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

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- Imperial China enacted a reform in 1712 that benefited underrepresented provinces at the national exam.

- 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 and regional inequalities.

# 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.

▸ 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 the number of participants.

- Competition became confined to within provinces; hence criteria for passing the exam began to vary from province to province.

"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.

# Comparisons With Modern Affirmative Action

- Modern affirmative action:
    1. A historical legacy of discrimination and exclusion based on racial, ethnic, gender, or hereditary categories.

    2. Equality in rights for all citizens.

    3. A target level of increased diversity.

- The 1712 reform was to extend opportunities to formerly disadvantaged groups in order to achieve a form of equality and political stability;

- Linked to proto-egalitarianism, although a notion of civil rights was not yet developed in imperial China.

# CONTRIBUTION

- The 1712 reform as a large-scale policy experiment with generalizable insights.

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- Our focus: How were gains from the reform shared?

- 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 correlated with initial shares of *jinshi*.

# 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?

$$StdRank_{i(p),t} = \beta_0 + \beta_1 G_p \cdot Post_t + \beta_2 L_p \cdot Post_t + \gamma X_p \cdot \eta_t + \delta_p + \eta_t + \varepsilon_{i(p),t}$$
$$(1)$$

$$Avg\ StdRank_{p,t} = \beta_0 + \beta_1 G_p \cdot Post_t + \beta_2 L_p \cdot Post_t + \gamma X_p \cdot \eta_t + \delta_p + \eta_t + \varepsilon_{p,t}$$
$$(2)$$

- $\beta_1$ and $\beta_2$ 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.

- $\delta_p$ is a vector of province fixed effects; $\eta_t$ is a vector of decade fixed effect.

- $\varepsilon_{i(p),t}$ is the error term.

|  | Exam rank, individual | | | |
|  | (1) | (2) | (3) | (4) |
|  | Share in 1454–1650 | | Share in pre-1425 | |
|---|---|---|---|---|
| G × Post | 0.403 | 0.381 | 0.483 | 0.609 |
|  | [0.183]** | [0.188]** | [0.232]** | [0.246]** |
| L × Post | 0.0586 | 0.0271 | 0.205 | -0.0138 |
|  | [0.119] | [0.119] | [0.127] | [0.139] |
| Controls × Decade FE | No | Yes | No | Yes |
| Region FE × 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 | 0.124 | 0.132 |

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

# THE 1712 ACADEMIC AND CAREER OUTCOMES

|  | Exam rank, province-average | | | |
|  | (1) | (2) | (3) | (4) |
|  | Share in 1454-1650 | | Share in pre-1425 | |
|---|---|---|---|---|
| G × Post | 0.667 | 0.497 | 0.861 | 1.073 |
|  | [0.277]** | [0.231]** | [0.598] | [0.472]** |
| L × Post | 0.0456 | -0.109 | 0.161 | -0.0457 |
|  | [0.088] | [0.061]* | [0.235] | [0.165] |
| Controls × Decade FE | No | Yes | No | 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 | 0.658 | 0.651 |

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

|                                  | Position in the bureaucracy, individual | | | |
|                                  | (1) | (2) | (3) | (4) |
|                                  | Share in 1454-1650 | | Share in pre-1425 | |
|----------------------------------|---------|---------|---------|---------|
| G × Post                         | 1.515   | 1.453   | 0.230   | -0.464  |
|                                  | [1.851] | [1.959] | [2.674] | [2.830] |
| L × Post                         | 0.506   | 0.782   | -0.871  | -0.759  |
|                                  | [1.365] | [1.414] | [1.854] | [2.044] |
| Controls × Decade FE             | No      | Yes     | No      | 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   | 0.011   |

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

| | Position in the bureaucracy, province-average | | | |
| | (1) | (2) | (3) | (4) |
| | Share in 1454-1650 | | Share in pre-1425 | |
|---|---|---|---|---|
| G × Post | 3.333 | 4.640 | 3.315 | 4.635 |
| | [1.228]** | [1.833]** | [1.237]** | [1.852]** |
| L × Post | 0.177 | 0.118 | 0.181 | 0.127 |
| | [0.565] | [0.659] | [0.569] | [0.668] |
| Controls × Decade FE | No | Yes | No | 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 | 0.146 | 0.183 |

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

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- 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.
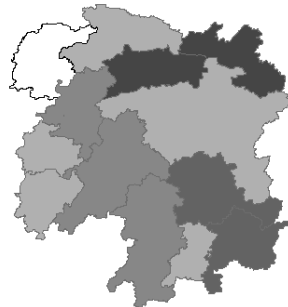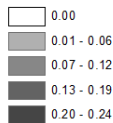
# PRE-EXISTING STRENGTH IN HUMAN CAPITAL
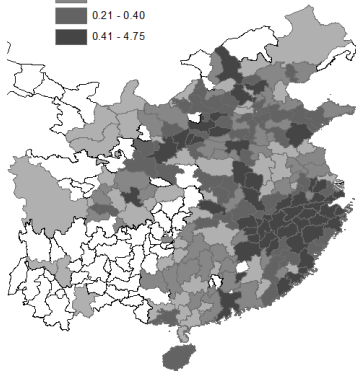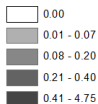


**(a)** China Proper

**(b)** Hunan Province

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

- 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.

- *Pre*1650 $HC_p$ is pre-existing strength in human capital, i.e. jinshi density before 1650.

- $\beta_1$ and $\beta_2$ 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*.

- $\mathbf{\Omega}_p$ is a vector of prefecture fixed effects. $\mathbf{\Lambda}_d$ 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*. <span>▸ Characteristics</span>

# Results

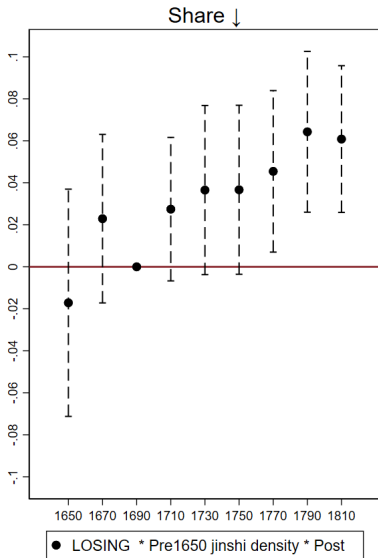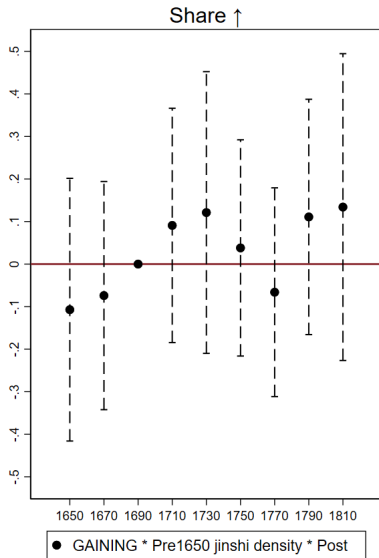| | Jinshi density | | | |
|---|---|---|---|---|
| | (1)<br>All | (2)<br>All | (3)<br>$Share_{prov}$ ↑ | (4)<br>$Share_{prov}$ ↓ |
| G × Pre1650 HC × Post | 0.0607<br>[0.023]*** | 0.0440<br>[0.022]** | 0.0643<br>[0.031]** | |
| L × Pre1650 HC × Post | 0.0148<br>[0.004]*** | 0.0217<br>[0.004]*** | | 0.0228<br>[0.005]*** |
| 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 $R^2$ | 0.574 | 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.

# RESULTS

| | Jinshi density | | | |
|---|---|---|---|---|
| | (1) All | (2) All | (3) $Share_{prov} \uparrow$ | (4) $Share_{prov} \downarrow$ |
| G × Pre1650 HC × Post | 0.0599 [0.023]*** | 0.0433 [0.022]** | 0.0671 [0.031]** | |
| L × Pre1650 HC × Post | 0.0151 [0.004]*** | 0.0220 [0.004]*** | | 0.0133 [0.005]*** |
| 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 | 3325 | 1748 |
| Adjusted $R^2$ | 0.574 | 0.608 | 0.499 | 0.770 |

Notes: $\Delta Share_{prov}$ is the difference between a province's share of *jinshi* in the respective exam region during 1713-1839 and its share during 1454–1650.

Share ↑                                          Share ↓

GAINING * Pre1650 jinshi density * Post          LOSING * Pre1650 jinshi density * Post

# 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.

# ALTERNATIVE TREATMENT

|  | Jinshi density | | | |
|  | (1) | (2) | (3) | (4) |
|  | All | All | $Share_{prov} \uparrow$ | $Share_{prov} \downarrow$ |
|---|---|---|---|---|
| G $\times$ Pre1650 HC $\times$ Post | 0.0451 | 0.0367 | 0.00786 | |
|  | [0.045] | [0.043] | [0.051] | |
| L $\times$ Pre1650 HC $\times$ Post | 0.0181 | 0.0166 | | 0.0298 |
|  | [0.010]* | [0.009]* | | [0.014]** |
| 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 | 3515 | 1558 |
| Adjusted $R^2$ | 0.573 | 0.608 | 0.606 | 0.625 |

Notes:$\Delta Share_{prov}$ is the difference between a province's share of *jinshi* in the entire country during 1713-1730 and its pre-1425 share.

# 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 × Pre1650 HC × Post | 0.0607 [0.018]*** | 0.0519 [0.017]** | 0.0818 [0.020]** | |
| L × Pre1650 HC × Post | 0.0180 [0.004]*** | 0.0164 [0.005]*** | | 0.0105 [0.005]*** |
| Pre1650 HC × Post | Yes | Yes | Yes | Yes |
| Controls × Decade FE | No | Yes | Yes | Yes |
| Province FE × Decade FE | Yes | Yes | Yes | Yes |
| County FE | Yes | Yes | Yes | Yes |
| Decade FE | Yes | Yes | Yes | Yes |
| Observations | 31293 | 31293 | 16796 | 14497 |
| Adjusted $R^2$ | 0.473 | 0.495 | 0.456 | 0.566 |

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 | 0.0223 | −0.00288 | 0.114 |
| | [0.152] | [0.023] | [0.027] | [0.029]*** |
| L × Pre1650 HC × Post | -0.138 | 0.0224 | -0.00490 | 0.0372 |
| | [0.237] | [0.004]*** | [0.007] | [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 $R^2$ | 0.743 | 0.608 | 0.526 | 0.689 |

# BEYOND QING: EVIDENCE FOR PERSISTENCE

|  | (1) THU | (2) PKU | (3) Japan |
|---|---|---|---|
| G × Pre1650 HC× 1712-1911 | 1.208 | 1.208 | 1.208 |
|  | [0.770]+ | [0.770]+ | [0.770]+ |
| L × Pre1650 HC× 1712-1911 | 1.128 | 1.128 | 1.128 |
|  | [0.152]*** | [ 0.125]*** | [0.121]*** |
| G × Pre1650 HC× Post1911 | -0.371 | 1.237 | 0.888 |
|  | [0.858] | [0.697]* | [1.005] |
| L × Pre1650 HC× Post1911 | 0.361 | 1.530 | 1.583 |
|  | [0.212]* | [0.137]*** | [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.

- 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.
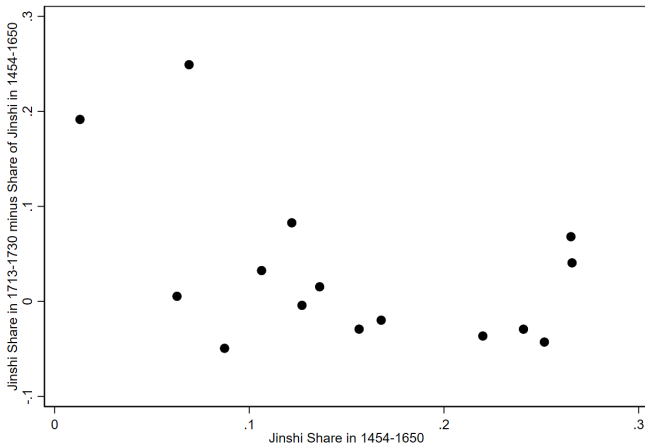
# A Series of Events

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**

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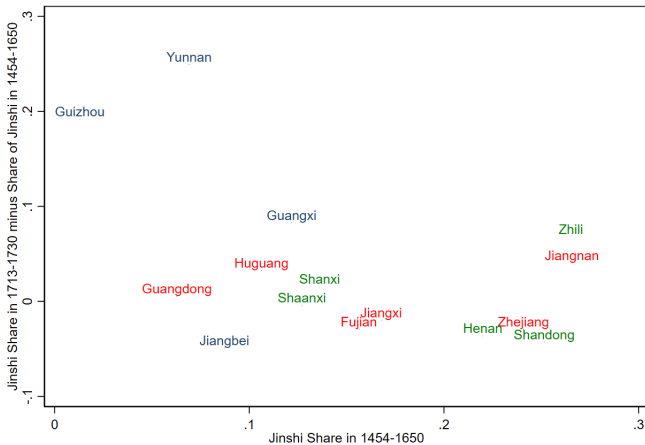
**Figure:** An inverse relationship between initial shares and post-reform changes in shares.

# 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.

# 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.

# Accounting for Population Change

|  | Jinshi density | | | |
|  | (1)<br>All | (2)<br>All | (3)<br>$Share_{prov} \uparrow$ | (4)<br>$Share_{prov} \downarrow$ |
| --- | --- | --- | --- | --- |
| G × Pre1650 HC × Post | 0.0616<br>[0.023]*** | 0.0453<br>[0.022]** | 0.0724<br>[0.032]** | |
| L × Pre1650 HC × Post | 0.0125<br>[0.006]*** | 0.0185<br>[0.006]*** | | 0.0085<br>[0.006] |
| 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 |

# IMPACT ON PREFECTURE-AVERAGE RANKING IN THE EXAM

| | Jinshi density | | | |
| | (1) All | (2) All | (3) $Share_{prov}$ ↑ | (4) $Share_{prov}$ ↓ |
|---|---|---|---|---|
| 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)<br>All | (2)<br>All | (3)<br>$Share_{prov} \uparrow$ | (4)<br>$Share_{prov} \downarrow$ |
|---|---|---|---|---|
| G × Pre1650 HC × Post | 2.776<br>[0.980]*** | 2.589<br>[1.000]** | 2.392<br>[1.380]* | |
| L × Pre1650 HC × Post | 2.029<br>[0.529]*** | 2.050<br>[0.545]*** | | 2.185<br>[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 |