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

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In late imperial China, the imperial examination system, or *keju*, produced both state bureaucrats and as a byproduct, a local gentry. The exams were demanding of cognitive skills such as the ability to read, remember and pay attention. Successful candidates improved their social standing and visibility in society (He, 1962).

In this study, we explore the impact of a reform in 1712 that ultimately favored provinces that were less developed — a version of "affirmative action". The reform effectively let individuals from less developed provinces to pass the exam with lower scores. Some of these provinces were remote, poor and lacking educational resources. Prior to 1712, candidates coming from many of those provinces had little chance to pass all the exams and became *jinshi*. The reform stipulated that the number of successful candidates was proportional to the total number of participants, restricting competition to within the province.

The literature has long been interested in whether affirmative action policies can incentivize human capital accumulation and skill formation among disadvantaged groups (Lundberg and Startz, 1983). We believe that the 1712 reform provides a good testing ground for studying the impact of affirmative action policies. Fryer Jr and Loury (2013) show that with non-contractible identity ("sighted"), affirmative action policies at the *ex post* stage can subsidize skill development. In the case of the 1712 reform, exam quotas were assigned based on residency—a factor that was highly identifiable and tractable in the context of imperial China. In addition, the reform was an intervention specific to the final stage of the imperial exam system, namely, the metropolitan exam. Thirdly, the reform was combined with a highly regulated labor market, namely, the imperial bureaucracy. Because jobs were guaranteed for all candidates that passed the exam, taste-based discrimination had no direct impact

on return to education through labor market opportunities.

Our setting is also useful for studying the long-run effects of affirmative action policies. The polices were in place for a long time (193 years) and if we wish, we can estimate the long-term impact of these policies for *another* hundred years or so after the policies were abruptly ended. To our knowledge, this is the first paper to investigate the effects of affirmative action policies over the centuries.

Anticipating a higher chance to pass the exam, would individuals in less developed provinces make a more substantial investment in education? Moreover, what was the distributional effect of the reform within the province? Essentially, we ask two questions: First, do we see long-run convergence in human capital across provinces? Second, do we see long-run convergence in human capital within provinces? We do not have a good measure of underlying human capital at a province level, once province-level admissions became directly regulated by the state. So we focus on the second question in the main analysis of the paper.

Throughout the *Qing* dynasty, about 26,000 candidates (*jinshi*) passed the highest-level exam. In the main analysis, we focus on the periods before and after the reform, 1650 - 1800. We identify the prefectural origins of successful candidates, in which years they passed the exam, and construct a panel of 266 prefectures and 16 periods. Each period is ten years.

We use a two-part treatment variable to evaluate the distributional effects of the 1712 reform at a prefecture level. To measure the strength of the 1712 reform, we compute the share of *jinshi* for each province before and after the reform. The difference in shares is our province-by-province measure of the strength of the 1712 reform. Figure 1 depicts the relationship between shares of *jinshi* before and after 1712. As intended by the reform, provinces with a high share of *jinshi* before 1712, their share decreased after 1712, whereas provinces with a low share of *jinshi* before 1712 saw their share increase. We then build a proxy for pre-existing skill levels at a prefecture level using the density of *jinshi* prior to the 1712 reform. Here "skill" refers to cognitive skills that were relevant for passing the exams, such as the ability to read, remember

2

and pay attention. The assumption is that facing the same admission criteria, with appropriate economic and political controls, the density of *jinshi* is indicative of *true* skill levels at a prefecture level.

We then examine the impact of 1712 reform at a prefecture-level using the following specification:

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\begin{aligned}
Jinshi\ Density_{ip,d} =& \beta_0 + \beta_1 Pre\ Jinshi\ Density_{ip} \times GAIN_i \times Post_d + \\
& \beta_2 Pre\ Jinshi\ Density_{ip} \times LOSS_i \times Post_d + \\
& \gamma X_{ip} \times Post_d + \theta_p + \eta_d + \delta_i \times \eta_d + \varepsilon_{ip,d} \\
& GAIN_i = |\Delta Share_i| \cdot \mathbb{1}(\Delta Share_i > 0) \\
& LOSS_i = |\Delta Share_i| \cdot \mathbb{1}(\Delta Share_i < 0)
\end{aligned}
$$

The dependent variable is measured by *jinshi* per 10,000 from prefecture p in province i during decade d. A number of provinces experienced an increase in the share of *jinshi* after the reform, captured by $GAIN_i$. Other provinces saw a decrease in their shares, as measured by $LOSS_i$. *Pre Jinshi Density*$_{ip}$ is measured by the average exam performance of the Ming Dynasty (*jinshi* per 10,000 in prefecture p in province i during 1368-1643), in which national exam performance was unrestricted by provincial quota. X_{ip} are control variables. θ_p is a vector of prefecture fixed effects, and η_d is a vector of decade fixed effects. Importantly, we include the interaction between a vector of provincial dummies, δ_i, and decade fixed effects.

The coefficient β_1 and β_2 represents the effects of 1712 reform on prefectures with different pre-existing skill levels. Our preliminary findings in Table 1 are that in provinces that benefited from the reform, prefectures with better pre-existing skill levels performed even better following the reform. In provinces that saw a declining share of *jinshi*, pre-existing skill levels did not have a significant impact on the number of successful candidates after the reform.

The intervention was directed at the highest level exam. How did early-stage invest-

3

ments respond? In next steps, we will examine changes in the number of successful candidates who passed lower-level exams. We would also like to explore whether the reform led to the reallocation of talents away from other activities in prefectures that saw an increase in *jinshi* per capita.
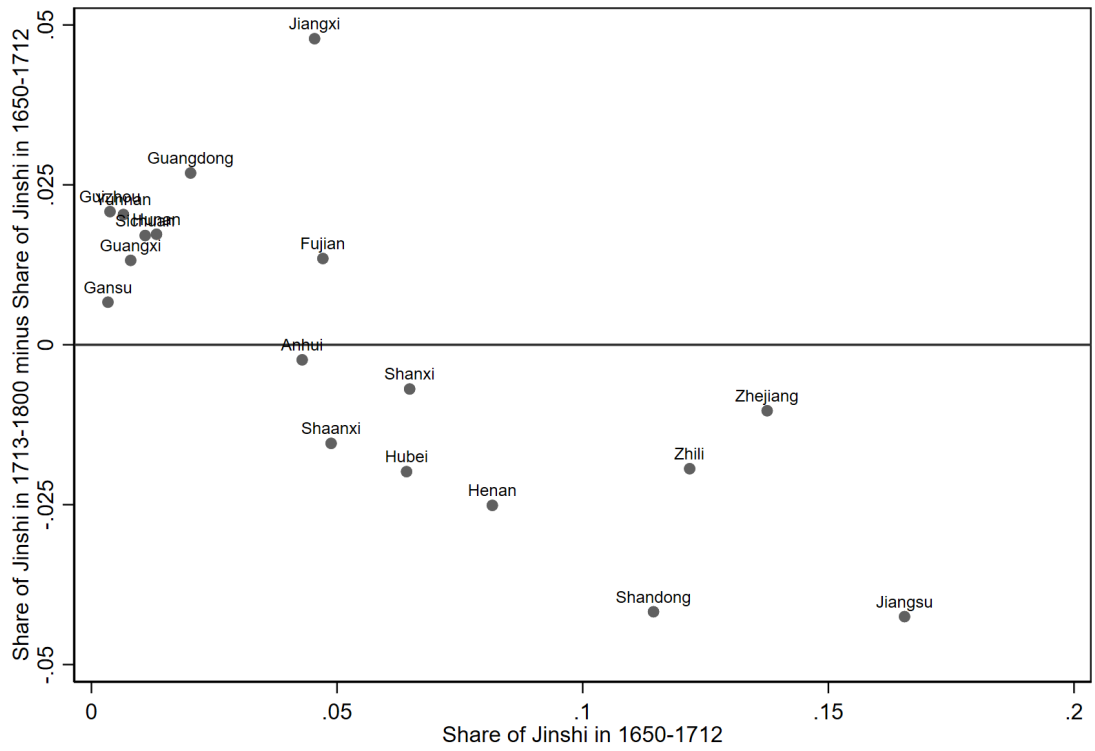
Figure 1. **The Impact of 1712 Reform**

Table 1. Effects of 1712 Reform (Prefecture-level)

	(1) All	(2) All	(3) Win	(4) Lose
Pre Jinshi Density ×	0.0491	0.0491	0.0488	
Win Share × Post	[0.018]***	[0.018]***	[0.018]***	
Pre Jinshi Density ×	-0.00901	-0.00897		-0.00851
Lose Share × Post	[0.058]	[0.058]		[0.058]
Year FE	YES	YES	YES	YES
Year FE*Province FE	YES	YES	YES	YES
Prefecture Pair FE	YES	YES	YES	YES
Year FE*Initial Pop	NO	YES	YES	YES
R-squared	0.643	0.645	0.588	0.651
Obs.	4128	4128	2496	1632

Coefficients are reported, with standard errors in brackets.

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