

The Short- and Long-Run Effects of Affirmative Action: Evidence from Imperial China

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INTRODUCTION

- In 1712, Qing China reinvented the rule governing the age-old imperial examination system.
- The reform allowed individuals from underdeveloped provinces to pass the exam with a lower score.
- The reform runs parallel to modern affirmative action in many respects.
- We study the short- and long-run effects of the 1712 reform on human capital accumulation.

THE IMPERIAL EXAMINATION SYSTEM

- The imperial examination system became formalized in the Song Dynasty (1000 AD) and popularized in the Ming period (1366 - 1644).
- An instrument to select qualified individuals to staff the bureaucracy.
- Three degrees are available: *shengyuan*, *juren* and *jinshi*.
- Perceived to be open and fair.
- A prerequisite to taking the exam is to be registered in a local administrative unit.

▶ More details

THE 1712 REFORM

- In 1712 the Kangxi Emperor proposed a reform to the imperial examination system.
- The reform directly affected how *jinshi* was selected.
- The reform was to make the number of successful candidates proportional to the number of participants.
- Competition became confined to within provinces; hence criteria for passing the exam began to vary from province to province.
- Migration between the provinces was not impossible, but extremely costly. Could take decades to establish formal residency in a new province.

▶ A series of events

“Participation in imperial exams has increased nationwide. This includes candidates coming from a humble background and traveling from far away. Few of them passed the exam in the end. I am deeply concerned by this situation. Going forward, we should set the quota by province. All candidates will first gather in the capital, and we can then set the quota based on the number of candidates from each province.”

—The Kangxi Emperor, Imperial Edict in 1712.

RECENT LITERATURE ON AFFIRMATIVE ACTION

- Bleemer (2022, QJE). Ending affirmative action caused underrepresented minority (URM) freshman applicants to cascade into lower-quality colleges.
- Kapor (2015, JMP). “Top Ten Percent” policy in Texas. More students from high-poverty schools to enroll; students who enrolled under it achieved higher GPAs.
- Badge et al. (2016, AER): The affirmative action program increases college attendance for targeted students. No evidence for the “mismatch” effect.
- Bertrand et al. (2010, JPub): Positive return to admission for intended beneficiaries. Lower-caste individuals from stronger socioeconomic backgrounds benefit the most. Exclusion of other disadvantaged groups.

DEFINITION OF AFFIRMATIVE ACTION

- A difficult and controversial concept.
- Affirmative action policies are designed to improve the position of groups that have been underrepresented or disadvantaged.
- The 1712 reform was linked to proto-egalitarianism, perceived fairness and concerns about political stability.
- No direct links to political representation or patronage since it was an imperial autocracy.

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- Spillovers and Mechanisms

DATA

- Three levels of administration: the province, the prefecture and the county.
- 18 provinces and 267 prefectures.
- Panel Data: the quantity of successful candidates; their exam rank and job placement.

QUANTIFYING THE REFORM

- The reform was adopted to boost the representation of less developed, remoter parts of the country.
- We quantify the reform with the change in a province's share of *jinshi* before and after the reform.
- Preferential treatment: the direction of the change was inversely related to initial shares of *jinshi*.

▶ Unlabelled

▶ labelled

▶ Harmonized

A STYLIZED EXAMPLE

	1454–1650	1710–1730
Province A	2,400	75
Province B	800	60
Region S	8,000	300
Province A/Region S	30%	25%
Province B/Region S	10%	20%

Provinces A and B were both located in Region S. Starting with a relatively high share before the reform, 30%, Province A saw a decrease in its share of *jinshi* to 25% after the reform. For Province B, its share of *jinshi* increased from 10%, which was relatively low, to 20%.

THE IMPACT OF THE REFORM ON ACADEMIC AND CAREER OUTCOMES

- After the reform, more successful candidates came from underrepresented provinces.
- How about their academic and career outcomes?

ESTIMATION

$$\text{StdRank}_{i(p),t} = \beta_0 + \beta_1 G_p \cdot \text{Post}_t + \beta_2 L_p \cdot \text{Post}_t + \gamma X_p \cdot \eta_t + \delta_p + \eta_t + \varepsilon_{i(p),t} \quad (1)$$

$$\text{Avg StdRank}_{p,t} = \beta_0 + \beta_1 G_p \cdot \text{Post}_t + \beta_2 L_p \cdot \text{Post}_t + \gamma X_p \cdot \eta_t + \delta_p + \eta_t + \varepsilon_{p,t} \quad (2)$$

- β_1 and β_2 are our coefficients of interest.
- The dependent variable $StdRank_{i(p),t}$ is defined as the standardized rank of successful candidate i from province p in period t .
- G_p is Province p 's added share of *jinshi* after the 1712 reform, and L_p is Province p 's lost share of *jinshi*.
- $Post_t$ is equal to 0 in the periods before the 1712 reform, and is equal to 1 in the periods after the 1712 reform.
- X_p is a set of province-level control variables.
- δ_p is a vector of province fixed effects; η_t is a vector of decade fixed effect.
- $\varepsilon_{i(p),t}$ is the error term.

THE IMPACT OF THE REFORM ON ACADEMIC AND CAREER OUTCOMES

	Exam rank, Individual level			
	(1) All	(2) All	(3) $Share_{prov} \uparrow$	(4) $Share_{prov} \downarrow$
G \times Post	0.403** (0.183)	0.381** (0.188)	0.892*** (0.333)	
L \times Post	0.0586 (0.119)	0.0271 (0.119)		-0.00609 (0.139)
Controls \times Decade FE	No	Yes	Yes	Yes
Region FE \times Decade FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	16073	16073	16073	16073
Adjusted R^2	0.124	0.132	0.150	0.117

Notes: Exam ranks are normalized. The numerical value of exam ranks ranges from 0 (lowest) to 1(highest).

THE IMPACT OF THE REFORM ON ACADEMIC AND CAREER OUTCOMES

	Exam rank, Province average			
	(1) All	(2) All	(3) <i>Share_prov</i> ↑	(4) <i>Share_prov</i> ↓
G × Post	0.667** (0.277)	0.497** (0.231)	0.241*** (0.000)	
L × Post	0.0456 (0.088)	-0.109* (0.061)		-1.170*** (0.000)
Controls × Decade FE	No	Yes	Yes	Yes
Region FE × Decade FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	304	304	304	304
Adjusted R^2	0.678	0.670	0.449	0.861

Notes: Exam ranks are normalized. The numerical value of exam ranks ranges from 0 (lowest) to 1(highest).

THE IMPACT OF THE REFORM ON ACADEMIC AND CAREER OUTCOMES

	Position in the bureaucracy, Individual level			
	(1) All	(2) All	(3) <i>Share_prov</i> ↑	(4) <i>Share_prov</i> ↓
G × Post	1.515 (1.851)	1.453 (1.959)	-0.221 (3.629)	
L × Post	0.506 (1.365)	0.782 (1.414)		0.882 (1.812)
Controls × Decade FE	No	Yes	Yes	Yes
Region FE × Decade FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	4314	4314	4314	4314
Adjusted R^2	0.013	0.011	0.013	0.007

Notes: The numerical value of placements range from 0.5 (lowest) to 9 (highest).

THE IMPACT OF THE REFORM ON ACADEMIC AND CAREER OUTCOMES

	Position in the bureaucracy, Province average			
	(1) All	(2) All	(3) <i>Share_prov</i> ↑	(4) <i>Share_prov</i> ↓
G × Post	3.333* (1.833)	4.640** (1.964)	5.016 (5.042)	
L × Post	0.177 (0.944)	0.118 (1.010)		4.372* (2.405)
Controls × Decade FE	No	Yes	Yes	Yes
Region FE × Decade FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	292	292	292	292
Adjusted R^2	0.146	0.184	0.308	0.356

Notes: The numerical value of placements ranges from 0.5 (lowest) to 9 (highest).

ALTERNATIVE TREATMENT

- Instead of measuring a province's *jinshi* as a share of a exam region's total number of *jinshi*;
- We measure a province's *jinshi* as a share of the whole country's.
- Exploiting the fact that competition at the metropolitan exam was nationwide before 1425;
- We take the difference between a province's post-reform share of *jinshi* and its pre-1425 share.

DISTRIBUTIONAL CONSEQUENCES OF THE REFORM

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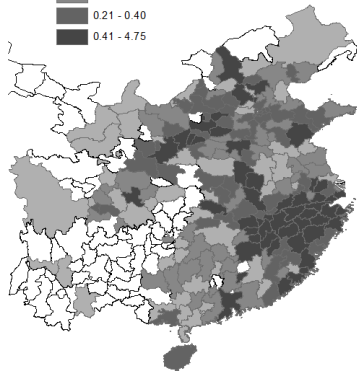
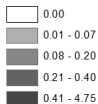
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- We use a prefecture's pre-1650 *jinshi* density to proxy its strength in human capital prior to the reform;

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- More specifically, how did *jinshi* density change in subprovincial units, i.e. prefectures and counties?
- Prefectures differed in their pre-existing strength in human capital;
- We use a prefecture's pre-1650 *jinshi* density to proxy its strength in human capital prior to the reform;
- We estimate the **heterogeneous impact** of the 1712 reform on *jinshi* density varying by a prefecture's pre-existing strength in human capital.

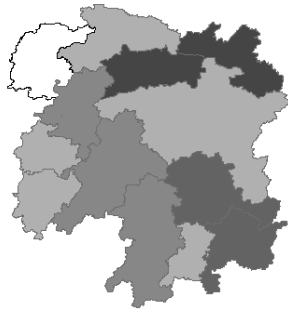
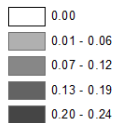
PRE-EXISTING STRENGTH IN HUMAN CAPITAL

Pre-1650 Jinshi Density
(# Jinshi per 10,000)



(a) China Proper

Pre-1650 Jinshi Density
(# Jinshi per 10,000)



(b) Hunan Province

ESTIMATION

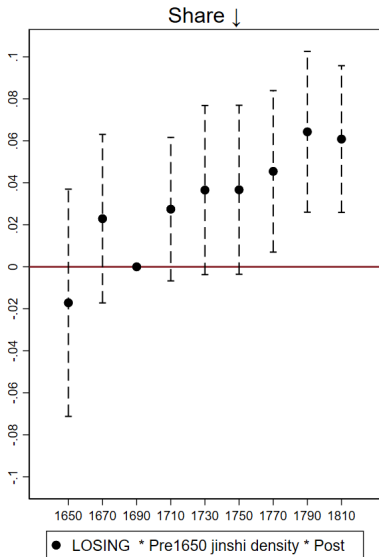
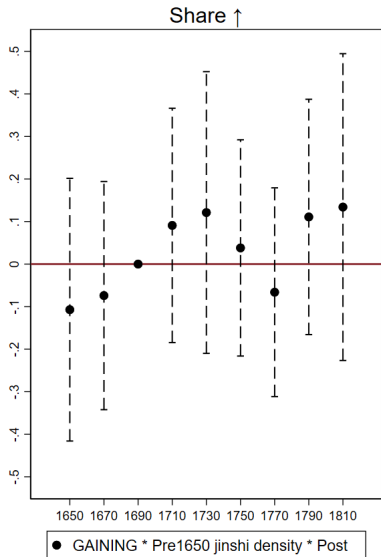
$$\begin{aligned} \text{Jinshi density}_{p,prov,d} = & \beta_0 + \beta_1 G_{prov} \times Pre1650 HC_p \times Post_d + \\ & \beta_2 L_{prov} \times Pre1650 HC_p \times Post_d + \\ & \gamma X_p \times \eta_d + \delta_{prov} \times \eta_d + \\ & \theta_p + \eta_d + \varepsilon_{p,prov,d} \end{aligned}$$

- A prefecture-decade level analysis.
- Jinshi density $_{prov,p,d}$ is the density of *jinshi* in Prefecture p during Decade d . d is from 1650 to 1830.
- $Pre1650 HC_p$ is pre-existing strength in human capital, i.e. jinshi density before 1650.
- β_1 and β_2 are our coefficients of interest.
- G_p is Province p 's added share of *jinshi* after the 1712 reform, and L_p is Province p 's lost share of *jinshi*.
- Ω_p is a vector of prefecture fixed effects. Λ_d is a vector of decade fixed effects.
- $\delta_{prov} \times \eta_d$ are provincial heterogeneous time trends.
- $\gamma X_p \times \eta_d$ allow trends to be related to the prefecture's initial conditions: agricultural suitability, population density and number of *Shengyuan*.

RESULTS

	Jinshi density			
	(1) All	(2) All	(3) $Share_{prov} \uparrow$	(4) $Share_{prov} \downarrow$
G \times Pre1650 HC \times Post	0.0607*** (0.023)	0.0440** (0.022)	0.0643** (0.031)	
L \times Pre1650 HC \times Post	0.0148*** (0.004)	0.0217*** (0.004)		0.0228*** (0.005)
Pre1650 HC \times Post	Yes	Yes	Yes	Yes
Controls \times Decade FE	No	Yes	Yes	Yes
Province FE \times Decade FE	Yes	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	5073	5073	2850	2223
Adjusted R^2	0.574	0.608	0.526	0.689

Notes: $\Delta Share_{prov}$ is the difference between a province's share of *jinshi* in the respective exam region during 1713-1730 and its share during 1454-1650.



OTHER ISSUES

- Accounting for population change between 1454-1650 and 1713-1730 ▶ Population
- Rankings and Positions ▶ Rankings and Positions
 - Prefecture-average ranking/position.
 - A prefecture without *jinshi* during a particular decade will be set to have the lowest possible exam ranking and position in the bureaucracy.

COUNTY-DECADE LEVEL ANALYSIS

	Jinshi density			
	(1) All	(2) All	(3) $Share_{prov} \uparrow$	(4) $Share_{prov} \downarrow$
G \times Pre1650 HC \times Post	0.0607*** (0.018)	0.0519*** (0.017)	0.0818*** (0.020)	
L \times Pre1650 HC \times Post	0.0180***	0.0164***		0.0105**
Pre1650 HC \times Post	Yes	Yes	Yes	Yes
Controls \times Decade FE	No	Yes	Yes	Yes
Province FE \times Decade FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	31293	31293	16796	14497
Adjusted R^2	0.437	0.460	0.418	0.534

Notes: $\Delta Share_{prov}$ is the difference between a province's share of *jinshi* in the respective exam region during 1713-1730 and its share during 1454-1650.

THE ROLE OF FUNDING AGENCIES

- The metropolitan exam was held in the capital city, Beijing.
- Long distance travel in premodern China was costly; in some prefectures, funding agencies were set up to provide a travel grant to exam participants.
- We examine the role of funding agencies in within-province divergence.

THE ROLE OF FUNDING AGENCIES

	Jinshi density			
	(1) Yes 1712	(2) No 1712	(3) Yes 1840	(4) No 1840
G × Pre1650 HC × Post	0.0604 (0.152)	0.0223 (0.023)	-0.00288 (0.027)	0.114*** (0.029)
L × Pre1650 HC × Post	-0.138 (0.237)	0.0224*** (0.004)	-0.00490 (0.007)	0.0372 (0.007)
Pre1650 HC × Post	Yes	Yes	Yes	Yes
Controls × Decade FE	Yes	Yes	Yes	Yes
Province FE × Decade FE	Yes	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	627	4332	2489	2527
Adjusted R^2	0.534	0.609	0.631	0.587

BEYOND QING: BETWEEN PROVINCES

	(1) THU	(2) PKU	(3) Japan
G × 1712-1911	2.906 (3.235)	2.906 (3.328)	2.906 (3.820)
L × 1712-1911	-1.713 (1.758)	-1.713 (1.794)	-1.713 (2.102)
G × Post1911	3.584 (2.566)	1.498 (2.587)	4.164 (3.891)
L × Post1911	-0.0359 (1.313)	0.0520 (1.335)	0.374 (2.058)
Controls × Decade FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes
Observations	48	48	48
Adjusted R^2	0.907	0.872	0.922

BEYOND QING: WITHIN PROVINCES

	(1) THU	(2) PKU	(3) Japan
G × Pre1650 HC × 1712-1911	1.208 ⁺ (0.770)	1.208 ⁺ (0.770)	1.208 ⁺ (0.770)
L × Pre1650 HC × 1712-1911	1.128 ^{***} (0.152)	1.128 ^{***} (0.125)	1.128 ^{***} (0.121)
G × Pre1650 HC × Post1911	-0.371 (0.858)	1.237 [*] (0.697)	0.888 (1.005)
L × Pre1650 HC × Post1911	0.361 [*] (0.212)	1.530 ^{***} (0.137)	1.583 ^{***} (0.150)
Pre1650 HC × Post1911	Yes	Yes	Yes
Pre1650 HC × 1712-1911	Yes	Yes	Yes
Controls × Decade FE	Yes	Yes	Yes
Province FE × Decade FE	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes
Observations	801	801	801
Adjusted R^2	0.737	0.659	0.644

SUMMARY

- The 1712 reform was a **policy intervention** to the imperial examination.
- The reform extended opportunities to individuals in previously **underrepresented** provinces.
- Gains from the reform were concentrated in the few prefectures that had *more* human capital prior to the reform.
- Between prefectures the gap did not close over time.
- The presence of funding agencies helped to prevent lasting divergence.

FUTURE WORK

- Spillovers and Mechanisms.
 - Why did prefectures diverge in their performance over time?
 - Specialization and reallocation of human capital across time and space.
 - Was there any positive spillover of the success of participants from certain prefectures on participants from elsewhere?
- Further analysis of the post-Qing period.

THE IMPERIAL EXAMINATION SYSTEM

- The metropolitan exam took place every three years. The exam was held in the capital.
- The number of successful candidates at the metropolitan exam varied. It could be as few as 30, or as many as 300.
- Candidates were tested on their literary talent and skills, such as their command of Confucian classics and poetry etc.
- The candidates received education at home or went to clan schools. Conditional on passing lower-level exams, they also received a small amount of training in government-sponsored academies.

▶ Return

A SERIES OF EVENTS

A series of events leading up to the 1712 reform:

- 1397: No candidate from North China passed the metropolitan exam.
- 1425: Divided the candidate pool into two:
Regional Quota: South China 60%, North China 40%
- 1454: Further split into three exam regions: South 55%, North 35%, Central 10%.
- **1712: Recruitment by Province**

▶ Return

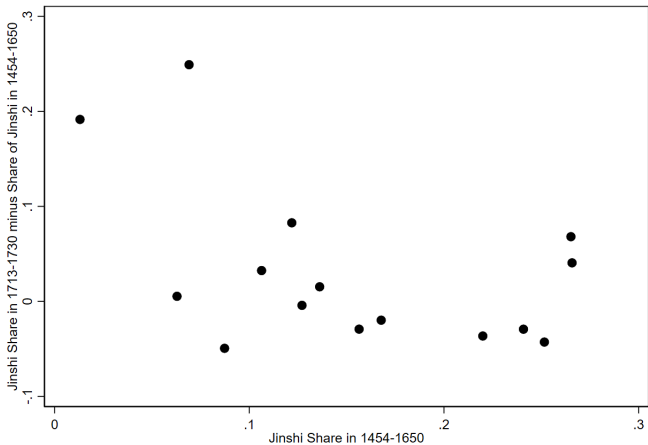


Figure: An inverse relationship between initial shares and post-reform changes in shares.

▶ Return

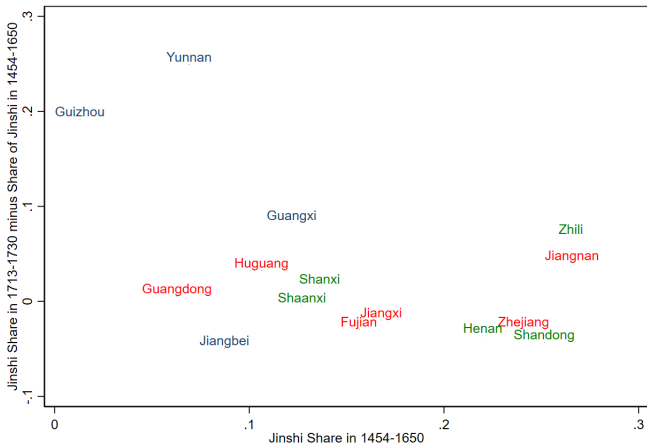


Figure: An inverse relationship between initial shares and post-reform changes in shares.

▶ Return

PROVINCIAL BOUNDARIES

- Provincial boundaries evolved over time from the Ming period (1368-1644) to post-1712.
- Ming Exam regions (North/South/Central) do not overlap with post-1712 provincial boundaries.
- To get around this, we construct artificial provinces, so that each “province” is continually contained in the same exam region.
- Examples are as follows:
 - Jiangnan – Southern Jiangsu and Southern Anhui;
 - Jiangbei – Northern Jiangsu and Northern Anhui.

▶ Return

CHARACTERISTICS OF PREFECTURES

- Agriculture suitability — Caloric Suitability Index
- Population density
- *Shengyuan*. *Shengyuan* are district-level exam graduates; the number of *Shengyuan* fixed for each prefecture.

▶ Return

ACCOUNTING FOR POPULATION CHANGE

	Jinshi density			
	(1)	(2)	(3)	(4)
	All	All	$Share_{prov} \uparrow$	$Share_{prov} \downarrow$
G \times Pre1650 HC \times Post	0.0616*** (0.023)	0.0453** (0.022)	0.0724** (0.032)	
L \times Pre1650 HC \times Post	0.0125** (0.006)	0.0185*** (0.006)		0.00885 (0.006)
Pre1650 HC \times Post	Yes	Yes	Yes	Yes
Controls \times Decade FE	No	Yes	Yes	Yes
Province FE \times Decade FE	Yes	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	5073	5073	3325	1748
Adjusted R^2	0.574	0.608	0.500	0.769

▶ Return

IMPACT ON PREFECTURE-AVERAGE RANKING IN THE EXAM

	Jinshi density			
	(1) All	(2) All	(3) $Share_{prov} \uparrow$	(4) $Share_{prov} \downarrow$
G × Pre1650 HC × Post	0.209 [0.103]***	0.146 [0.101]	-0.0287 [0.158]	
L × Pre1650 HC × Post	0.162 [0.054]***	0.185 [0.057]***		0.209 [0.062]***
Pre1650 HC × Post	Yes	Yes	Yes	Yes
Controls × Decade FE	No	Yes	Yes	Yes
Province FE × Decade FE	Yes	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	5073	5073	2850	2223
Adjusted R^2	0.515	0.522	0.552	0.488

IMPACT ON PREFECTURE-AVERAGE POSITION IN THE GOVERNMENT

	Jinshi density			
	(1) All	(2) All	(3) $Share_{prov} \uparrow$	(4) $Share_{prov} \downarrow$
G × Pre1650 HC × Post	2.776 [0.980]***	2.589 [1.000]**	2.392 [1.380]*	
L × Pre1650 HC × Post	2.029 [0.529]***	2.050 [0.545]***		2.185 [0.569]***
Pre1650 HC × Post	Yes	Yes	Yes	Yes
Controls × Decade FE	No	Yes	Yes	Yes
Province FE × Decade FE	Yes	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes	Yes
Decade FE	Yes	Yes	Yes	Yes
Observations	5073	5073	2850	2223
Adjusted R^2	0.622	0.660	0.566	0.812

▶ Return