The Last or Lasting Samurai?
The Impact of Secondary Schools on Elite Formation in Early Development

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Abstract

We investigate the long-run impact of secondary education on occupational and upward intergenerational mobility in late 19th century Japan. The enrollment rate in post-elementary education was still low but increasing due to rapid construction of secondary schools across regions. Using cohort-specific discontinuities in access to the newly established neighborhood schools, we examine how improved access to secondary schools altered the chances of reaching leadership positions in private and public sectors for individuals with different social backgrounds, particularly former samurai (who used to inherit public sector occupations) and commoners (who used to inherit private sector occupations). We find that the expansion of secondary education increased both samurai and commoner elites, mainly from non-elite families, but most of these new elites chose the same occupations as their ancestors.

Keywords: secondary education, intergenerational mobility, elite, human capital, history

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1 Introduction

Individuals holding top positions in companies and governments (i.e. elites) greatly influence the society and economy. A primary and still outstanding question is the role of education institutions in producing elites from different social backgrounds. Does improving access to education help children of non-elite parents to climb up the social ladders? Does it help them to choose occupations different from those of their parents? Occupational mobility can have a particularly important implication: for example, persistent selection of politicians from political dynasties may lead to the appointment of lower-qualified candidates (Geys, 2017). There is growing evidence on how post-elementary education impacts intergenerational mobility (Zimmerman, 2019; Barrios Fernández et al., 2023; Katzkowicz et al., 2023). However, previous studies have been silent about the impacts of education on intergenerational occupational mobility in forming elites and have predominantly focused on post-secondary education.

We examine the long-run impacts of secondary education on elite formation exploiting a rapid secondary education expansion in Japan in its early development stage (1890s-1900s). Around that time in Japan, only about 2% of the population enrolled in secondary schools, which is comparable to some of the low-income countries today.[1] Using discontinuity design around the cohorts of school construction years and long-run outcome data of individuals holding top positions in business, public sector, and other professional careers, our investigations reveal that secondary education expansion resulted in upward mobility but not occupational mobility of elites. More specifically, the expansion of secondary education increased the number of elites with non-elite fathers, but most of these new elites chose the same occupations as their ancestors.

Our study context is a few decades after the country transitioned from a hereditary society of the former Tokugawa period (1600–1868) to a more meritocratic society in the Meiji period (1869–1912). In the Tokugawa period, individuals' occupations were determined by social classes: commoners (families of merchants, artisans, and farmers) and samurai (families of public servants and warriors). The social classes were hereditary and determined

[1]For example, South Sudan, Niger, and Burkina Faso with the secondary school enrollment rates of 5.5% in 2010, 1.8% in 2012, and 3.6% in 2010, respectively.

their occupations and educational opportunities: only samurai received education above the elementary level. At the beginning of the Meiji period, the Meiji government abolished samurai's privileges and renamed them nobles. However, in the early years of the Meiji period, former samurai over-represented the shares of business, political/bureaucratic, and professional elites relative to their small share in the population, possibly because they also significantly over-represented the share of secondary and tertiary school graduates.

In the early period of education reforms, to concentrate limited resources for secondary education, the Meiji government restricted the number of secondary schools to at most one per prefecture. In 1891, this restriction was removed, leading to the rapid construction of 2nd secondary schools in many prefectures within a decade.

We investigate the long-run impacts of improved access to secondary schools on students' lifetime trajectories, particularly, whether they reach top positions in either private or public sectors, by nobility (i.e. commoners and former samurai). For this purpose, we newly digitized the Personnel Inquiry Records (PIR), a version of Who's Who, published in 1903, 1915, 1928, 1934, and 1939. This data provides a list of around 77,478 distinguished individuals (e.g. high-income top managers in companies, high-ranking government officials, distinguished scholars, lawyers, judges, and physicians) together with their biographical information (including year, prefecture of birth, nobility, and family information), which enables us to match fathers and sons among the elites.[2] To identify the causal impacts of school construction on making new elites, we exploit discontinuity at the cohort who became schooling age for the 2nd school established in the birth prefecture.

To preview our empirical findings, first, we confirm that both former samurai and elites' children over-represented the share of elites listed in PIRs for baseline cohorts (who turned schooling age just before the school expansion period) relative to their small shares in the population. Former samurai, consisting of only 5% of the population, represented 11.7% of elite business managers, 31.9% of elite public servants, and 26.9% of professional elites (including scholars, lawyers, judges, and physicians). Also, elites' children (measured by

[2]Moriguchi et al. (2024) use the same data in 1939 and show that the data covers a large fraction of the national population of elites (e.g., 53% of the top 0.01% income earners) by comparing our data with national administrative statistics. They also show that there is no systematic variation in the sampling rates across prefectures, consistent with our assumption that sample selection bias is uncorrelated with the prefecture-cohort variation we use.

whether the father was listed in earlier publications of PIRs), consisting of 0.1% in the population, represented 5.5% of elite business managers, 5.9% of elite public servants, and 2.8% of professional elites.

Second, we find that the construction of the 2nd secondary school almost doubled the existing secondary school capacity in the prefecture. The total number of qualified teachers also increased, although the pace was relatively slower compared to the increase of students.

Third, in the long run, we show that the construction of secondary schools led to a significant increase in occupational elites from both samurai and commoner families. Notably, each group pursued careers in occupations where they historically dominated in the Tokugawa period: elite business managers from commoner families increased by 24%, and elite public servants from samurai families increased by 79%. We also find that professional elites, encompassing new types of elite occupations required strict qualifications, increased from commoner families by 23%. The rise of those elites is entirely driven by an increase in elites whose fathers were not elites, suggesting that the schools improved upward intergenerational mobility.

We explore three potential channels: (1) human capital, (2) family influence, and (3) peer effects. On (1) human capital, we explore the quality of learning of the secondary school materials (proxied by the number of qualified teachers) and progression to higher education. The results suggest that human capital accumulation at schools mattered for producing professional and public servant elites but not for producing high-income managers. In particular, as children of samurai families were more likely to progress to higher education after graduation of secondary schools compared to those of commoner families, this evidence suggests that occupational differences of samurai and commoners elites partly arose from their differences in progression to (and possibly aspiration to enter) higher education.

On (2) family influence, we explore two possible types of influence of families leading to intergenerational occupation persistence among commoners. The first is broadly defined family endowments shared within family members, including knowledge, networks, and norms forming aspirations. The second is the influence of family members' expectations that the sons should take over the business of their parents. Examining the heterogeneity by eldest sons (who faced the pressures to succeed the business) and the other sons, we find evidence

suggesting that secondary schools possibly helped the eldest sons to upgrade the traditional firms they inherited to modern firms. We also find that even the subsequent-born sons who were mostly free from the succession pressures did not became public sector elites but become business elites after the expansion of secondary schools. This result suggests the importance of the family's endowments in determining the persistence of occupations across generations.

On (3) peer effects, we explore possible channels related to peer effects and obtain some suggestive evidence that they mattered. In particular, we find that new secondary schools built on the legacy of former fief schools and castles had greater share of former samurai students and produced greater numbers of public servant elites from samurai families and professional elites from commoner families. In addition, for commoner business elites, the presence of sons of famous business elites in the same class years mattered to some extent. However, these peer effects do not explain the differences in occupational choices of samurai and commoners.

This study contributes to three strands of literature. The first is the empirical literature on the link between education and intergenerational/social mobility.[3] While positive correlation between education and upward intergenrational mobility has been widely presented (Chetty et al., 2014; Acciari et al., 2022; Fairbrother and Mahadevan, 2016), Zimmerman (2019) and Michelman et al. (2022) show that selective higher education institutions do not benefit students from low-status families to reach executive positions and high-status careers. On the other hand, Barrios Fernández et al. (2023) provide evidence that such institutions improve the upward mobility of the children of those who were admitted through enhanced social capital. In addition, Doxey et al. (2022) examine the impact of high school movements in the US early 20th century using data of Who's Who similar to our data and find that they improved economic opportunities of women. Our contribution to this literature is to provide evidence on the effects of secondary education on the production of elites, uncovering their intergenerational occupational and upward mobility patterns.

Second, this study is connected to the literature on the impacts of secondary education.

[3]While we focus on the impacts of education expansion, our paper is also related to the broader literature on intergenerational transmission of elite status. Some of these studies show persistence of elite status across many generations within families even over the periods of rapid social and economic changes (Clark and Ishii, 2012; Clark, 2014; Alesina et al., 2020) while others show less persistence (Ager et al., 2021).

While Angrist et al. (2006), Blimpo et al. (2019), and Brandt and Mkenda (2020) examined short- to mid-run effects on academic outcomes, Spohr (2003), Ozier (2015), Duflo et al. (2021), Sakai and Masuda (2020), and Masuda and Shigeoka (2023) study the long-run effects of labor markets and mortality outcomes. Our study differs from these works in three aspects: (1) providing evidence on further long-run impacts of secondary education covering individuals' lifetime occupational trajectories, (2) focusing on outcomes of whether individuals obtained top positions in the economy, and (3) providing insights on inter-generational mobility.

Third, this study contributes to the historical sociology and the formation of elites in Japan. Sonoda et al. (1995), Aso (1978), Takane (1976), Takeuchi (1981), Matsumoto and Okazaki (2023), Clark and Ishii (2012), and Clark (2014) have made significant contributions to the study of samurai families' (nobles) transitions into Meiji period and elite formation. Our study bridges the gap between historical narratives and empirical analysis and analyzes educational institutions' causal impact on elite formation in this context.

This paper proceeds as follows. Section 2 describes the background of the study context and secondary school expansion. In Section 3 explains our data. We present and discuss our empirical specification and findings in Section 4 and explore the mechanisms by heterogeneity analysis in Section 5. We provide concluding remarks in Section 6.

2 Background

We focus on the construction of secondary schools in the 1890s-1900s. This period is a few decades after the Meiji Restoration (1868), which marked a major transition from the hereditary society of the Tokugawa period (1603–1868) to the meritocratic society of the Meiji period (1868–1912). The Meiji Restoration was accompanied first by the abolition of various vested rights belonging to the samurai, followed by decades of educational reforms. These institutional changes are summarized below.

2.1 Transition from Tokugawa period to Meiji Period

For around 250 years of the Tokugawa period, Japan was governed by the Tokugawa family. The Tokugawa family adopted a decentralized political system by delegating control to the local lords. Local lords governed a clan (a group of vassals) and the local community according to the guidelines set by the Tokugawa family.

Tokugawa family ruled the country under a hereditary status system that strictly separated samurai (the families of Tokugawa, local lords, and vassals) and commoners (including farmers, artisans, and merchants) in terms of occupation, residence, and marriage. Samurai families dominated most public sector jobs including roles in the government, military, and police. Samurai were forbidden to work in the private sector and commoners were forbidden to work in the public sector. Housing was also divided by class, and marriages across class lines were rare.

Educational opportunities varied considerably according to social class. At the elementary level, temple schools (Terakoya) were widespread across the country at the end of the Tokugawa period and accessible to commoners. These schools aimed to provide the minimum knowledge to engage in business activities such as reading, writing, and arithmetic.

Above the elementary level, however, there were only fief schools mainly targeted at the children of samurai families. Children of upper-class samurai were required to attend fief schools in order to take over the family occupations. The fief schools provided Confucianism and neo-Confucianism education that were considered essential to becoming public servants. While there were a few fief schools and specialized private schools that accommodated commoners, the number of such schools was limited (Dore, 2010). Among commoners, practical knowledge and skills were individually imparted within families and through the apprenticeship system (Kudo and Shiba, 2022).

The Tokugawa period ended in 1868 with the Meiji Restoration. Faced with foreign threats, the Meiji government conducted various reforms to rebuild the country. The abolition of the status system (samurai, farmers, artisans, and merchants) and education reforms were the central pillars of the reforms.

The abolition of the status system was materialized by three major reforms that deprived

the privileges of samurai. First, the Meiji government required local lords to return the control of their land and people to the Emperor in 1869. Samurai were given an alternative status called nobles, and all others were called commoners.[4] For simplicity, in this paper, we refer to nobles in and after the Meiji period as samurai families, or just samurai.[5] Second, the Conscription Law (1873) stipulated the obligation of citizens to serve in the military regardless of nobility. Third, the Abolition Measure of Hereditary Stipend (1875) abolished the privilege of samurai to receive the public stipend.

However, even after a few decades since samurai were deprived of their privileges, samurai over-represented shares in elites, not only in the public sector but also in the private sector, as previous studies document (Aso, 1978; Aonuma, 1965; Clark and Ishii, 2012; Clark, 2014). We confirm this fact in our data of elites in section 3.3.

2.2 Education reforms in Meiji Period

The Meiji government initiated the education reform by the promulgation of the Education System Order (1872). The law defined the main concepts of the new education system, emphasizing that education would now be the critical determinant of occupations and future earnings, rather than family background, as in the past. The law laid out a plan to construct elementary schools, secondary schools, and imperial universities based on a zoning system adopted from France. Although the plan was somewhat idealistic and not strictly enforced for budgetary and other reasons, the law is considered to have marked a significant milestone in establishing the modern education system in Japan.

The government prioritized the spread of elementary schools. Since the promulgation of the Elementary School Order (1886), the eight years of elementary school education starting from the age of six were divided into ordinary and higher courses, each consisting of four years of schooling. The ordinary course was compulsory education, and students who finished the ordinary course with adequate grades could proceed to the higher class.

[4]However, there was an outflow from the samurai to the commoners. The percentage of former samurai in the early Meiji period was about 10% (Azuma, 1940).

[5]The term "samurai" here includes both peerages ("*Kazoku*", or former local lords) and former lower class samurai (former vassals). In terms of numbers, former lower-class samurai consisted of a much larger share.

Secondary school was one of the subsequent educational institutions to which students who have completed four years of ordinary courses in an elementary school could apply.[6] Since the government devoted most resources to establishing elementary schools, the development of standards for secondary schools had to wait until the 1880s. Until 1879, there were about 800 public and private secondary schools, a mix of different types of schools, including former fief schools and new European-style schools. However, most of these schools did not meet the standard required by the government mainly due to a shortage of public funds and qualified teachers: 70% of the schools had only one teacher. There were also significant differences in education levels across schools. In addition, some schools prioritized admission to children of parents who invested in the school, often upper-class samurai (Kambe, 1990).

To cope with these issues, the government first enforced standardization of secondary schools based on the Education Order (1879), some 630 private schools lost their former secondary school status, and only 188 secondary schools (including public and private) remained in 1880. The government further enforced standardization by publishing General Rules for Middle School (1884). This law defined secondary schools as educational institutions that offered five years of practical and general higher education. The new standards were required to employ qualified teachers, teaching materials, subject standardization, and number of class hours. Admission policies were also standardized. As a result, the number of secondary schools decreased to 108 in 1885. The standardization led to the loss of control by samurai and wealthy business families (Ministory of Education, 1972).

Next, in order to concentrate resources, the government issued the Secondary School Order (1886), limiting the number of publicly funded secondary schools to, at most, one per prefecture. For more than one public secondary school to be continued, private individuals had to invest in the schools. At the same time, the administration was entrusted to the Minister of Education or the prefectural governor's decree. Due to the poor financial condition of the prefectures, and the reluctance to be placed under the central government's control, most prefectures chose to hold one or none of the public secondary schools. Since this regulation was strictly enforced, the law limited the number of public secondary schools

[6]This standard was maintained until 1898. In 1899, the central government enforced a revision, then completing two years of higher courses at an elementary school became the standard for admission. We will explain more details in Section 2.3.

to remain constant for several years (see Figure 1a for the total number of schools). However, the number of public secondary school graduates did not decline over this period, implying that this law only affected the concentration of the resources but not the overall capacity of the schools within prefectures (see Figure 1b for the total number of graduates).

The restriction on the number of schools was removed by the Revision of Secondary School Order in December 1891. The revision allowed more than one publicly funded secondary schools to operate in a prefecture. Soon after the enforcement of the revision, the number of public secondary schools increased rapidly from around 50 to nearly 250 within a decade (Figure 1a). The increase in the number of schools accompanied an increase in the number of graduates, suggesting that the total capacity of the schools per prefecture also increased.

Figure D1 shows the number of prefectures that had more than one secondary school by year. Within a decade, most prefectures established the 2nd school. In our analysis, we focus on 37 prefectures where the 2nd school was established within 10 years of the revision (1892–1901). This excludes 10 prefectures, including Tokyo that had a national public secondary school in addition to a local public school. The timing of the 2nd school establishments slightly differed across prefectures within 10 years. This is possibly due to the differences in the length of time it takes for decision-making and enforcement, the degree of resource constraints, and local demand for the schools. We assume that such unobserved conditions affecting school establishment timing move smoothly around the year of establishment, and use regression discontinuity at cohorts.

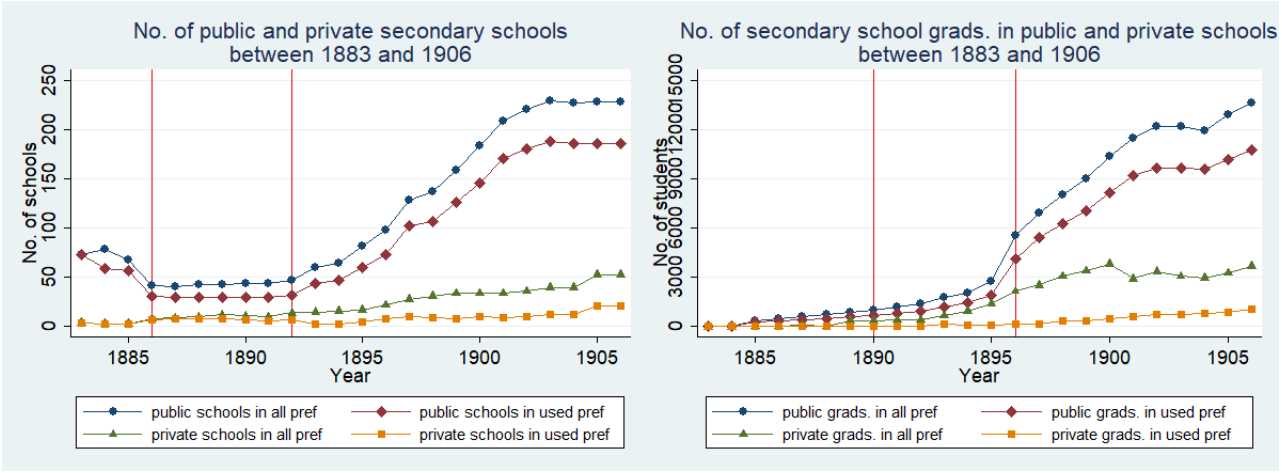
While we focus on public secondary schools in our analysis, private secondary schools were always allowed by the government and existed. Figures 1a and 1b show that the numbers of private schools and their graduates were much less than that of public schools. In addition, most of these private schools are concentrated in Tokyo, which is not in our sample for analysis. Therefore, the number of private schools in the prefectures we use for analysis is small, less than 10 in total in most years.

Figure 2 shows the number of secondary school students by nobility from 1886 to 1898 (data is missing in 1893–1896). Until around the 1880s, almost half of secondary school students were samurai. This share is very high given that the noble's share in population was only about 5%. For instance, in 1886, samurai were about ten times more likely to be

enrolled in secondary schools than those of commoners.

The number of secondary school students then dramatically increased from 1892 to 1898. In particular, the number of commoner students increased relatively more than that of samurai students. A possible reason for this is that the 2nd schools were located in locations that were accessible for commoners compared to the existed schools. We document this fact in more details in section 5.3.

Figure 1: No. of Secondary Schools and Secondary School Grads.



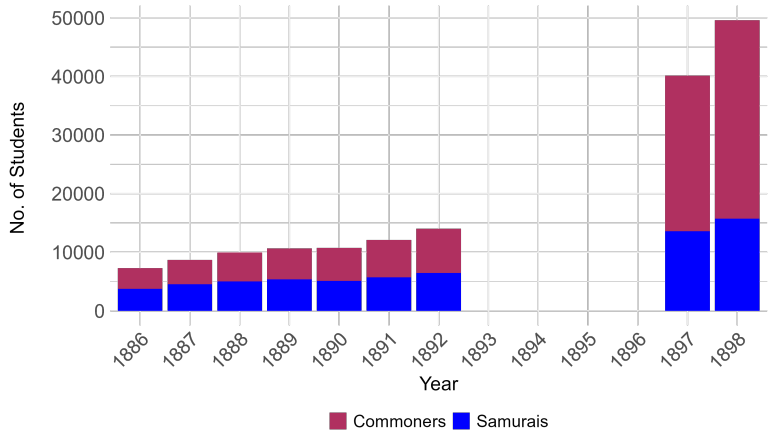
(a) No. of Secondary Schools **(b)** No. of Grads. in Secondary Schools

Notes: Panel (a) shows the number of public/private schools by year. "Public schools in all pref" (or "private schools in all pref") represents the number of public (or private) secondary schools among all 47 prefectures. "Public schools in used pref" (or "private schools in used pref") shows the number of public (or private) secondary schools in the subset of prefectures we use in our analysis (these are 37 prefectures that established 2nd schools in 1893–1901). Vertical lines mark the year of the Secondary School Order (1886) and the year of the Revision of the Secondary School Order (1892). Panel (b) shows the number of public/private school graduates by year. As in panel (a), we show the statistics for all 47 prefectures and the subset of prefectures used in our analysis. Vertical lines mark the year of Secondary School Order + 4 (1890) and the year of Revision of Secondary School Order + 4 (1896) since it took five years to graduate from a secondary school.

2.3 Institutional details of secondary schools

It is worthy to describe some key additional features of secondary schools during the period of our study (around 1889–1905). A series of educational reforms enacted in the 1880s unified the content and quality of secondary school education among schools across the country. Students had 28 periods of classes per week, including 5 hours of Japanese, 6 hours of foreign language, and 4 hours of mathematics, which did not differ significantly from today's

Figure 2: No. of Secondary School Students by Nobility



Notes: This figure presents the number of secondary school students by nobility from 1886 to 1898. The data is missing in 1893–1896. We use two data sources: *Goinbunko Bunsho* for 1886–1892 and Mitsuihara (1898) for 1897–1898.

secondary education in Japan. Furthermore, the recruitment criteria for secondary school teachers were specified as graduation from either imperial universities or teacher's schools, or passing the national standard teacher recruitment examination.

The annual fees were around 20% of GDP per capita during this period. This implies that the fees were not restrictively high for households with average income: for example, for households with 3 persons, the fee is about 7% of the household income. That said, it is likely that poor households could not afford it because formal fellowship schemes were apparently absent at that time.

In 1886-1898, eligibility for secondary schools was restricted to male students above 12 years old who had completed an ordinary course of four years of elementary school. In 1886, the attendance rate of secondary schools was roughly 4 out of every 1,000 male births. By 1898, when most prefectures had constructed 2nd schools, the rate increased to about 20 per 1,000 male births.

Demand for secondary schools also increased over this period. As the number of applicants exceeded capacity, individual schools either conducted entrance exams or adjusted their admission requirements to complete the additional two years in higher courses of an

elementary school.[7] Mitsuihara (1898) indicate that the fraction of applicants to capacity was, on average, 0.5 for schools established before 1891 and 0.75 for those established after 1892. To make admission requirements uniform for all schools across the country, the government implemented the 2nd Revision of the Secondary School Order in 1899, requiring completion of an additional two years in higher courses of an elementary school.

According to the Mitsuihara (1898), the average age of the first-year students of secondary schools was 14.3. However, this is likely to be higher than the age at entrance because statistics are typically measured several months after entrance. Therefore, we assume the average entry age to be 13. One year of delay relative to the minimum entry age of 12 is plausible given that students were likely to have taken one year for preparation for the entrance exam or for repeating grades in elementary schools. We use this age 13 as the baseline threshold for empirical RDD specification.

3 Data

3.1 Data on secondary schools

To measure the evolution of school constructions and capacity across prefectures, we use the Ministry of Education Yearbook in 1892–1901. We digitized the prefecture-level data on the number of secondary schools, the number of teachers, the number of students enrolled (for students in grades 1–5), and the number of graduates.

3.2 Data on elites (PIR)

To evaluate long-run outcomes, we digitized the Personnel Inquiry Records (PIRs) published in 1903, 1915, 1928, 1934, and 1939. PIRs are a version of Who's Who and are used as a source of information about potential business and marriage partners. The number of unique individuals listed in at least one of three years of PIRs is 77,478.[8] These records are a se-

[7] If a student does not repeat a grade, the student is 12 years old when he finishes two years of higher course of an elementary school.

[8] The 1939 PIR lists 54,856 individuals, representing about 0.08% of the total population. The 1934 PIR lists 26,058 individuals, representing about 0.04% of the total population. The 1928 PIR lists 25,164 individuals, representing about 0.04% of the total population. The 1915 PIR lists 13,916 individuals, representing

lective list of socially distinguished individuals, such as top business managers, high-ranking public servants, professional elites, high-income earners, medal recipients, and high-ranking military servants. For each listed individual, the records provide biographical details such as birth year, birthplace, final education institution, and career history. We utilized the information regarding birth year and birth prefectures to make aggregate counts of elites by cohorts (birth year) and birth prefectures.

For identifying socially distinguished individuals, the PIR sourced information from multiple directories, which include the government's official personnel list (Shokuin-roku in Japanese), bank and corporate directories (Teikoku Ginkou Kaisha Youroku and Zenkoku Ginkou Kaisha Youroku in Japanese), the member list of the national commerce and industry chamber (Zenkoku Shoukou Kaigisho Giin Meibo in Japanese), and the directory of Japanese notables (Nihon Shinshi-roku in Japanese) (see PIR 1934). The government directory include details of all public servants in national and local governments. Similarly, the bank and corporate directories include a complete list of banks and companies whose capital exceeds a certain threshold (Teikoku Ginkou Kaisha Youroku 1938, p.2). Another notable source, the Japanese notables' directory, identified affluent residents of 24 urban prefectures based on their tax contributions (Nihon Shinshi-roku, 1938, p.i).

Using the same data for 1939 PIR, Moriguchi et al. (2024) provide a detailed comparison between PIR sample and the population for top-income earners. Sampling rate is decent compared to complete count from tax statistics: 53% and 39% for the top 0.01% and 0.05% income earners. The number of top income earners listed in PIR and the complete count from tax statistics are highly correlated at the prefecture level, with similar sampling rates across prefectures.

Still, given that we mainly use broader categories of career elites, we need to care about possible sampling biases. Sampling may be biased toward prefectures with a larger population (possibly for higher demand in such areas). To cope with this issue, we control for prefecture fixed effects. We also have age effects that people are more likely to reach top positions around their late 50s. We assume that the age effect is not discontinuous at the

about 0.03% of the total population. The 1903 PIR lists 3,267 individuals, representing about 0.01% of the total population.

cutoff in each prefecture (note that cutoff cohort differs across prefectures).

We focus on three occupational categories of the elites: business managers, public servants, and professionals. For each occupation category, we count the number of persons who appear in at least one of three years of PIRs and satisfy the following criteria.[9]

1. High-income managers who are either (modern) business managers, holding formal titles as top business managers, or (pre-modern type) family business managers, identified by family-business type firm names. They are limited to ones who pay tax, implying that their incomes were high enough to be above the threshold to start paying the tax (1,000 yen/year). Below this income level, individuals did not need to pay income tax. Since the average GDP per capita between 1928 and 1939 was 297 yen/year, 1,000 yen/year was three to four times of the average GDP per capita.

2. High-ranking public servants who are either central government officers, politicians, or prefectural governors.

3. Professional elites who are either scholars, lawyers, judges, or physicians.

In this paper, we are interested in the outcomes of occupational mobility from their ancestors' occupations (horizontal intergenerational mobility) and upward mobility within the occupational categories of their ancestors (vertical intergenerational mobility). The horizontal mobility is measured by comparing the elite's occupation and his nobility, which indicates the family's occupation in Tokugawa period. More specifically, occupations are preserved if sons of samurai families become public servants and those of commoner families become business elites.

From this perspective, professional occupations are considered to be "new types of occupations" that began to be formed during the Meiji period. While similar occupations existed in Tokugawa period, there were no official qualifications for professionals such as teachers, lawyers, judges, and physician. In the Meiji period, certification examinations for these professionals were institutionalized. The increase in public-funded schools and private schools

[9]When a person is listed in multiple PIRs, we use information from all past records to identify the occupation category.

made these professionals key routes for climbing the social ladders through meritocracy (Amano, 2006.

To measure upward mobility, we match these elites with earlier editions of PIRs published in 1903, 1915, and 1928. These earlier editions include information on the elites' children such as first names, birth years, and relationships to the listed individuals. Through extensive name and birth year matching, we identify whether the individuals in our main data are also listed in any of the five editions of PIRs as children of other elites. This process identifies 6,869 pairs where both an elite and his father are listed in the PIRs, out of 67,916 unique father-son pairs who appear in 1903, 1915, and 1928 PIRs.

3.3 Over-representation of samurai and elites' sons among elites

Table 1 shows the likelihood of becoming an elite, measured by the number of individuals listed in the PIRs per 1,000 birth population, by samurai and commoners (panel A), and by elite families and non-elite families (panel B). We focus on cohorts born between 1876 and 1878, which represent the cohorts that turned 13 years old just before the expansion of secondary schools.

Panel A indicates that samurai were much more likely to become elites in all occupational categories. The likelihood of becoming an elite for samurai is approximately 3 times (=3.44/1.21) higher than that of commoners for high-income managers, about 8 times (=3.92/0.50) higher for professional elites, and about 10 times (=1.86/0.186) higher for public servants. Despite the fact that samurai constituted only 5% of the population, they represented 11.7% of elite business managers, 26.9% of professional elites, and 31.9% of elite public servants.[10]

Why could samurai dominate a large share of elite positions? Most of the samurai did not inherit job positions from their parents. Back in the Tokugawa period, top government

[10]This evidence is consistent with other studies in the literature using alternative data. Using a random sample for 200–300 individuals from each PIR (1903, 1915, and 1928), Aso (1978) similarly shows a high share of samurai among business elites and professional elites. Aonuma (1965) uses data on top managers in corporations and finds that the proportion of samurai among them was 25% in 1900 and continued to be above 20% in the 1930s. Clark and Ishii (2012); Clark (2014) use the rare surnames to track the descendants of samurai and peerage families and show large over-representation of these families' names among elites in the same period and even for the recent years in Japan.

positions were dominated by local lords (*Daimyo*) and court nobles (*Kuge*), who later became peerages (*Kazoku*). Peerages were allowed to inherit some elite government positions even after the Meiji Restoration. However, they constitute only a tiny fraction of population. Aside from peerages, a much larger population of samurai were previous lower-class samurai who worked for local lords, and they did not inherit any public sector position from their parents after the Meiji Restoration. Indeed, there is evidence of substantial upward mobility among these former lower-class samurai in the sense that their parents did not have a chance to become top government officers in the Tokugawa period but did have such a chance in the Meiji period (Takane, 1976; Matsumoto and Okazaki, 2023). Income level was not likely to be the major advantage of samurai. Since a large share of samurai lost their jobs after Meiji Restoration, many of them had difficulty making ends meet and were poorer than wealthy merchant families (Sonoda et al., 1995).

An outstanding factor that possibly explains why samurai continued to over-represent the elite share is the levels of education, especially at secondary and tertiary levels. As shown earlier in Figure 2, until around the 1880s, almost half of secondary school students were samurai.

Historians have discussed several possible reasons for the over-representation of samurai in secondary and tertiary education. First, these samurai students might have largely consisted of those originally from samurai families of high status (Sonoda et al., 1995). These samurai families could have kept financial and physical assets since Tokugawa period, which might have helped them afford secondary school fees. Second, Takeuchi (1981) points out that, after the abolition of samurai class, samurai had strong aspirations to secure upper-level positions in the society which are similar to their original occupations. Third, given that formal education institutions were new to commoners at that time, only samurai might have known the value of educational human capital as an asset to earn income (Amano, 2006). Fourth, in contrast to the children of commoners, samurai children did not have family businesses to engage in, which might have allowed them to engage in upper-level education (Sonoda et al., 1995). Lastly, some secondary schools in the early period were funded by samurai and explicitly targeted for noble students.

Next, in Panel B, we observe a stronger pattern of over-representation of individuals

from elite families in all occupational categories. The likelihood of becoming an elite for individuals from elite families is approximately 52 times (=51.7/1.00) higher than for those from non-elite families for high-income managers, about 26 times (=13.11/0.51) higher for professional elites, and about 59 times (=11.67/0.20) higher for public servants. Although individuals from elite families were only 0.1% of the population, those elites represented 5.5% of elite business managers, 2.8% of professional elites, and 5.9% of elite public servants. This over-representation of elites' sons among elites may also be attributed to a higher share of individuals among elites' sons enrolled in post-elementary education relative to the rest of the population.

Table 1: Baseline Cohorts

	No. of elites		No. of elites per 1,000 births	
	Commoner families	Samurai families	Commoner families	Samurai families
Panel A: By commoner families and samurai families (born in 1876-1878)				
All occupational elites	581.333	125.000	1.760	8.112
High-income managers	399.667	53.000	1.210	3.440
Public servants	61.333	28.667	0.186	1.860
Professional elites	164.000	60.333	0.496	3.916
	No. of elites		No. of elites per 1,000 births	
	Non-elite families	Elite families	Non-elite families	Elite families
Panel B: By non-elite families and elite families (born in 1876-1878)				
All occupational elites	675.333	31.000	1.578	67.493
High-income managers	429.000	23.667	1.003	51.527
Public servants	84.667	5.333	0.198	11.612
Professional elites	218.333	6.000	0.510	13.063

Notes: This table shows the average number of individuals listed in the PIRs per cohort for the cohorts born between 1876 and 1878. The first two columns show the average number of elites per cohort, and the last two columns show the average number of elites per 1000 male birth population. Panel A shows these numbers separately by nobility, and Panel B shows them by elite and and non-elite families. We focus on individuals who were born in the subset of prefectures that we use in our analysis (we use 37 prefectures that established 2nd schools in 1893–1901). "High-income managers" are individuals who are employed in a private sector and pays any positive amount of income or corporate tax. "Professional elites" are individuals whose occupations are either scholars, lawyers, judges, or physicians. "Public servants" are individuals who work at the central government either as officers or politicians. "All occupational elites" consist of all individuals in these three categories. See Section 3.2 for more detailed descriptions.

4 Empirical specification and results

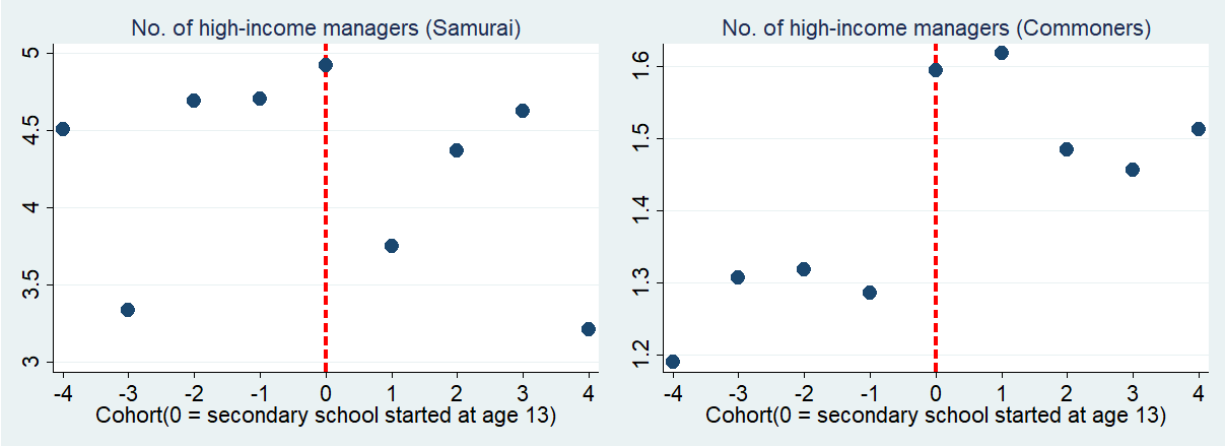
Throughout our analysis, we focus on 37 prefectures where the 2nd secondary schools were established between 1892 and 1901. See Figure D2 for the map of these prefectures.

4.1 Graphical results

Before starting regression analysis, we graphically examine the relationship between one's exposure to 2nd secondary school and the probability of becoming an elite.

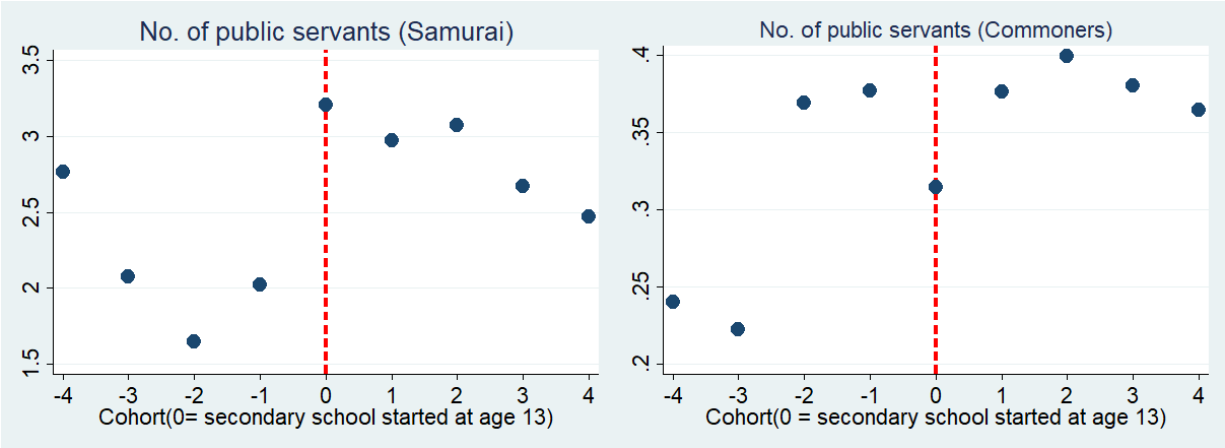
To capture the variation in exposure to 2nd secondary school, we define *cohort* by "the year when a birth cohort turned age 13" subtracted by "the year when the 2nd secondary school was established in the prefecture". That is, cohort 0 is the cohort who turned age 13 when the 2nd secondary school was established in the prefecture. Cohort k is the cohort who turned age 13 after k years since the 2nd secondary school was established in the prefecture. For negative k, cohort k turned age 13 $-k$ years prior to the establishment of 2nd school. In each prefecture and cohort, the probability of becoming an elite by nobility is measured by the number of individuals listed in PIR per 1,000 male birth population of the nobility. We create this measure for each occupational category: high-income managers, professionals, and public servants.

Figure 3 panels (a)-(f) depict the average probability of becoming an elite in each occupation category over nine cohorts (from cohort -4 to cohort 4) across 37 prefectures. For high-income managers, the probabilities jump up at cohort 0 only for commoners. In contrast, for public servants, the probabilities jump up from cohort 0 only for samurai. For professional elites, the probabilities increase from cohorts 0-1 only for commoners.



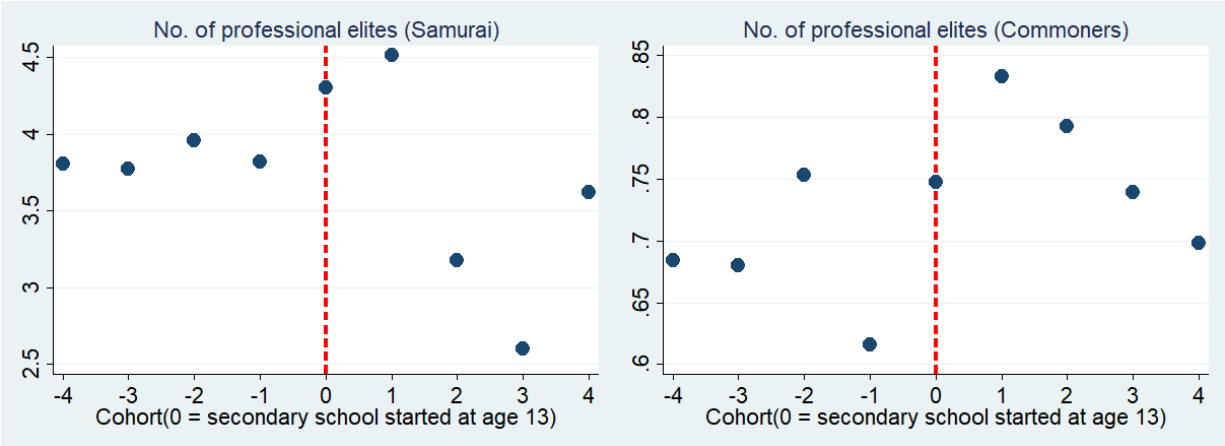
(a) Samurai - High-income managers

(b) Commoners - High-income managers



(c) Samurai - Public servants

(d) Commoners - Public servants



(e) Samurai - Professional elites

(f) Commoners - Professional elites

Figure 3: High-income managers, professional elites, and public servants

Notes: These figures show the average number of high-income business managers, public servants, and professional elites (per 1,000 male births) across prefectures for each cohort. We define cohort by "the year when a birth cohort turned age 13" subtracted by "the year when the 2nd secondary school was established in the prefecture". That is, cohort 0 is the cohort who turned age 13 when the 2nd secondary school was established in the prefecture. Cohort -4 to cohort -1 are pre-treatment cohorts, while cohorts 0–4 are treatment cohorts. For a detailed description of the outcome, see Section 3.2. We focus on individuals who were born in the subset of prefectures we use in our analysis (we use 37 prefectures that established 2nd schools in 1893–1901).

4.2 Empirical strategy

4.2.1 Staggered DiD

Since the establishment of the 2nd schools varied across years and prefectures, one natural empirical specification is Staggered DiD. Figure A1 shows the results of staggered DiD based on Callaway and Sant'Anna (2021) method.[11]. We use only not-yet-treated units as comparison. Aggregating the estimates by cohorts, we find positive and statistically significant treatment effects for cohorts 0–2. However, we find that Staggered DiD specification suffers from the existence of pre-trend. We test the null hypothesis that pretrend in pre-treatment cohorts within window from -4 to -1 is equal to 0. Then, for all elite occupational categories and nobilities, the test is rejected at a 1% level (see Table A1 for χ^2(df)).

4.2.2 RDD approach

As our main empirical specification, we use regression discontinuity at the cohort who became secondary school entrance age when the prefecture's 2nd secondary school was established. Specifically, we estimate the following equation:

$$\frac{N_{j,c}^{k,n}}{pop_j^n} \times 1000 = \beta^{k,n} After_{j,c} + Trend_c^{k,n} + \delta_j^{k,n} + u_{j,c}^{k,n}, \tag{1}$$

where, j is the prefecture, c is a cohort, k is an occupation category (either high-income managers, professionals, and public servants), and n is nobility. In our main analysis for long-run effects, the dependent variable indicates the probability of becoming an elite for each occupational category k. The definition is the same as in Section 4.1. For each occupation k, nobility n, prefecture j, and cohort c, the variable is defined by the number of individuals listed in PIRs per 1,000 male birth population. As a measure of birth population, we take an average male birth population in prefecture j across the cohorts born between 1871 and 1896 of our sample. We use the average instead of the raw population data in order to mitigate the influence of measurement and estimation errors in the original population data.

The treatment indicator variable $After_{j,c}$ takes 1 for cohorts who were 13 years old or younger when the 2nd secondary school was established in prefecture j, and is set to 0

[11] We use csdid command in Stata.

for those in cohorts who were 14 years or older at the establishment. Some prefectures established 3rd or 4th secondary schools at the same time of the 2nd school establishment. This problem will lead to an overestimation of the impact of expansion of the 2nd secondary schools within those prefectures. To cope with this problem, we use a dummy variable that takes 1 if the 3rd school was established at the same time, and interact it with $School_{j,c}$ in Section 4.6.

In our baseline specification, we focus on the nine cohorts who turned age 13 years old between four years before and four years after the establishment of the second secondary school in the prefecture. We include a linear cohort trend, denoted $Trend_c^k$. This term controls for any smoothly varying cohort trends, such as local demand for secondary schools gradually changing over cohorts. This term also controls for the effects of ages to become an elite. An individual becomes more likely to reach a top position and listed in PIR in late 50s. The cohorts in our analysis (born in 1876-1892) were aged around between 40 and 60 during the year of the survey. Therefore, the probability of being listed in PIR has a negative linear trend from older cohorts to younger cohorts. We test robustness of this specification in Section 4.6, where we alternatively include squared trend term or birth-year fixed effect. We also include prefecture fixed effects, denoted by $\delta_j^{k,n}$, to control for the sampling bias toward prefectures with a larger population. We cluster the standard errors at a prefecture level.

4.3 Secondary school capacity

Using the specification in equation (1), we first check how much the number of secondary schools and their graduates increased after the establishment of the 2nd school. Since the 2nd school constructions were rapidly conducted, it is possible that the additional schools only divided the original school resources (such as school seats and teachers) without expanding the total school capacity in the prefecture.

Table 2 shows the results. As shown in columns 1-2, the number of public schools increased by 1.6 after establishing the 2nd school. The coefficient is above one because some prefectures established the 3rd school just after the establishment of 2nd school. In contrast, the number of private schools declined by -0.157. This is possibly because some

Table 2: Secondary schools, secondary school graduates, and teachers

	No. of Schools		No. of School Grads		No. of Teachers	
	(1) Public	(2) Private	(3) Public	(4) Private	(5) No.	(6) per Grads.
After	1.635***	-0.157*	4.305***	0.069	4.745***	-0.064*
	(0.220)	(0.089)	(1.135)	(0.149)	(1.634)	(0.033)
No. of prefecture-cohort	333	333	333	333	297	297
Mean Dep Before	0.96	0.20	4.63	0.12	16.44	0.45
Percent Effect(%)	170	-77	93	57	29	-14

Note: This table shows regression discontinuity design estimates of the short-run effects of the 2nd secondary schools on the number of public/private secondary schools and graduates. The estimates are based on the prefecture-year level data from the Ministry of Education Yearbook in 1892–1901, counting the number of public/private secondary schools, graduates from public/private secondary schools, and secondary school teachers in the prefecture (per 1,000 male births). For the number of graduates, we take a lag of four years to adjust for the time gap between school entrance and graduation. We use 37 prefectures that established the 2nd schools in 1893-1901. "After" is an indicator variable that takes 1 in the years after 2nd school was established in the prefecture, and takes 0 otherwise. We include a cohort linear trend term and prefecture fixed effects. "Mean Dep. Before" shows the mean of the dependent variable for the 4 years before the 2nd school establishment. "Percent Effect" indicates the percentage increase in dependent variables compared to the "Mean Dep. Before". Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

private schools were converted to public schools due to the reform that allowed more than one public school in a prefecture.

Columns 3 and 4 indicate the results for the number of graduates (per 1,000 male births) from public and private schools in the prefecture. Since the school year for secondary schools was five years, we take a lag of four years to adjust for the time gap between school entrance and graduation. The coefficient for public school graduates is positive with a magnitude of 4.3, corresponding to an improvement of the secondary school enrollment rate by 0.43 percentage points. Given that the number of graduates was 4.6 on average prior to the establishment of the 2nd school, this result implies that the number of graduates doubled. Note that the number of public schools more than doubled. This implies that second and third schools typically had a smaller capacity than the prefecture's first schools. The coefficient for private school graduates is small and insignificant, suggesting that the changes in the number of private schools have only negligible effect on overall capacity.

Columns 5 and 6 examine the impact of the total number of teachers in secondary schools. We find that the total number of teachers increased (column 5). However, the increase was

relatively smaller than that of school seats, leading to lower average number of teachers per students in the prefecture after the school construction (column 6). As Secondary School Order (1886) required the schools to employ only qualified teachers by specifying recruitment criteria, an increase of such teachers might have taken some years.

In summary, we find that the establishment of the 2nd school significantly increased the overall capacity of secondary schools in the prefecture. Since it almost doubled the existing school capacity, it is likely to have improved access to secondary education for potential candidates.

Additional evidence tells that the 2nd schools accommodated a relatively larger fraction of commoner students than the 1st schools. In 1898, in which we have data of the number of students by nobility, the fraction of commoners was around 70–80% in 2nd schools, which was 10-15% higher than 1st schools (Mitsuihara, 1898). This is consistent with Figure 2, indicating a large increase in the number of commoner students relative to samurai students after 1892.[12] One reason for this feature could be the location of the schools: these 2nd schools were more likely to be located in merchant towns rather than inside the castles, samurai residences, or former fief schools, compared to the 1st schools. The difference in school neighborhoods implies that these new schools were targeted and more accessible for commoners than the ones before. We will explore this feature more in Section 5.3.

4.4 Long-run effects on production of elites

We explore the long-run effects of secondary school expansion on production of elites by nobility. We estimate equation (1) for probability of becoming an elite for each occupational category.

Table 3 panel A shows the results for all elites including both samurai and commoners. Column 1 shows the effect on the number of all categories of occupational elites, who were either high-income business managers, public servants, or professional elites. Columns 2-4 report the results for each occupational category. The coefficients are positive and significant for the number of all occupational elites and the numbers of high-income managers and

[12]We do not run regression because we do not have information on the number of secondary school students by nobility for each prefecture between 1889 and 1905.

Table 3: Long-run impacts of additional secondary schools: baseline specification

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.353***	0.252***	0.029	0.125*
	(0.103)	(0.073)	(0.056)	(0.072)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.95	1.16	0.32	0.67
Percent Effect(%)	18	22	9	19
Panel B: Samurai				
After	2.121	0.341	1.680**	0.755
	(1.495)	(0.867)	(0.631)	(1.113)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.97	4.31	2.13	3.84
Percent Effect(%)	24	8	79	20
Panel C: Commoners				
After	0.356***	0.311***	-0.050	0.156*
	(0.129)	(0.102)	(0.075)	(0.085)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68
Percent Effect(%)	17	24	-17	23

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites. The estimates are based on the prefecture-cohort level data, counting the number of individuals listed in the PIRs (per 1,000 male births) by birth prefecture and birth cohort. We focus on the individuals who turned 13 years old in 1888–1905 and were born in 37 prefectures that established 2nd secondary school in 1893–1901. "Occupational Elites" are defined as individuals in the PIRs who are either "High-income Managers", "Professional Elites", or "Public Servants" as detailed in following. "High-income Managers" are defined as individuals in the PIRs who are employed in the private sector and pay any positive amount of income or corporate tax. "Professional Elites" are defined as individuals in the PIRs whose occupation is either scholars, lawyers, judges, or physicians. "Public Servants" are defined as individuals in the PIRs who work at the central government either as officers or politicians. For a detailed description of these outcome variables, see Section 3.2. "After" is an indicator variable that takes one if the cohort was 13 years old or younger when 2nd school was established in the prefecture, and takes 0 otherwise. We control for a cohort linear trend term and prefecture fixed effects. "Mean Dep. Before" shows the mean of the dependent variable for the four years before the 2nd school establishment. "Percent Effect" indicates the percentage increase in dependent variables compared to the "Mean Dep. Before". In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we examine samurai and commoner elites separately. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

professional elites. Creation of an additional school in a prefecture corresponds to increases of 0.35 high-income managers and 0.13 professional elites per 1,000 male birth population on average. These are large effects compared to the mean of the variables in baseline cohorts, amounting to 19-22% increases in such elites. For public servants, the effect is positive but

not significant, and the effect is relatively small compared to the baseline cohorts (9%). These results indicate that the establishment of secondary schools overall increased the number of elites especially in the private sector.

Next, we explore the results for samurai (in panel B) and commoners (in panel C). In panel B, we find statistically significant effects of an additional school on the production of public servants (79% compared to the baseline mean) from samurai family. Additionally, it is worth noting that the coefficient for samurai high-income managers is small and insignificant (column 2 in panel B). As shown in panel C, the coefficients for commoner high-income managers and professional elites are positive and significant. These coefficients are large: about a 23-24% increase compared to the mean of baseline cohorts. In contrast, the effect is small and insignificant for commoner public servants.

So far, the results suggest that the construction of additional schools led to an increasing number of elites who chose the same occupation as those of their families in the Tokugawa period. To quantify the aggregate effects of the new secondary schools, we calculate the percentage increase in the samurai share of occupational elites from the baseline cohorts. In the baseline cohorts, samurai represented 11.7% of elite business managers, 31.9% of elite public servants, and 26.9% of professional elites and (as Table 1 panel A). We find that the impact of having one additional secondary school in all prefectures in this analysis reduces the samurai share of elites by 1.3 percentage points for high-income business managers and 1.9 percentage points for professional elites, but increases the samurai share among public servants by 23.0 percentage points.

One possible reason for the occupation persistence could be the existence of family endowments shared within family members accumulated over generations, including knowledge, social networks, and norms. If secondary school education was complementary to these endowments, it would produce more elites choosing the same occupations as their families. Another reason may be the influence of their family members' desires and expectations to the sons to succeed their business. Since it was common during this period for the eldest son to take over the family business or profession, he may not have had the freedom to choose another profession. We explore these channels in Section 5.2.

Table 4: Long-run impacts of additional secondary schools: upward mobility

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: Samurai from elite families				
After	48.750	65.388	-11.553	2.722
	(55.643)	(45.158)	(30.273)	(22.071)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	74.70	37.07	25.44	20.69
Percent Effect(%)	65	176	-45	13
Panel B: Samurai from non-elite families				
After	1.761	-0.025	1.653***	0.705
	(1.383)	(0.809)	(0.604)	(1.068)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.52	4.09	1.98	3.72
Percent Effect(%)	21	-1	84	19
Panel C: Commoners from elite families				
After	6.949	4.080	9.315	-1.268
	(31.858)	(25.195)	(13.663)	(14.308)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	93.24	69.21	14.71	24.42
Percent Effect(%)	7	6	63	-5
Panel D: Commoners from non-elite families				
After	0.339***	0.297***	-0.060	0.153*
	(0.119)	(0.091)	(0.073)	(0.087)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.97	1.19	0.29	0.66
Percent Effect(%)	17	25	-21	23

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites. We use the same data and specification as in Table 3 except that we divide the sample by the fathers' listing status in the PIRs from 1903, 1915, and 1928. These results are presented separately for two categories: elites whose fathers are listed in PIRs (panel A, C), and elites whose fathers are not listed in PIRs (panel B, D). For a detailed description about this table, see Section 4.5. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

4.5 Long-run effects on vertical intergenerational mobility

In the previous section, we have documented intergenerational occupational persistence among the new elites produced by secondary school expansion. We next explore the impact of secondary school expansion on the vertical aspect of intergenerational mobility. In particular, we ask whether secondary schools helped the children of non-elite families climb the social ladder to become an elite (possibly within the same occupational categories as their families).

To explore this question, we compiled earlier editions of PIRs published in 1903, 1915, and 1928. If the father of an elite in our sample also had a socially distinguished career, the father is likely to be listed in one of these editions. These earlier editions of PIRs contain information on family registry information of the listed individuals including their children's names and birth years. Among the sons of all individuals listed in these earlier editions of PIRs, we find 3,865 sons (consisting of 962 samurai and 2903 commoners) who were born in the prefecture-cohorts focused in our main analysis (see Table E1 in the Appendix). Using name and birth year, we identified whether these sons are also listed in PIRs as elite and find 997 of them are.

Among the all occupational elites in our baseline cohorts, 4.5% of them had an elite father listed in the earlier editions (see Table 1 Panel B). While these numbers may be considered small, they are substantially higher than unconditional probability of having an elite father: note that PIRs select and list socially distinguished individuals representing about 0.1% of the total population.

In Table 4, the dependent variables are the probability of becoming an elite, conditional on having an elite father (samurai for panel A, commoners for panel C) or conditional on having a non-elite father (samurai for panel B, commoners for panel D), both in the unit of per 1,000 male births. The number of male births from elite fathers is calculated by the total number of male children of individuals listed in the earlier editions of the PIRs by birth cohort, prefecture, and nobility. The number of male births from non-elite fathers is approximated by the total male birth population subtracted by the number of male children of individuals listed in the earlier editions of the PIRs, by birth cohort, prefecture, and

nobility. Note that the small number of observations for elites with elite fathers requires caution in interpretation as it possibly leads to erroneous estimates.

For samurai elites, the coefficient for public servants from elite families is statistically insignificant and negative (Panel A column 3). Contrary, the coefficient for public servants from non-elite families is statistically significant and positive (Panel B column 3). Similarly, as for commoner elites, the coefficients for high-income managers and professional elites from elite families are statistically insignificant and small (relative to the mean of the dependent variable) (Panel C columns 2 and 4), while those from non-elite families are positive and statistically significant (Panel D columns 2 and 4). These results suggest that the secondary school expansion helped individuals from non-elite families to climb up the social ladders and join the top elites, rather than preserving elite status for those from elite families.

In summary, the results suggest that the construction of additional schools improved the intergenerational upward mobility within the occupations that their families were engaged in during the Tokugawa period. In the baseline cohort, Table 1 panel B shows that elite families represented 5.5% of elite business managers, 5.9% of elite public servants, and 2.8% of professional elites. Based on the above estimates, we find that having one additional secondary school in all prefectures in this analysis reduces the share of individuals from elite families by 1.0 percentage points for public sector elites and 1.0 percentage points for professional elites, and slightly increases the share by 0.2 percentage points for high-income business managers.

4.6 Robustness checks

Alternative specifications

We present several robustness tests using alternative specifications to our main equation (1) presented in Section 4.2. To account for cohort trends and age effects, we use a linear trend term in the main specification. Table B1 shows that the results are qualitatively unchanged even when we control for a quadratic trend term. As an alternative approach, we include birth year fixed effects and confirm that the results are largely consistent with our main results (see Table B2 for the result). In addition, the results are similar when we restrict the

sample cohorts to two years before and after the establishment (instead of four years before and after), as shown in Table B3.

Influence of military careers

Since the period of our study for long-run effects corresponds to the First World War, we check whether transitioning from/to military positions has any influence on our results. We first examine whether the secondary school expansion is related to an alternative educational track to become an elite military officer. In this period, preparatory military schools (Rikugun Yonen Gakko in Japanese) were open for students aged 13-15 years old, attracting those aspiring to become military servants.[13] After graduating these schools, these students entered regular military schools. Using the information on the final education in PIRs (which also list elite military officers), we count the number of individuals in PIRs who graduated from any kind of military schools. We also count the number of military servants listed in PIRs. As shown in Table B4, the establishment of additional secondary schools did not have any statistically significant impact on the number of military school graduates or the number of elite military servants.

Furthermore, to exclude the influence of retired military officers transitioning to high-income managers, we decomposed the sample of high-income managers based on military experience in their career history (Table B5). Elites with military experience does not influence our results.

Influence of peerages

We exclude the influence of the top elite families among samurai, peerages (*Kazoku*, e.g. children of former local lords) since they could inherit some elite government positions even after Meiji Restoration. We conducted the same analysis as the baseline specification after excluding the peerages, as presented in Table B6. These results are almost unchanged from our main result. This result is reasonable given that there are only a small number of peerages in the PIRs as well as in population.

[13]Preparatory military school was not for free. To enroll the preparatory military school, the applicants had to take physical examination, followed by academic examination (Japanese, Writing, Geography, History, Mathematics, Science).

Spillovers across prefectures

Students could apply and enter a secondary school in other prefectures from their original home. If such migration for a secondary school was prevalent, local students in prefectures that built 2nd school in earlier period might have been more likely to be crowded out. To the baseline specification, we add $Post_j$, a time-invariant dummy variable that takes 1 if the 2nd school was established after the median year of establishment among the sample prefectures, and its interaction with the treatment variable. The result shown in Table B7 suggests that schools established in earlier years tended to have greater treatment effects on elite production. This is inconsistent with the hypothesis that earlier schools were crowded out by entrants from other prefectures.

Establishing multiple schools in the same year

Since some prefectures established 3rd school at the same time as establishing 2nd school, the effect of 2nd school may be confounded with the effect of 3rd school. In Table B8, we include the interaction term with $TwoorMoreSchools_j$ which is a time-invariant dummy variable set to 1 if prefectures established two or more secondary schools at the same year of the 2nd school's establishment. The results on the coefficients of 2nd school remain largely consistent with our main results.

5 Possible channels

In this section, we explore several possible channels through which secondary school expansion led to an increasing number of elites with differential occupation choices by nobility. We discuss mainly three channels: (1) human capital accumulation, (2) family's expectation and comparative advantages, and (3) peer effects.

5.1 Human capital accumulation

We first explore the channels of human capital accumulation through learning of the secondary school materials and progression to higher education. The results described in

below highlight the importance of human capital accumulation as a channel for producing professional and public servant elites but not for producing high-income managers. As children of samurai families were more likely to progress to higher education compared to those of commoner families, this evidence suggests that occupational differences of samurai and commoners elites partly arose from their differences in progression to higher education.

Quality of learning about secondary school materials

The extent of learning about school materials at the secondary schools was likely to be constrained by the number of qualified teachers at the school. As shown earlier in Table 2, an increase of qualified teachers have sometimes been delayed after establishment of new schools. In Table C1, we add to the main specification the ratio of secondary school teachers to graduates (measured for each prefecture and year) and its interaction term with the treatment variable.[14]

For professional elites, for both samurai and commoners, the coefficients of treatment variable become smaller and insignificant after controlling for the interaction term, and the coefficients of the interaction term are positive and large. For public servants from samurai families, adding the interaction term also reduces the main coefficient. Contrary, for high-income managers the coefficients of treatment variable are similar to the baseline results without interaction terms, and the interaction term is small and insignificant. These results suggest teacher resources or the quality of education were important for producing professional and public servant elites but not so much for high-income managers.

Progression to higher education institutions

Graduating from a secondary school likely opened up the opportunities to enter higher education institutions such as Imperial Universities. About 30% of the elites in the PIR graduated from Imperial Universities (see Table E2 for more details). Graduating a secondary school was a requirement to apply for preparatory schools for Imperial Universities. Since the entrance to these preparatory schools was based on examinations and highly competitive

[14]We exclude 4 prefectures because those do not have information on the number of secondary school teachers.

Moriguchi et al. (2024), the quality of learning at the secondary school might have also mattered.

In Table 5, we count the number of elites by their highest level of education achieved. As we describe in Section 3.2, we classify elites into three categories: graduates from Imperial Universities (columns (1)–(3)), graduates from other higher education institutions (columns (4)–(6)), and those who did not proceed to higher education (columns (7)–(9)).

Columns (1)–(3) indicate that construction of secondary schools increased the number of professional elites (from commoner families) and public servant elites (from samurai families) who graduated from Imperial Universities. This result is consistent with the required levels of qualification to enter these professions. For instance, to become a central government official, one had to pass the Higher Civil Service Examinations. Physicians and judges were also licensed based on examinations that tested the level of knowledge qualifications. In addition, due to their academic achievements, Imperial University graduates were partially or wholly exempted from the Higher Civil Service Examinations and other selective national qualification exams to become high-ranking administrators, diplomats, judges, and physicians.

On the other hand, the coefficients for high-income managers (from commoner families) are significant and large only for those who did not proceed to higher education, as indicated in columns (1), (4), and (7). This result implies that becoming high-income managers did not require additional schooling after graduation of a secondary school.

Table 5: Educational path

	Imperial University			Other Higher Education			No Higher Education		
	High-income Managers	Public Servants	Professional Elites	High-income Managers	Public Servants	Professional Elites	High-income Managers	Public Servants	Professional Elites
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All									
After	0.040	0.071**	0.145***	0.040	-0.012	-0.012	0.201**	-0.025	0.019
	(0.044)	(0.035)	(0.048)	(0.055)	(0.027)	(0.039)	(0.074)	(0.027)	(0.025)
No. of prefecture-cohort	333	333	333	333	333	333	333	333	333
Mean Dep Before	0.204	0.212	0.389	0.273	0.085	0.234	0.850	0.073	0.147
Percent Effect(%)	20	34	37	15	-14	-5	24	-35	13
Panel B: Samurai									
After	0.745	1.707***	0.745	-0.709	-0.082	-0.020	0.305	0.055	0.305
	(0.618)	(0.511)	(0.618)	(0.550)	(0.300)	(0.491)	(0.578)	(0.169)	(0.578)
No. of prefecture-cohort	333	333	333	333	333	333	333	333	333
Mean Dep Before	1.343	1.455	1.343	1.415	0.435	0.966	1.553	0.238	1.553
Percent Effect(%)	55	117	55	-50	-19	-2	20	23	20
Panel C: Commoners									
After	0.023	-0.002	0.107**	0.062	-0.030	-0.012	0.225***	-0.018	0.051*
	(0.041)	(0.052)	(0.052)	(0.062)	(0.027)	(0.039)	(0.079)	(0.027)	(0.030)
No. of prefecture-cohort	333	333	333	333	333	333	333	333	333
Mean Dep Before	0.166	0.160	0.328	0.246	0.075	0.234	0.863	0.068	0.137
Percent Effect(%)	14	-1	33	25	-40	-5	26	-27	37

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites by post-graduation education paths. We use the same data and specification as in Table 3 except that here we count the number of elites by the type of final education institutions. Columns (1)-(3) show the results for the elites who graduated from the Imperial Universities, column (4)-(6) show the results for the elites who graduated from other higher education institutions, and column (7)-(9) show the results for the elites who did not proceed to any higher education. For a detailed description of these variables, see Section 3.2. In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

5.2 Influence of family

The results on the human capital channel do not explain why secondary schools produced commoner managerial elites and not commoner public servant elites. Here, we explore two possible types of influence of families on intergenerational occupation persistence. The first is family endowments, broadly defined, that are shared within the family members and accumulated over generations. These endowments possibly include knowledge, social networks, and norms, which could shape aspirations of the children. If the return to schooling (either from human capital accumulation, peer effects, or something else) was complementary to these endowments, an improved access to secondary school is likely to produce more elites choosing the same occupations as their families. The second is the influence of family members' expectations and social norms that the sons should take over the business of their parents.

To explore these two mechanisms, we examine heterogeneity of the treatment effects by 1) the eldest sons, who faced the pressures to take over the family business and profession, and 2) the other sons, who were mostly free from such pressures. In prewar Japan, the Civil Code (1898) stipulated that family heads exclusively inherit all the property and business from their fathers and that the eldest son or adopted son should inherit the family headships from their fathers. We focus on commoners in this analysis because samurai lost their privileges to inherit public sector jobs at the beginning of the Meiji period.

Table 6 shows the results. Since we do not have information about the birth order of the elites in the 10th edition of PIR, we exclude those who are only listed in the 10th edition in this analysis. We first confirm in Panel A column (1) that the coefficient for high-income managers based on this sample is similar to the baseline specification in Table 3.

Panel B shows the results for firstborn or adopted elites. The coefficient for high-income managers in column 1 is positive and statistically significant. In columns 2–4, we divide the high-income managers into three mutually exclusive groups: 1) those who have worked only in modern firms, 2) those who experienced both modern and traditional firms (which were likely to have existed from Tokugawa period), and 3) those who worked only in traditional firms. We find positive and significant effects not only for the managers who worked only in

modern firms (column (2)) but also for those who worked in both modern and traditional firms (column (3)). In contrast, the coefficient for managers who worked only in traditional firms is negative and statistically significant (column (4)). Furthermore, column 5 shows that the coefficient for the number of high-income corporate executives (a subset of high-income managers who are executives of the company) is positive and significant, suggesting that an increase in high-income CEOs drives the 70% increase in the number of high-income managers (0.214/0.300).

A possible explanation for these results is that those business elites upgraded their traditional style business that they inherited from their parents to modern style business by using the human capital or connections obtained in secondary schools. Another possibility is that they established new modern firms or became professional elites (column (7)) without inheriting the family business.

Panel C shows the results for elites who are second or subsequent-born sons in their family line. The coefficient for high-income managers is positive and statistically significant, and the magnitude is similar to the effect for firstborn and adopted sons. However, unlike firstborn and adopted sons, the second and subsequent-born sons are less likely to be executives and more likely to be working only in modern firms.

Notably, even for the second and subsequent-born sons, the coefficient for public servant elites is small and insignificant. This result implies that the family's expectation for succession alone does not explain the persistence of occupations for commoners elites. Overall, the results are consistent with the hypothesis that the family endowments plays a key role in inducing the persistence of occupations.

Table 6: Long-run impacts of additional secondary schools by birth order

	High-income Managers					Public Servants	Professional Elites
	All	Modern Business	Modern& Tradtional Business	Traditional Business	Executives	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Individuals who were listed in 8th or 12th edition of PIR (commoners)							
After	0.300***	0.189**	0.130**	-0.019	0.214**	-0.048	0.144*
	(0.098)	(0.082)	(0.057)	(0.029)	(0.091)	(0.075)	(0.077)
No. of prefecture-cohort	333	333	333	333	333	333	333
Mean Dep Before	1.21	0.62	0.41	0.18	0.82	0.28	0.65
Percent Effect(%)	25	31	32	-10	26	-17	22
Panel B: Eldest sons (commoners)							
After	0.359**	0.232*	0.240**	-0.113**	0.329**	-0.044	0.327**
	(0.148)	(0.117)	(0.094)	(0.044)	(0.128)	(0.074)	(0.124)
No. of prefecture-cohort	333	333	333	333	333	333	333
Mean Dep Before	1.43	0.67	0.51	0.24	0.97	0.30	0.67
Percent Effect(%)	25	35	47	-46	34	-14	49
Panel C: Younger sons (commoners)							
After	0.259**	0.156	0.047	0.056	0.127	-0.054	0.011
	(0.114)	(0.094)	(0.074)	(0.048)	(0.108)	(0.095)	(0.097)
No. of prefecture-cohort	333	333	333	333	333	333	333
Mean Dep Before	1.05	0.57	0.33	0.14	0.72	0.27	0.65
Percent Effect(%)	25	27	14	41	18	-20	2

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of commoner occupational elites by birth order. We use the same data and specification as in Table 3 panel C except that we divide the sample by the birth order of individuals, which is either firstborn or adopted elites (Panel B) or second or subsequent-born elites (Panel C). For a detailed description of this table, see Section 5.2. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

5.3 Peer effects

The above evidence suggests that human capital channel does not explain the impacts of the schools on producing business elites. Here, we explore possible channels related to peer effects, in particular, the influence of school neighborhoods (which influenced the share of commoners in the school and possibly the school culture) and sons of business elites. Overall, the results suggest that the peers mattered to some extent.

School neighborhoods

Motivated by the literature on the long-run effects of childhood neighborhoods (e.g. Chetty et al. 2014), we examine the influence of the new school's location, namely, whether the school that was built on the legacy of former fief schools and castles, or inside a merchant town with more commercial activities. This difference in school location also speaks to historical origins of the schools and characteristics of peers in our context as detailed below. The historical background of the location of secondary schools played significant roles in determining the social background of the students who enrolled in the schools and possibly the school culture. Before the Secondary School Order (1886) was implemented, school facilities, even public schools, relied heavily on private donations and investments. Both peerages and samurai contributed greatly to funding the education of their heirs. These donations were not only financial, but also included bequests of land and residences, and former fief schools in Tokugawa period.

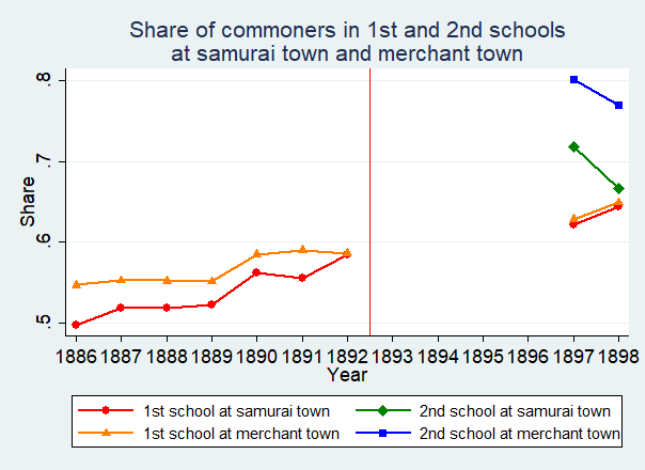
We classify the historical origins of schools by their locations. The first category is schools built on a former fief school or schools established within old castle grounds or samurai residences. As schools were typically supported by peerages and samurai, we call them as schools in "samurai towns". The second category is schools located in areas unassociated with peerages or samurai, typically in towns next to castles or merchant areas. We call them as schools in "merchant towns".[15] Out of the 37 prefectures in this study, 73% established their 1st schools in samurai towns. In contrast, 43% of the prefectures set up their 2nd school in samurai towns, suggesting that the 2nd schools were more likely to be located in

[15]Figure E1a demonstrates classification results across prefectures in a map.

merchant towns compared to the 1st schools.

The location of the schools influenced the student compositions of samurai and commoners, especially for the 2nd schools.[16] Figure 4 illustrates the average share of commoner students from 1886 to 1898 by 1st and 2nd schools and by school location.[17] The shares of commoner students in 1st schools were similar across school locations, those in 2nd schools were higher in merchant towns (78.6%) compared to those in samurai towns (69.3%).

Figure 4: Share of commoners and samurai in the first and second secondary schools



Notes: This figure shows the fraction of students from commoner families among all public secondary school students between 1886 and 1898, separately by 1st and 2nd schools and by school locations. The data is missing in 1893–1896. For a detailed description about this table, see Section 5.3.

This evidence provides two important implications. First, the 2nd schools encouraged more commoners to enroll relative to the 1st schools. This is consistent with our earlier evidence (Figure 2) that the increase in commoner students was grater than that of samurai students after the 2nd schools were started to be constructed.

Second, since the 2nd schools in merchant towns accommodated more commoner students than the schools in samurai towns, the effect of secondary schools might have been

[16]Kikuchi (2003) similarly observed the effect of the historical background of the area where the secondary school was established on the fraction of commoners in secondary schools.

[17]The primary sources of this data are derived from *GoinBunko Bunsho*, including the data from 1886 to 1892, and the secondary sources are from Mitsuihara (1898) including the data from 1897 to 1898. For this figure, prefectures lacking data on the number of both samurai and commoner students in the 1st and 2nd schools were excluded. That means prefectures without 2nd schools between 1897 and 1898 were removed from the calculation for each data point of this figure. Due to data limitations, we lack information for the years between 1893 and 1896.

heterogeneous depending on the location of the schools. To explore this conjecture, we interact the treatment variable with indicators of the 2nd school location in Appendix Table E3. For samurai elites (panel B), the coefficient for samurai public servants are positive and significant in both types of towns, but the coefficients are larger in samurai town (p-value for the difference = 0.149). For commoner elites (panel B), the coefficients for high-income managers are positive and significant with similar magnitudes in both towns. Regarding professional commoner elites, the coefficient in samurai towns is larger than that in merchant town (p-value for the difference = 0.155), possibly suggesting some influence of peers or school culture.

Classmate networks

The establishment of additional secondary schools could provide students with opportunities to interact with sons of influential business families that existed since the Tokugawa period. Connecting with such families may influence job-finding prospects as well as students' learning about potential business opportunities.

To explore this effect, for each prefecture and cohort, we construct a measure of the likely number of the sons of key business families by counting the number of either first-born or adopted sons who turned age 13 in the year and whose fathers resided in the prefecture and were listed as a business elite in earlier editions of PIRs published in 1903, 1915, 1928. In Table E4 in the Appendix, we add the number of such business families' sons in the cohort and the prefecture and its interaction terms with the treatment variable. For outcome variables, we focus on commoner business elites and we classify high-income managers into three types based on the type of firm: those exclusively working in modern firms, those working in both modern and traditional firms, and those exclusively working in traditional firms. Additionally, we examine the outcome of "executives" counting a subset of high-income managers who hold executive positions such as CEOs. All of these outcome variables exclude from their counts elites whose fathers are business elites.

The base coefficients of the treatment variable for manager elites working in modern business firms and as executives are positive and statistically significant, but the coefficient of the interaction term is negative or close to zero. In contrast, the coefficients for business

elites working in both modern and traditional firms show the opposite pattern: the baseline coefficient is zero, but the interaction term is positive and significant. These results imply that having sons of business elites in classmates may not influence establishment of new firms but may help upgrading the traditional style business to modern firms or finding new job prospects.

We should note that this analysis potentially suffers from a measurement error arising from mis-classification of true school networks. The measurement error may lead to underestimation of the interaction term if it has the property of white-noise. Furthermore, since the additional establishment of a secondary school might have split the pool of sons of business families into two schools, the new school construction could have mechanically reduced the chance of encountering business elites' sons as a peer student, again leading to underestimation of the coefficient of the interaction term.

6 Concluding Remarks

This study investigates the long-run impacts of a rapid secondary education expansion on occupational and upward intergenerational mobility in Japan in its early development stage. We take an advantage of using natural experiments in history to examine the long-run outcomes on social mobility. Our findings indicate that secondary education expansion led to an increased number of elites with non-elite fathers who chose same occupations as their ancestors. An exception was the rise in professional elites, who mostly came from commoner families after the school construction.

Exploring the underlying factors, we conclude that family influence, especially family endowments shared within the family, contributes to this persistence to some extent. For producing professional elites, human capital accumulation mattered the most. For public servant elites, both human capital accumulation and peer effects seem to have mattered. For business elites, personal connections built in the schools had some influence.

Our evidence in historical Japanese context indicates some resemblance to persistence of traditional institutions in shaping career choices throughout the world, for example, the Indian caste networks (Munshi and Rosenzweig, 2006). Our evidence implies that improving

access to post-elementary education benefits individuals to with non-elite fathers to climb up social ladders, but their occupational choices could remain the same as those of their fathers, possibly influenced by traditional institutions. That said, we need to draw some cautions to extend this evidence to current developing countries. For instance, the individuals who attended the newly constructed secondary schools are likely to be come from non-poor families who could afford time and school fees. Therefore, this study does not speak to the effect of improving the access to the school for poorest population in a society.

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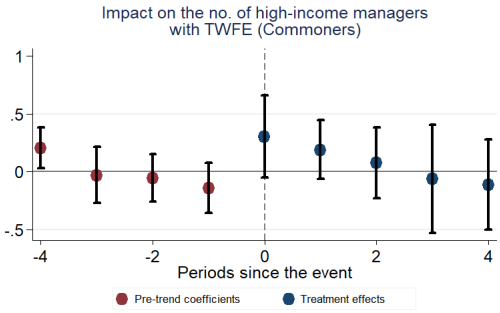
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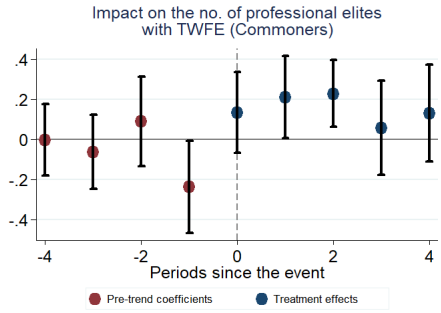
1 Appendix

1.1 Staggered DiD

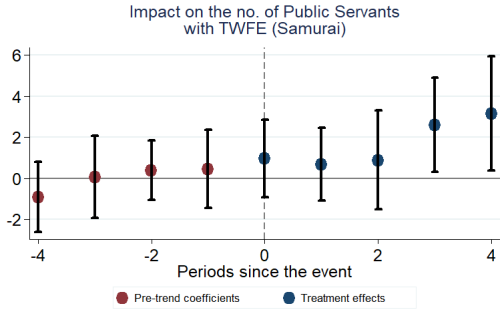
Figure A1: Staggered DiD



(a) High-income managers among commoners



(b) Professional elites among commoners



(c) Public servants among samurai

Notes: This figure presents the results of staggered DiD estimation of the long-run effects of the 2nd secondary schools on the number of samurai and commoner occupational elites. We use the method proposed by Callaway and Sant'Anna (2021) and implemented by csdid package in Stata. We focus on the individuals who turned age 13 in 1888–1905 and were born in 37 prefectures that established 2nd secondary school in 1893–1901. We use only not-yet-treated units as comparison. The estimates are based on the prefecture-cohort level data, counting the number of individuals listed in the PIRs (per 1,000 male births) by birth prefecture and birth cohort. We aggregate the estimates by cohort. Panel (a) shows the estimates for "High-income Managers" among commoners defined as individuals in the PIRs who are employed in a private sector and pay any positive amount of income or corporate tax. panel (b) shows the estimates for "Professional elites" among commoners defined as individuals in the PIRs whose occupation is either scholars, lawyers, judges, or physicians, and panel (c) shows the estimates for "Public Servants" among samurai defined as individuals in the PIRs who are either central government officers, politicians, or prefectural governors. For a detailed description of the outcome, see Section 3.2. The bars represent 95% confidence intervals.

Table A1: Staggered DID: pretrend test

	χ^2(df)		
	High-income Managers	Professional Elites	Public Servants
All	3183.39(32)	697.93(32)	12262.40(32)
Samurai	184.37(32)	788.51(32)	472.83(32)
Commoners	1184.40(32)	2498.18(32)	4825.10(32)

Notes: In this table, we test the null hypothesis that the pretrend in pre-treatment cohorts within a window from -4 to -1 equals 0. Degrees of freedom are in parentheses. The definitions of the outcome variables are the same as Table A1.

1.2 Different specification with RD approach

Table B1: Controlling for squared trend term

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.294***	0.205***	-0.002	0.111
	(0.068)	(0.075)	(0.055)	(0.073)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.95	1.16	0.32	0.67
Percent Effect(%)	15	18	-1	17
Panel B: Samurai				
After	1.769	0.068	1.749**	0.582
	(1.586)	(0.882)	(0.697)	(1.163)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.97	4.31	2.13	3.84
Percent Effect(%)	20	2	82	15
Panel C: Commoners				
After	0.298**	0.272**	-0.082	0.144*
	(0.129)	(0.103)	(0.073)	(0.082)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68
Percent Effect(%)	14	21	-27	21

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites. We use the same data and specification as in Table 3 except that we include a quadratic trend term here. In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we examine samurai and commoner elites separately. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B2: Controlling for birth year fixed effect

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.238**	0.174**	0.002	0.094
	(0.098)	(0.077)	(0.060)	(0.075)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.95	1.16	0.32	0.67
Percent Effect(%)	12	15	0	14
Panel B: Samurai				
After	1.914	0.086	1.729**	0.547
	(1.467)	(0.988)	(0.677)	(1.126)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.97	4.31	2.13	3.84
Percent Effect(%)	21	2	81	14
Panel C: Commoners				
After	0.224*	0.226**	-0.087	0.126
	(0.120)	(0.104)	(0.077)	(0.092)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68
Percent Effect(%)	11	18	-29	18

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites. We use the same data and specification as in Table 3 except that here we include a birth year fixed effect instead of using a linear cohort. In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B3: 2 years before and after

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.323*	0.297**	-0.020	0.094
	(0.162)	(0.112)	(0.080)	(0.107)
No. of prefecture-cohort	185	185	185	185
Mean Dep Before	2.01	1.20	0.36	0.66
Percent Effect(%)	16	25	-6	14
Panel B: Samurai				
After	1.997	0.199	1.194	1.303
	(2.214)	(1.323)	(0.929)	(1.586)
No. of prefecture-cohort	185	185	185	185
Mean Dep Before	9.09	4.70	1.83	3.89
Percent Effect(%)	22	4	65	34
Panel C: Commoners				
After	0.373*	0.391**	-0.099	0.130
	(0.191)	(0.150)	(0.092)	(0.137)
No. of prefecture-cohort	185	185	185	185
Mean Dep Before	2.15	1.30	0.37	0.68
Percent Effect(%)	17	30	-26	19

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites. We use the same data and specification as in Table 3 except that here we narrow the cohorts to two years before and after the establishment instead of four years before and after establishment. In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B4: Military-related outcomes

	Military Servants (1)	Military School Grads. (2)
Panel A: All		
After	-0.014	0.009
	(0.036)	(0.027)
No. of prefecture-cohort	333	333
Mean Dep Before	0.23	0.10
Percent Effect(%)	-6	9
Panel B: Samurai		
After	0.112	0.047
	(0.470)	(0.317)
No. of prefecture-cohort	333	333
Mean Dep Before	1.70	0.79
Percent Effect(%)	7	6
Panel C: Commoners		
After	0.005	0.005
	(0.046)	(0.031)
No. of prefecture-cohort	333	333
Mean Dep Before	0.21	0.08
Percent Effect(%)	2	5

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of military-related elites that here we restrict the sample of elites who graduate from military schools (column (1)), or higher-ranking of military servants (column (2)). We use the same data and specification as in Table 3. In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B5: Military vs. non-military high-income managers

	High-income Managers		
	All	Military	Non-military
	(1)	(2)	(3)
Panel A: All			
After	0.252***	-0.011	0.262***
	(0.073)	(0.015)	(0.072)
No. of prefecture-cohort	333	333	333
Mean Dep Before	1.16	0.06	1.11
Percent Effect(%)	22	-19	24
Panel B: Samurai			
After	0.341	-0.220	0.561
	(0.867)	(0.164)	(0.842)
No. of prefecture-cohort	333	333	333
Mean Dep Before	4.31	0.39	3.93
Percent Effect(%)	8	-57	14
Panel C: Commoners			
After	0.311***	0.002	0.309***
	(0.102)	(0.021)	(0.098)
No. of prefecture-cohort	333	333	333
Mean Dep Before	1.28	0.05	1.22
Percent Effect(%)	24	4	25

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of high-income managers. We use the same data and specification as in Table 3 except that here we restrict the sample of total high-income business managers (column (1)), high-income managers who have a military experience (column (2)) or high-income managers who do not have a military experience (column (3)). In panel A, we use the total number of high-income managers in samurai and commoner families. In panels B and C, we separately examine samurai and commoner high-income managers. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B6: Excluding Kazoku

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.395***	0.272***	0.029	0.150*
	(0.116)	(0.083)	(0.066)	(0.082)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.23	1.33	0.36	0.77
Percent Effect(%)	18	20	8	19
Panel B: Samurai				
After	1.704	0.032	1.489**	0.655
	(1.460)	(0.840)	(0.583)	(1.105)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.84	4.30	2.01	3.82
Percent Effect(%)	19	1	74	17
Panel C: Commoners				
After	0.356***	0.311***	-0.050	0.156*
	(0.129)	(0.102)	(0.075)	(0.085)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68
Percent Effect(%)	17	24	-17	23

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of high-income managers. We use the same data and specification as in Table 3 except that here we exclude Kazoku (former local lords, Damimyo and Kuge) from the samurai elites. In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B7: Prefectures established secondary schools in early years vs. later years

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.542***	0.334***	0.096	0.221***
	(0.127)	(0.082)	(0.061)	(0.081)
Post × After	-0.410***	-0.180*	-0.145***	-0.208**
	(0.117)	(0.089)	(0.044)	(0.085)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.95	1.16	0.32	0.67
Panel B: Samurai				
After	3.185*	0.848	2.383***	1.091
	(1.731)	(1.063)	(0.685)	(1.112)
Post × After	-2.316	-1.105	-1.531**	-0.733
	(1.710)	(1.212)	(0.583)	(0.923)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.97	4.31	2.13	3.84
Panel C: Commoners				
After	0.525***	0.389***	-0.010	0.250**
	(0.158)	(0.118)	(0.076)	(0.094)
Post × After	-0.368***	-0.171	-0.086*	-0.205**
	(0.135)	(0.116)	(0.046)	(0.100)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of occupational elites. We use the same data as in Table 3 but here we include "Post" that takes 1 if the 2nd school was established after the median year of establishment among the sample prefectures and its interaction term with "After". In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table B8: Prefectures with two or more secondary schools

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.285**	0.262**	0.013	0.044
	(0.127)	(0.097)	(0.063)	(0.095)
2 or more schools × After	0.134	-0.021	0.031	0.159*
	(0.136)	(0.094)	(0.052)	(0.089)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.95	1.16	0.32	0.67
Panel B: Samurai				
After	3.331*	1.464	1.834**	0.933
	(1.712)	(1.139)	(0.692)	(1.151)
2 or more schools × After	-2.355	-2.188*	-0.301	-0.347
	(1.709)	(1.137)	(0.645)	(0.912)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.97	4.31	2.13	3.84
Panel C: Commoners				
After	0.243	0.309**	-0.079	0.041
	(0.160)	(0.133)	(0.080)	(0.110)
2 or more schools × After	0.220	0.004	0.057	0.224**
	(0.146)	(0.119)	(0.047)	(0.099)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of high-income managers. We use the same data and specification as in Table 3 except that here we include "Two or More Schools" which is a time-invariant dummy variable set to 1 if the prefecture established two or more secondary schools at the same year of the 2nd school's establishment and its interaction term with "After". In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

1.3 Heterogeneity of treatment effect

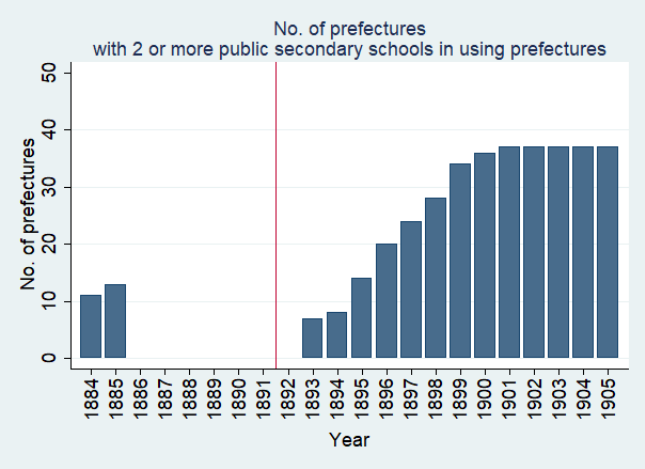
Table C1: Interaction term with the no. of teachers per graduates

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
After	0.254	0.226*	0.116	-0.023
	(0.188)	(0.127)	(0.092)	(0.108)
$\frac{\text{No. of Teachers}}{\text{No. of Graduates}} \times$ After	0.389	0.143	-0.249	0.451
	(0.489)	(0.340)	(0.214)	(0.299)
No. of prefecture-cohort	297	297	297	297
Mean Dep Before	1.97	1.20	0.30	0.66
Panel B: Samurai				
After	-0.181	-1.089	1.406	-1.113
	(2.088)	(1.425)	(1.212)	(1.453)
$\frac{\text{No. of Teachers}}{\text{No. of Graduates}} \times$ After	7.012	3.942	1.011	5.927**
	(5.215)	(3.958)	(2.813)	(2.478)
No. of prefecture-cohort	297	297	297	297
Mean Dep Before	8.70	4.33	2.01	3.63
Panel C: Commoners				
After	0.355	0.371**	0.077	0.050
	(0.247)	(0.160)	(0.127)	(0.153)
$\frac{\text{No. of Teachers}}{\text{No. of Graduates}} \times$ After	0.074	-0.088	-0.380	0.275
	(0.545)	(0.350)	(0.236)	(0.368)
No. of prefecture-cohort	297	297	297	297
Mean Dep Before	2.13	1.33	0.30	0.69

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of high-income managers. We use the same data and specification as in Table 3 except that here we include the ratio of secondary school teachers to graduates (measured for each prefecture and year) and its interaction term with "After". In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

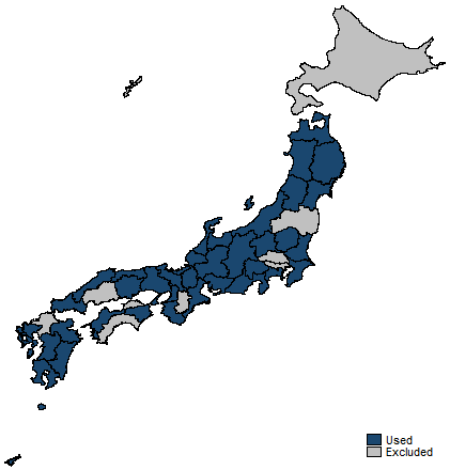
1.4 Figure

Figure D1: No. of Prefectures with Two or More Secondary Schools



Notes: This figure shows the number of prefectures with two or more secondary schools by year. We focus on the subset of prefectures that we use in our analysis (37 prefectures that established 2nd schools in 1893–1901).

Figure D2: Prefectures focused in the main analysis



Notes: This figure displays the map of all 47 prefectures in Japan. For our analysis, we focus on 37 prefectures (blue) that established 2nd secondary schools between 1893 and 1901 and did not simultaneously establish both 1st and 2nd schools.

1.5 Additional analysis

Table E1: Total number of sons of elite/non-elite families (born in the prefecture-cohorts in our RDD sample)

	No. of sons from elite families	No. of sons from non-elite families
All	3,865	3,107,904
Samurai	962	137,715
Commoners	2,903	2,970,189

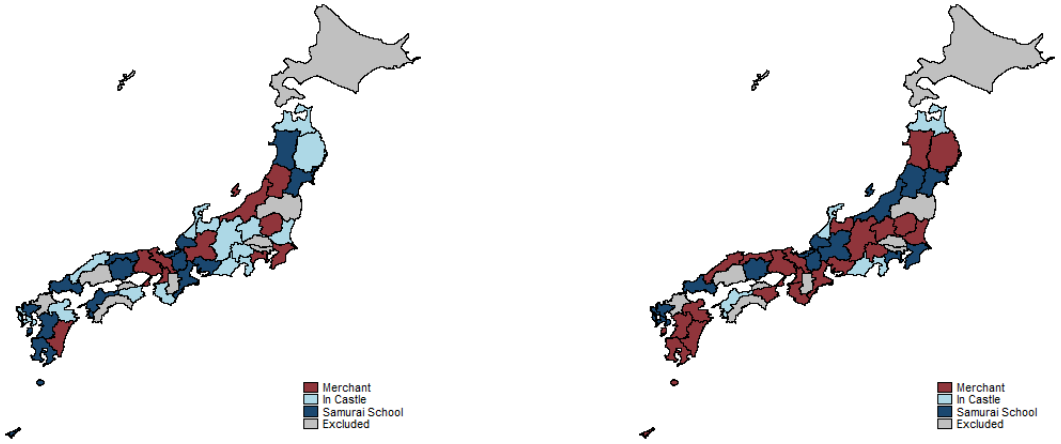
Notes: This table shows the number of sons of elite and non-elite families who were born in the prefectures and cohorts we use in our main analysis (37 prefectures × 9 cohorts). "No. of sons from elite families" is the total number of sons of individuals who are listed in PIRs published in 1903, 1915, and 1928. "No. of sons from non-elite families" is calculated by subtracting "No. of sons from elite families" from the male birth population.

Table E2: Share of individuals who graduated from higher education institutions among occupational elites

	No. of Elites	Share among Elites
Panel A: All Occupational Elites		
All Occupational Elites	17,527	1
Panel B: Graduates of Higher Education Institutions among All Occupational Elites		
Imperial University	5,307	0.30
Other Higher Education	4,116	0.23

Notes: This table shows the number and share of elites who were born in 1879–1892 by final education institutions. Column 1 shows the number of elites and column 2 shows the share of elites by final education institutions.

Figure E1: Town classification in 1st schools and 2nd schools



(a) 1st schools **(b)** 2nd schools

Notes: This figure shows a classification of prefectures depending on the location of 1st/2nd secondary schools. We use three categories: first, schools were built on a former fief school ("samurai schools") second, schools established within old castle grounds or samurai residences ("in castle"), third, schools located in areas unassociated with Kazoku or samurai, but typically in towns next to castles or merchant areas ("merchant towns"). Panel (a) shows the classification of prefectures depending on the location of 1st school. Panel (b) shows the classification of prefectures depending on the location of 2nd school.

Table E3: Commoners in Samurai Town vs. Merchant Town

	All Occupational Elites (1)	High-income Managers (2)	Public Servants (3)	Professional Elites (4)
Panel A: All				
Samurai Town × After	0.400***	0.230**	0.053	0.180*
	(0.138)	(0.094)	(0.063)	(0.093)
Merchant Town × After	0.318***	0.268***	0.010	0.084
	(0.108)	(0.078)	(0.061)	(0.077)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	1.95	1.16	0.32	0.67
p-value (Samurai Town × After = Merchant Town × After)	0.534	0.671	0.412	0.298
Panel B: Samurai				
Samurai Town × After	2.317	0.406	2.213**	0.365
	(1.931)	(1.054)	(0.850)	(1.217)
Merchant Town × After	1.972	0.291	1.274**	1.052
	(1.578)	(1.040)	(0.538)	(1.173)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	8.97	4.31	2.13	3.84
p-value (Samurai Town × After = Merchant Town × After)	0.848	0.923	0.149	0.455
Panel C: Commoners				
Samurai Town × After	0.413**	0.299**	-0.047	0.241**
	(0.156)	(0.134)	(0.073)	(0.102)
Merchant Town × After	0.312**	0.319***	-0.052	0.092
	(0.141)	(0.104)	(0.083)	(0.093)
No. of prefecture-cohort	333	333	333	333
Mean Dep Before	2.08	1.28	0.30	0.68
p-value (Samurai Town × After = Merchant Town × After)	0.489	0.868	0.925	0.155

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools on the number of samurai or commoner occupational elites by school location. We use the same data and specification as in Table 3 panel (c) except that we divide the sample by the location of the 2nd school in the prefecture, which is either a samurai town (panel A, C) or a merchant town (panel B, D). For a detailed description about this table, see Section 5.3. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.

Table E4: Long-run impacts of additional secondary schools: classmates whose fathers were elites

	High-income Managers				
	All	Modern Business	Modern & Traditional Business	Traditional Business	Executives
	(1)	(2)	(3)	(4)	(5)
Commoners					
After	0.231	0.275**	0.008	-0.053	0.193*
	(0.150)	(0.122)	(0.069)	(0.033)	(0.108)
No. of Business Elites × After	0.159	-0.140	0.289**	0.010	0.073
	(0.262)	(0.197)	(0.133)	(0.062)	(0.167)
No. of prefecture-cohort	333	333	333	333	333
Mean Dep Before	1.19	0.60	0.39	0.20	0.78

Notes: This table shows regression discontinuity design estimates of the long-run effects of the 2nd secondary schools. We use the same specification as in Table 3, but here we include sons with business elite fathers per 1,000 male births, which counts the number of oldest sons (either firstborn or adopted) whose fathers are listed as business elites in PIRs published in 1903, 1915, or 1928 by prefecture and cohort. Additionally, it incorporates an interaction term with "After". In panel A, we use the total number of elites in samurai and commoner families. In panels B and C, we separately examine samurai and commoner elites. We exclude the sons of business elites from the calculation of the dependent variables. Standard errors reported in parentheses are clustered at the prefecture level. ***, **, and * mean significance at the 1%, 5%, and 10% levels, respectively.