **Human Capital Persistence**

   2. The Culture Channel

4. Conditions of cultural transmission

5. Conclusion

3.1. Human Capital Persistence

- Human capital advantages—especially parental educational attainment—can be transmitted across generations

  "Children from successful families are more likely to be successful themselves by virtue of the additional time spent on them and also their superior endowments of culture and genes" (Becker, 1991, p.179)

  - Through genetics or genetic inheritance (Becker, 1991)

  - Or through family culture—the so-called veritical transmission of culture (Bisin and Verdier, 2000)

    * Parental input (Guryan, Hurst and Kearney, 2008)

  - Direct income effect (Behrman and Rosenzweig, 2002)

3.1. Human Capital Persistence (cont'd)

- A micro-level analysis using China's 2005 1% mini-census to verify the transmission of human capital advantage within the elite families Table 7

    - Transmission from parents: father's and mother's years of schooling

    - Transmission from ancestors: patrilineal and matrilineal ancestors' achievements in the *keju* exam

        * People with the same surname in the same hometown tend to share the same patrilineal ancestors (Clark, 2014)

        * Identify the ancestors of the surveyed individuals sharing the same surname at the prefecture level

        * e.g. $\frac{9\ jinshi\ of\ the\ surname\ Kung\ in\ prefecture\ i\ in\ the\ Ming\ and\ Qing}{340,00\ people\ with\ surname\ Kung\ in\ prefecture\ i\ today} \rightarrow$ vertical *jinshi* density $= 0.0003$

Table 7. Channels of Human Capital Persistence Decomposed

	Years of Schooling (logged)					
	(1)	(2)	(3)	(4)	(5)	(6)
Jinshi	0.139***	0.083**	0.092***	0.213***	0.091***	0.091***
	(0.025)	(0.029)	(0.027)	(0.042)	(0.027)	(-0.027)
Patrilineal *Jinshi* Ancestors		0.021***	0.019***	0.019***	0.012***	0.012***
		(0.002)	(0.002)	(0.002)	(0.003)	(-0.003)
Matrilineal *Jinshi* Ancestors		0.008*	0.008*	0.008*	0.008*	0.005*
		(0.003)	(0.003)	(0.003)	(0.003)	(-0.003)
Father's Years of Schooling			0.029***	0.049***	0.004	0.026***
			(0.001)	(0.005)	(0.007)	(0.001)
Mother's Years of Schooling			0.028***	0.061***	0.023***	0.029***
			(0.001)	(0.005)	(0.007)	(0.001)
Jinshi*Father's Years of Schooling				-0.034***		
				(0.007)		
Jinshi*Mother's Years of Schooling				-0.054***		
				(0.007)		
Jinshi*Patrilineal Jinshi Ancestors					-0.028***	
					(0.008)	
Jinshi*Matrilineal Jinshi Ancestors					-0.019**	
					(0.007)	
Patrilineal *Jinshi* Ancestors*Father's Years of Schooling						0.025***
						(0.003)
Matrilineal *Jinshi* Ancestors*Mother's Years of Schooling						0.021
						(0.014)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Clustered at Prefecture Level	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	563498	563498	563498	563498	563498	563498
Adj. R-squared	0.202	0.208	0.219	0.219	0.216	0.221

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. All regressions run by 2SLS based on 2005 mini-census individual level data. Individual-level control variables include age, gender, ethnicity and household's status (rural/urban). Prefectural-level control variables are the same as column (5) of Table 2. Robust standard error in parentheses.

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			(0.001)	(0.005)	(0.007)	(0.001)
Mother's Years of Schooling			0.028***	0.061***	0.023***	0.029***
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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Clustered at Prefecture Level	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	563498	563498	563498	563498	563498	563498
Adj. R-squared	0.202	0.208	0.219	0.219	0.216	0.221

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. All regressions run by 2SLS based on 2005 mini-census individual level data. Individual-level control variables include age, gender, ethnicity and household's status (rural/urban). Prefectural-level control variables are the same as column (5) of Table 2. Robust standard error in parentheses.

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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Clustered at Prefecture Level	Yes	Yes	Yes	Yes	Yes	Yes
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Adj. R-squared	0.202	0.208	0.219	0.219	0.216	0.221

Notes: * p<0.1; ** p<0.05; *** p<0.01. All regressions run by 2SLS based on 2005 mini-census individual level data. Individual-level control variables include age, gender, ethnicity and household's status (rural/urban). Prefectural-level control variables are the same as column (5) of Table 2. Robust standard error in parentheses.

Roadmap

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   1. Human Capital Persistence

   2. **The Culture Channel**

4. Conditions of cultural transmission

5. Conclusion

3.2. The Culture Channel

- A society's culture represents another channel for *keju* persistence

  "At any rate, for good or evil, the examination system profoundly affected the civilization of China. Among its good effects were a widely-diffused respect for learning..." (Bertrand Russell, 1922, p. 46)

  □ Culture (beliefs, values, and norms) is likely to remain stable and transmit from one generation to the next over a long period of time (e.g., Richerson and Boyd, 2008; Bisin and Verdier, 2000)

  □ A pervasive culture of learning and examination at the societal level—horizontal transmission—is crucial for social learning

How to Measure Culture?

- ▸ "The most common tool for measuring culture is through survey questions" (Alesina and Giuliano, 2015)

  - □ Chinese General Social Survey (CGSS) is a repeated cross-sectional (2003, 2005, 2006, 2008, 2010, 2011, 2012) survey project using stratified sampling method to collect national representative sample (http://www.chinagss.org/)

  - □ We use the following subjective questions in CGSS 2006 to measure the culture of valuing education:

    * "Is education the most important determinant of social status? (Yes=1, No=0)"

    * "Among the following public expenditures, which one do you prefer your government to prioritize spending on? (Respondent chooses "educational expenditure"=1, Otherwise=0)"

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3.2.1. The Culture Channel of *keju* Persistence

‣ Verifying the culture channel

  ▫ *Keju* has a significant effect on the cultural norms of valuing education
    Columns 1-3, Table 8 , and

  ▫ Alternative Channel of work ethic Column 4, Table 8

  ▫ The effect of *keju* on current human capital outcomes comes actually from
    the cultural norms of valuing education
    Columns 5-8, Table 8

Table 8. The Culture Channel

	Whether education is the most important determinant of social status (1=yes, 0=not)	Whether the government should prioritize spending on education (1=yes, 0=not)	Annual household expenditure on education (log, in Chinese yuan)	Whether hard working is important for success in society (1-5: very important)	Years of Schooling (logged)	Years of Schooling (logged)	Years of Schooling (logged)	Years of Schooling (logged)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jinshi	0.178***	0.363**	0.548*	0.187	0.516***	0.416	0.437	0.496**
	(0.062)	(0.170)	(0.312)	(0.115)	(0.194)	(0.261)	(0.737)	(0.196)
Whether education is most important for social status (1=yes, 0=not)						0.251***		
						(0.084)		
Whether the government should prioritize spending on education (1=yes, 0=not)						0.103		
						(0.151)		
Annual household expenditure on education (Log, in RMB yuan)						0.037***		
						(0.003)		
Norm of valuing education							0.191***	
							(0.036)	
Work ethic								0.169***
								(0.045)
Parents' Average Years of Schooling	-0.007***	-0.002	0.094***	0.027***	0.404	0.406	0.404***	0.399
	(0.001)	(0.007)	(0.011)	(0.010)	(0.400)	(0.400)	(0.047)	(0.400)
Two-way Clustering at Prefecture and HRS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	8807	8807	8807	8796	8018	8018	8018	8018
Adj. R-squared	-0.010	0.022	0.090	0.015	0.440	0.444	0.444	0.442

Notes: * p<0.1; ** p<0.05; *** p<0.01. All results are based on 2SLS estimates of the 2006 CGSS survey data. Individual-level control variables include age, gender, ethnicity, parents' education, household status (rural/urban), religion, sibling size, marital status and personal social status. The prefectural-level control variables are the same as column (5) of Table 2. The norm of valuing education is the first principal component of the above three measures of education culture. Robust standard error in parentheses. Constant added but not reported. HRS refers to a household's status (rural/urban) under the Household Registration System.

3.2.1. The Culture Channel of *keju* Persistence

▸ Verifying the culture channel

　　□ *Keju* has a significant effect on the cultural norms of valuing education Columns 1-3, Table 8 , and

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	Whether education is the most important determinant of social status (1=yes, 0=not) (1)	Whether the government should prioritize spending on education (1=yes, 0=not) (2)	Annual household expenditure on education (log, in Chinese yuan) (3)	Whether hard working is important for success in society (1-5: very important) (4)	Years of Schooling (logged) (5)	Years of Schooling (logged) (6)	Years of Schooling (logged) (7)	Years of Schooling (logged) (8)
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Work ethic								0.169*** (0.045)
Parents' Average Years of Schooling	-0.007***	-0.002	0.094***	0.027***	0.404	0.406	0.404***	0.399
	(0.001)	(0.007)	(0.011)	(0.010)	(0.400)	(0.400)	(0.047)	(0.400)
Two-way Clustering at Prefecture and HRS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	8807	8807	8807	8796	8018	8018	8018	8018
Adj. R-squared	-0.010	0.022	0.090	0.015	0.440	0.444	0.444	0.442

Notes: * p<0.1; ** p<0.05; *** p<0.01. All results are based on 2SLS estimates of the 2006 CGSS survey data. Individual-level control variables include age, gender, ethnicity, parents' education, household status (rural/urban), religion, sibling size, marital status and personal social status. The prefectural-level control variables are the same as column (5) of Table 2. The norm of valuing education is the first principal component of the above three measures of education culture. Robust standard error in parentheses. Constant added but not reported. HRS refers to a household's status (rural/urban) under the Household Registration System.

3.2.1. The Culture Channel of *keju* Persistence

- ▶ Verifying the culture channel

  - □ *Keju* has a significant effect on the cultural norms of valuing education
    Columns 1-3, Table 8 , and

  - □ Alternative Channel of work ethic   Column 4, Table 8

  - □ The effect of *keju* on current human capital outcomes comes actually from
    the cultural norms of valuing education
    Columns 5-8, Table 8

Table 8. The Culture Channel

	Whether education is the most important determinant of social status (1=yes, 0=not)	Whether the government should prioritize spending on education (1=yes, 0=not)	Annual household expenditure on education (log, in Chinese yuan)	Whether hard working is important for success in society (1-5: very important)	Years of Schooling (logged)	Years of Schooling (logged)	Years of Schooling (logged)	Years of Schooling (logged)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jinshi	0.178***	0.363**	0.548*	0.187	0.516***	0.416	0.437	0.496**
	(0.062)	(0.170)	(0.312)	(0.115)	(0.194)	(0.261)	(0.737)	(0.196)
Whether education is most important for social status (1=yes, 0=not)						0.251*** (0.084)		
Whether the government should prioritize spending on education (1=yes, 0=not)						0.103 (0.151)		
Annual household expenditure on education (Log, in RMB yuan)						0.037*** (0.003)		
Norm of valuing education							0.191*** (0.036)	
Work ethic								0.169*** (0.045)
Parents' Average Years of Schooling	-0.007***	-0.002	0.094***	0.027***	0.404	0.406	0.404***	0.399
	(0.001)	(0.007)	(0.011)	(0.010)	(0.400)	(0.400)	(0.047)	(0.400)
Two-way Clustering at Prefecture and HRS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	8807	8807	8807	8796	8018	8018	8018	8018
Adj. R-squared	-0.010	0.022	0.090	0.015	0.440	0.444	0.444	0.442

Notes: * p<0.1; ** p<0.05; *** p<0.01. All results are based on 2SLS estimates of the 2006 CGSS survey data. Individual-level control variables include age, gender, ethnicity, parents' education, household status (rural/urban), religion, sibling size, marital status and personal social status. The prefectural-level control variables are the same as column (5) of Table 2. The norm of valuing education is the first principal component of the above three measures of education culture. Robust standard error in parentheses. Constant added but not reported. HRS refers to a household's status (rural/urban) under the Household Registration System.

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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	8807	8807	8807	8796	8018	8018	8018	8018
Adj. R-squared	-0.010	0.022	0.090	0.015	0.440	0.444	0.444	0.442

Notes: * p<0.1; ** p<0.05; *** p<0.01. All results are based on 2SLS estimates of the 2006 CGSS survey data. Individual-level control variables include age, gender, ethnicity, parents' education, household status (rural/urban), religion, sibling size, marital status and personal social status. The prefectural-level control variables are the same as column (5) of Table 2. The norm of valuing education is the first principal component of the above three measures of education culture. Robust standard error in parentheses. Constant added but not reported. HRS refers to a household's status (rural/urban) under the Household Registration System.

Table 8. The Culture Channel

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	(0.062)	(0.170)	(0.312)	(0.115)	(0.194)	(0.261)	(0.737)	(0.196)
Whether education is most important for social status (1=yes, 0=not)						0.251***		
						(0.084)		
Whether the government should prioritize spending on education (1=yes, 0=not)						0.103		
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Annual household expenditure on education (Log, in RMB yuan)						0.037***		
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								(0.045)
Parents' Average Years of Schooling	-0.007***	-0.002	0.094***	0.027***	0.404	0.406	0.404***	0.399
	(0.001)	(0.007)	(0.011)	(0.010)	(0.400)	(0.400)	(0.047)	(0.400)
Two-way Clustering at Prefecture and HRS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	8807	8807	8807	8796	8018	8018	8018	8018
Adj. R-squared	-0.010	0.022	0.090	0.015	0.440	0.444	0.444	0.442

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3.2.2 The Culture Transmission and Social Mobility

► Might the horizontal transmission of *keju* culture, by reducing the human capital advantage accrued to the elite families, promote social mobility?

- ▫ Interacting regional *jinshi* density with parents' years of schooling
  Column 4, Table 7

- ▫ Interacting regional *jinshi* density with ancestral human capital measures
  Column 5, Table 7

- ▫ The effect of parents' human capital is reinforced by the patrilineal human capital Column 6, Table 7

Horizontal Transmission

Table 7. Channels of Human Capital Persistence Decomposed

	(1)	(2)	(3)	(4)	(5)	(6)
	Years of Schooling (logged)					
Jinshi	0.139***	0.083**	0.092***	0.213***	0.091***	0.091***
	(0.025)	(0.029)	(0.027)	(0.042)	(0.027)	(0.027)
Patrilineal *Jinshi* Ancestors		0.021***	0.019***	0.019***	0.012***	0.012***
		(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Matrilineal *Jinshi* Ancestors		0.008*	0.008*	0.008*	0.008*	0.005*
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Father's Years of Schooling			0.029***	0.049***	0.004	0.026***
			(0.001)	(0.005)	(0.007)	(0.001)
Mother's Years of Schooling			0.028***	0.061***	0.023***	0.029***
			(0.001)	(0.005)	(0.007)	(0.001)
Jinshi*Father's Years of Schooling				-0.034***		
				(0.007)		
Jinshi*Mother's Years of Schooling				-0.054***		
				(0.007)		
Jinshi*Patrilineal Jinshi Ancestors					-0.028***	
					(0.008)	
Jinshi*Matrilineal Jinshi Ancestors					-0.019**	
					(0.007)	
Patrilineal *Jinshi* Ancestors*Father's Years of Schooling						0.025***
						(0.003)
Matrilineal *Jinshi* Ancestors*Mother's Years of Schooling						0.021
						(0.014)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Clustered at Prefecture Level	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	563498	563498	563498	563498	563498	563498
Adj. R-squared	0.202	0.208	0.219	0.219	0.216	0.221

Notes: * p<0.1; ** p<0.05; *** p<0.01. All regressions run by 2SLS based on 2005 mini-census individual level data. Individual-level control variables include age, gender, ethnicity and household's status (rural/urban). Prefectural-level control variables are the same as column (5) of Table 2. Robust standard error in parentheses.

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	Years of Schooling (logged)					
	(1)	(2)	(3)	(4)	(5)	(6)
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Patrilineal *Jinshi* Ancestors		0.021***	0.019***	0.019***	0.012***	0.012***
		(0.002)	(0.002)	(0.002)	(0.003)	(-0.003)
Matrilineal *Jinshi* Ancestors		0.008*	0.008*	0.008*	0.008*	0.005*
		(0.003)	(0.003)	(0.003)	(0.003)	(-0.003)
Father's Years of Schooling			0.029***	0.049***	0.004	0.026***
			(0.001)	(0.005)	(0.007)	(0.001)
Mother's Years of Schooling			0.028***	0.061***	0.023***	0.029***
			(0.001)	(0.005)	(0.007)	(0.001)
Jinshi*Father's Years of Schooling				-0.034***		
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Jinshi*Mother's Years of Schooling				-0.054***		
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Jinshi*Matrilineal Jinshi Ancestors					-0.019**	
					(0.007)	
Patrilineal *Jinshi* Ancestors*Father's Years of Schooling						0.025***
						(0.003)
Matrilineal *Jinshi* Ancestors*Mother's Years of Schooling						0.021
						(0.014)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Clustered at Prefecture Level	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	563498	563498	563498	563498	563498	563498
Adj. R-squared	0.202	0.208	0.219	0.219	0.216	0.221

Vertical Transmission

Notes: * p<0.1; ** p<0.05; *** p<0.01. All regressions run by 2SLS based on 2005 mini-census individual level data. Individual-level control variables include age, gender, ethnicity and household's status (rural/urban). Prefectural-level control variables are the same as column (5) of Table 2. Robust standard error in parentheses.

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	(1)	(2)	(3)	(4)	(5)	(6)
			Years of Schooling (logged)			
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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
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3.3. A Quasi-experiment on Beijing College Students: Further Evidence on the Culture Channel

- ► Cultural values change only gradually and that people retain their cultural values even when they move to a difffferent culture (Alesina and Giulinao, 2015)

  □ "Immigrant approach" of measuring culture: examine the attitudes and behavior of the immigrants' descendants whose ancestors came from different parts of the world live in the same destination country

    · Cultural traits persisted and affected female labor-force participation among second-generation immigrants in America (Alesina, Giuliano, and Nunn, 2013; Fernandez and Fogli, 2009)

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    ⋆ Cultural traits persisted and affected female labor-force participation among second-generation immigrants in America (Alesina, Giuliano, and Nunn, 2013; Fernandez and Fogli, 2009)

3.3. A Quasi-experiment on Beijing College Students

- A quasi-experiment on a group of 4,711 college students in Beijing

    □ Conducted in 2009, the BCSPS randomly selected 5,100 students from two cohorts (respectively freshman and junior) of students studying in 15 universities in Beijing, and followed up annually in the next 4 years

    □ A quasi-experiment design: students were exposed to varying strengths of *keju* culture in their hometowns before attending college

    □ Same subjective questions as in the CGSS survey

    □ Also provides measures on students' cognitive and non-cognitive skills and graduate school enrollment

        · Cognitive skills: numeracy and literacy

        · Non-cognitive skills: incentives, persistence, self-control

        · Both skills are important determinants of an individual's human capital outcome (Heckman, 2000; Heckman, Stixrud and Urzua, 2006)

3.3. A Quasi-experiment on Beijing College Students

- ▶ A quasi-experiment on a group of 4,711 college students in Beijing

  - □ Conducted in 2009, the BCSPS randomly selected 5,100 students from two cohorts (respectively freshman and junior) of students studying in 15 universities in Beijing, and followed up annually in the next 4 years

  - □ A quasi-experiment design: students were exposed to varying strengths of *keju* culture in their hometowns before attending college

  - □ Same subjective questions as in the CGSS survey

  - □ Also provides measures on students' cognitive and non-cognitive skills and graduate school enrollment

    - ⁎ Cognitive skills: numeracy and literacy

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- ▶ Verify the culture channel using the same subjective questions (external validity) Columns 1-2, Table 9

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- ▶ On students' non-cognitive abilities Columns 5-6, Table 9

- ▶ On graduate school admissions
  - □ Both cognitive and non-cognitive performances significantly mediate the effect of *keju* on educational outcome Columns 7-8, Table 9

- ▶ Evidence of "horizontal transmission" or social imitation among classmates Columns 9-10, Table 9
  - □ Peer effect: Average of *jinshi* densities in the hometowns of those students specializing in the same major in the same university

Table 9. Robustness of the Culture Channel: Quasi-Experiment on 4,711 Undergraduates Studying at 15 Beijing Universities, 2008-2012

	How important is education in determining ones social status (1-5 very important; important)	Whether the government should prioritize spending on education (1==yes, (0=not),	Class Ranking (# of student ranking)	College English Test Scores	Academic Absence 2=often; 1=sometimes; 0=never)	Intend to Pursue Graduate Studies	Admitted by Graduate Schools	Admitted by Graduate Schools	College English Test Scores	Intend to Pursue Graduate Studies
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Jinshi (hometown)	0.807***	0.073*	6.335***	0.084*	-0.105**	0.136***	0.133**	0.107*	0.154***	0.193***
	(0.170)	(0.042)	(1.115)	(0.048)	(0.050)	(0.037)	(0.062)	(0.061)	(0.039)	(0.034)
Class Ranking								0.003*		
								(0.002)		
Intend to Pursue Graduate Studies								0.043**		
								(0.019)		
Average *Jinshi*									0.051***	0.091***
									(0.018)	(0.016)
Entrance Exam Scores (logged)	0.088	-0.010	6.282***	0.169***	-0.018	0.394***	0.009	-0.038	0.328***	0.634***
	(0.159)	(0.071)	(1.715)	(0.054)	(0.059)	(0.036)	(0.076)	(0.073)	(0.049)	(0.047)
Father's Education	0.017*	0.003	0.047	0.002	0.006	0.012***	0.003	0.001	0.007**	0.018***
	(0.010)	(0.004)	(0.110)	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)	(0.003)	(0.003)
Mother's Education	0.004	-0.005	0.145	-0.002	-0.002	0.019***	0.002	0.001	-0.003	0.019***
	(0.010)	(0.005)	(0.139)	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)	(0.003)	(0.003)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Cohort FE	No	No	No	No	No	No	No	No	Yes	Yes
University-major-cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Number of Observations	3892	3892	11960	6015	9094	11960	3020	3020	6022	11964
Adj. R-squared	0.091	0.031	0.174	0.142	0.088	0.287	0.373	0.404	0.063	0.102

Notes: * p<0.1; ** p<0.05; *** p<0.01. All results are based on 2SLS estimates of the 2012 survey of Beijing university students. Individual-level control variables include age, gender, household income (logged).
The prefectural-level control variables are the same as column (5) of Table 2. In column 1-8, *Jinshi* is instrumented by river distance to the nearest printing center. Robust standard error in parentheses.

3.3. A Quasi-experiment on Beijing College Students

- ▶ Verify the culture channel using the same subjective questions (external validity) Columns 1-2, Table 9

- ▶ Effect of *jinshi* density on students' cognitive abilities Columns 3-4, Table 9

- ▶ On students' non-cognitive abilities Columns 5-6, Table 9

- ▶ On graduate school admissions
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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Cohort FE	No	No	No	No	No	No	No	No	Yes	Yes
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3.3. A Quasi-experiment on Beijing College Students (cont'd)

- Verify the culture channel using the same subjective questions (external validity) Columns 1-2, Table 9

- Effect of *jinshi* density on students' cognitive abilities Columns 3-4, Table 9

- On students' non-cognitive abilities Columns 5-6, Table 9

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Table 9. Robustness of the Culture Channel: Quasi-Experiment on 4,711 Undergraduates Studying at 15 Beijing Universities, 2008-2012

	How important is education in determining ones social status (1-5 very important) important)	Whether the government should prioritize spending on education (1==yes, (0=not),	Class Ranking (# of student ranking)	College English Test Scores	Academic Absence 2=often; 1= sometimes; 0=never	Intend to Pursue Graduate Studies	Admitted by Graduate Schools	Admitted by Graduate Schools	College English Test Scores	Intend to Pursue Graduate Studies
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	(0.010)	(0.004)	(0.110)	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)	(0.003)	(0.003)
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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enrollment Cohort FE	No	No	No	No	No	No	No	No	Yes	Yes
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3.3. A Quasi-experiment on Beijing College Students

- ▶ Verify the culture channel using the same subjective questions (external validity) `Columns 1-2, Table 9`

- ▶ Effect of *jinshi* density on students' cognitive abilities `Columns 3-4, Table 9`

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Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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- ▶ Verify the culture channel using the same subjective questions (external validity) (Columns 1-2, Table 9)
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Roadmap

1. Background

2. The Effect of *Keju* on Contemporary Human Capital

   1. Baseline Results

   2. Identifying the Causal Effect of *Keju*: the Role of Printing

3. Accounting for the Channels of *Keju* Persistence

   1. Human Capital Persistence

   2. The Culture Channel

4. **Conditions of cultural transmission**

5. Conclusion

4.1 Uneven Conditions of Cultural Transmission

Culture embedded in the *keju* system has persisted more strongly in some areas than in others today

Average Year of Education in 2000
- .00 - 6.81
- 6.82 - 7.38
- 7.39 - 7.83
- 7.84 - 8.29
- 8.30 - 10.09

\# of Jinshi per 10,000 People in Ming-Qing Dynasty
- .00 - .01
- .02 - .94
- .95 - 1.98
- 1.99 - 3.96
- 3.97 - 7.90

Current Municipality Boundary

Figure 10. Number of *jinshi* (1368-1905) and Average Years of Education in 2000

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☐ Regions of stronger persistence

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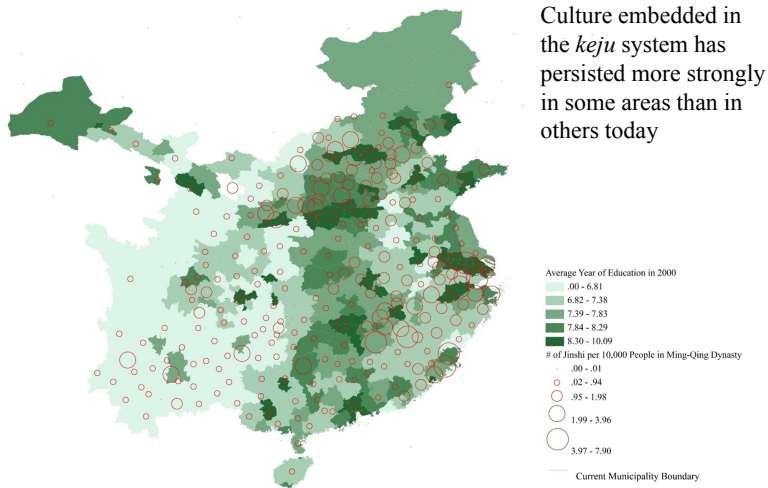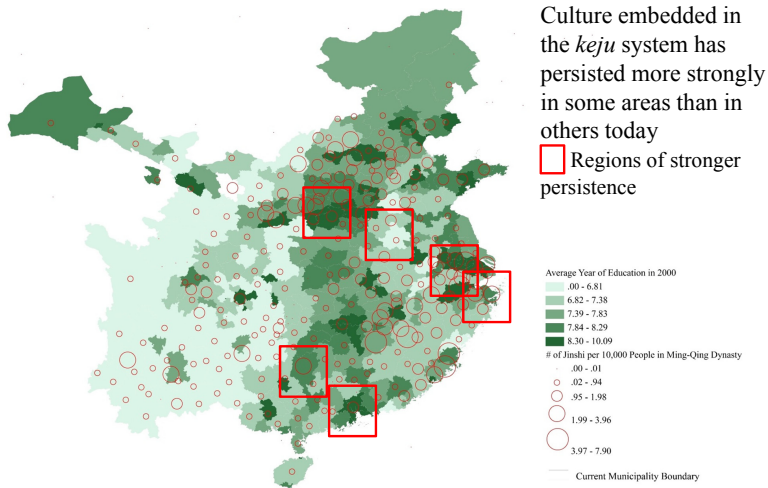- .95 - 1.98
- 1.99 - 3.96
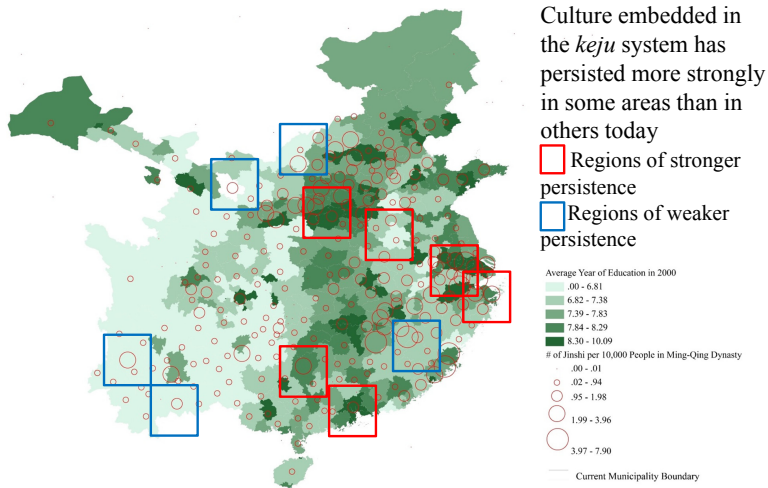- 3.97 - 7.90

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Figure 10. Number of *jinshi* (1368-1905) and Average Years of Education in 2000

4.2 Conditions of Cultural Transmission

- ▶ Under what conditions would culture persist and when will it change

  ◦ Social organizations, e.g. family ties or social capital can strengthen the persistence of culture (Alesina and Giuliano, 2013).

    ∗ e.g. Satyanath, Voigtlander and Voth (2013) find the social network among different civil associations helped to spread and give rise to the Fascism in Weimar Germany in 1913 to 1933

  ◦ In China, clans may help to preserve the *keju* culture

    ∗ Clans: a group of people sharing the same ancestor in the form of an extensive family; "the locus of cooperation providing public goods and social safety nets to clan members since the Song dynasty (960-1279)" (Bol, 2008; Greif and Tabellini, 2011; Watson, 1982)

    ∗ Two measures: # of genealogies in a given prefecture from Song to Qing (per 10,000 population);
    a dummy variable indicating whether an individual belongs to a clan with genealogy Columns 1 and 2, Table 10

    ∗ Data source: *Comprehensive Catalogue on the Chinese Genealogy*

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    - ⋆ Clans: a group of people sharing the same ancestor in the form of an extensive family; "the locus of cooperation providing public goods and social safety nets to clan members since the Song dynasty (960-1279)" (Bol, 2008; Greif and Tabellini, 2011; Watson, 1982)

    - ⋆ Two measures: # of genealogies in a given prefecture from Song to Qing (per 10,000 population);
      a dummy variable indicating whether an individual belongs to a clan with genealogy Columns 1 and 2, Table 10

    - ⋆ Data source: *Comprehensive Catalogue on the Chinese Genealogy*

4.2 Conditions of Cultural Transmission

- ▶ Under what conditions would culture persist and when will it change

  - □ Social organizations, e.g. family ties or social capital can strengthen the persistence of culture (Alesina and Giuliano, 2013).

    - ⋆ e.g. Satyanath, Voigtlander and Voth (2013) find the social network among different civil associations helped to spread and give rise to the Fascism in Weimar Germany in 1913 to 1933

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Table 10 Conditions of Cultural Transmission

	(1)	(2)	(3)	(4)	(5)
	Average Schooling in 2010				
Jinshi	0.031***	0.015***	0.029**	0.026***	0.066***
	(0.008)	(0.003)	(0.011)	(0.008)	(0.016)
# of Genealogy	-0.005				
	(0.004)				
Jinshi*# of Genealogy	0.093***				
	(0.032)				
Genealogy (Dummy)		-0.223**			
		(0.101)			
Jinshi*Genealogy (Dummy)		0.051***			
		(0.019)			
Taiping Rebellion			-0.023*		
			(0.012)		
Jinshi*Taiping Rebellion			0.014		
			(0.018)		
Treaty Ports				0.053***	
				(0.012)	
Jinshi*Treaty Ports				0.012	
				(0.014)	
Cultural Revolution					0.013***
					(0.003)
Jinshi*Cultural Revolution					-0.007**
					(0.003)
Control Variables	Yes	Yes	Yes	Yes	Yes
Number of Observations	243	563,498	243	243	243
Adj. R-squared	0.518	0.249	0.501	0.546	0.536

* p<0.10; ** p<0.05; *** p<0.01; All regressions run by OLS. Column (2) based on 2005 mini-census individual level data. In column (1), genealogy (count) is a prefectural level variable measuring the number of historical genealogy normalized by population in a prefecture, while in column (2), genealogy (dummy) is measured at individual level, referring to a dummy variable indicating whether one belong to a clan with genealogy in history. The control variables in columns (1), (3) to (5) are the same as Column (2) in Table 2, while the control variables in column (2) is the same as Column (2) in Table 10. Robust standard error in parentheses.

4.2 Conditions of Cultural Transmission (Cont'd)

- ▶ Negative historical shocks may affect persistence

  - □ We focus on three major historical events in China from Qing to the present

    - ⋆ Taiping Rebellion—the largest peasant rebellion in China's recent times in terms of death toll (an estimated 70 million people were killed) Columns 3

    - ⋆ The forced opening up by the Westerners—the treaty ports were the places where the diffusion of Western values and culture were first exposed Columns 4

    - ⋆ The Cultural Revolution, a political movement aimed directly at attacking the Confucian culture and to denounce the merits of education Columns 5

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Roadmap

1. Background

2. The Effect of *Keju* on Contemporary Human Capital

   1. Baseline Results

   2. Identifying the Causal Effect of *Keju*: the Role of Printing

3. Accounting for the Channels of *Keju* Persistence

   1. Human Capital Persistence

   2. The Culture Channel

4. Conditions of cultural transmission

5. **Conclusion**

5. Conclusion

- ▶ Using China's imperial exam as an example, the effect of an institution can persist over a long time into the future even long after it is gone

- ▶ Prefectures having produced more *jinshi* historically have higher human capital outcomes today

- ▶ Both human capital and culture are the channels through which this effect persists

- ▶ Strength of the transmission is aided by clans and weakened by the Culture Revolution

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Thank you!

Matching Prefectural Boundaries between Ming-Qing and Contemporary China
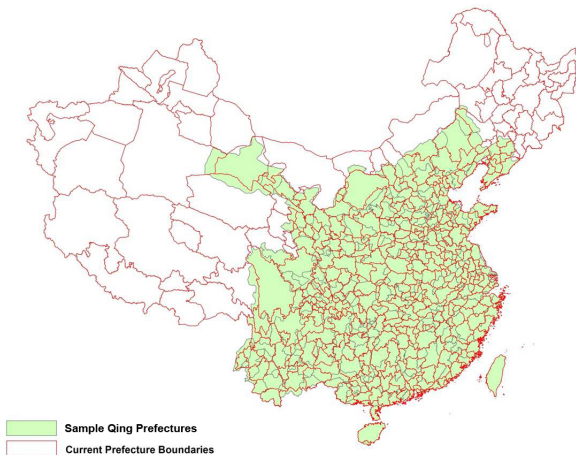

■ Sample Qing Prefectures
□ Current Prefecture Boundaries

Figure A1. Matching Prefectural Boundaries between Ming-Qing China and Contemporary China

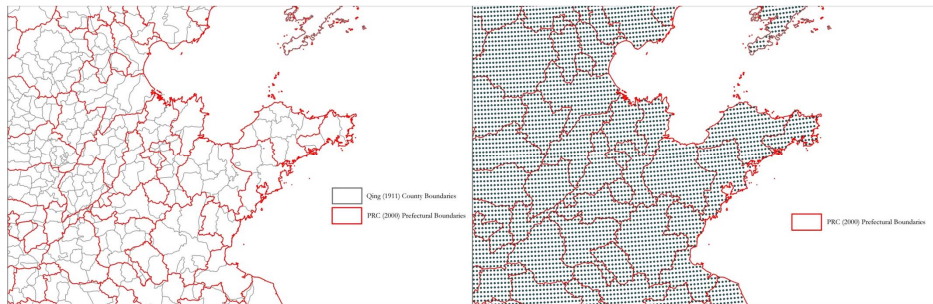# Matching the Prefectural Boundaries between the Ming-Qing and PRC Periods

Back

Table A1. Summary Statistics

Variables	#	Mean	Std.	Source
Average Years of Schooling	243	8.86	0.93	2010 Census Summary Statistics
Share of College Students	243	0.08	0.05	2010 Census Summary Statistics
Literacy rate	243	0.94	0.03	2010 Census Summary Statistics
Number of *jinshi*/Population	243	1.16	1.02	Directory of Ming-Qing Imperial Exam Graduates(Mingqing *jinshi* Timinglu Suoyin)
Urbanization Level in 1920s	243	0.03	0.05	Rozman, Gilbert. 1973. Urban Networks in Ch'ing China and Tokugawa Japan.
Population Density	243	0.01	0.01	Cao, Shuji. 2000. History of Population in China (zhongguo renkou shi). Volume 5. Shanghai: Fudan University Press.
Agricultural Suitability	243	3040.454	688.56	Caloric Suitability Index (Galor and Ozak, 2014), http://ozak.github.io/Caloric-Suitability-Index/
Exam Quotas for *Shengyuan*	243	103.95	53.51	Chang, Chung-li, and Zhongli Zhang, 1962. The income of the Chinese gentry. University of Washington Press.
Frequency of Wars	243	2.88	3.91	"Military History of China"Writing Group. Chronology of Warfare in Dynastic China (Zhongguo Lidai Zhanzheng Nianbiao). Beijing: China PRC Press.
Distance to Coast	243	446483.80	366766.80	
Terrain Ruggedness Index	243	183.97	160.42	NASA, Digital Elevation Model (DEM) at 90-meters Resolution, http://www.cgiar-csi.org/data/srtm-90m-digital-elevation-database-v4-1
GDP Per Capita	243	18991.69	22595.22	Regional Economy Statistical Yearbook 2011
Fiscal expenditure on education	243	457.80	322.73	Regional Economy Statistical Yearbook 2011

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