Do Middle and Vocational Schools Foster Meritocracy? Historical Evidence from Japan*

(Preliminary and Not for Citation)

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Abstract

Around the 1890s in Japan, middle and vocational schools underwent a large and rapid construction process. This study examines how this rapid period of school construction affected the country's transition from a feudal society, in which noble families dominated public sector jobs, to a meritocratic society, in which commoners gained the opportunity to become elites. By exploiting the variations across cohorts and regions in the availability of schools, I examine the extent to which improved access to middle and vocational school education affected occupational outcomes by social class. Occupational outcomes are measured by the number of elites on the Japanese Personal Inquiry Records, which list the biographies of notable people and high taxpayers in the 1920s–1930s, and the number of successful candidates who passed the exam for becoming central government officers. I find strong evidence of the positive effect of middle school construction on the production of commoner elites in both the private and the public sectors as well as increases in tax payments by commoners, with mixed evidence of these for noble elites.

Keywords: Social Mobility, Middle School, Vocational School, Economic Development, Economic History, Japan

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1 Introduction

Does providing children with better access to education improve their social mobility? In many societies around the world, we observe persistent inequality over generations in societies with uneven distribution of beneficiaries of education. Indian Caste system and US racial inequality are two prominent examples. Growing empirical studies of intergenerational mobility also suggest that children's neighborhoods are important determinants of social mobility (**??**). Yet, we know little about the causal effects of education on social mobility. In theory, public investment in schools may improve the educational attainment and therefore the subsequent earnings of children in families facing credit constraints. However, schools might attract only those children from higher social classes for various reasons. On the one hand, the return to education in a discriminatory society may be too low for certain social classes to invest. On the other, even in a non-discriminatory society, families' preference for education or perception of its value can differ by social class, which may result in the persistence of educational attainment across generations.

The setting of the late 19th century in Japan provides a rare experimental setting to investigate the impacts of schools on intergenerational educational mobility by social classes who used to have received different levels of education. In this paper, I investigate the extent to which middle school and vocational school construction in Japan around the 1890s affected the occupational outcomes of children from two social classes, children from noble families whose parents received high education and children from commoner families whose parents did not.

In the late 19th century, immediately after the Tokugawa shogunate government in the Edo period had been removed from office, the new Meiji Restoration government abolished the feudal regime and started to construct a modern education system. Under the previous feudal regime, only children in noble families, who dominated public sector jobs, received a middle or higher education. Soon after the Meiji Restoration, however, the new Meiji government deprived nobles of the privilege of exclusively holding public sector jobs. Nevertheless, for some decades after this event, nobles still held a much higher proportion of elite public jobs compared with their percentage of the population. The new government initiated education reform through the promulgation of a law named (*Gakusei*) in 1872, which aimed to establish a modern education system based on Western education systems. After the large and rapid construction of elementary schools in the 1870s, the central government regulated public middle schools by allowing only one school to be established in each of the 47 prefectures in 1886. In 1891, the central government deregulated the

order and allowed local governments to construct more than one middle school, and this resulted in the establishment of nearly 200 middle schools during the 1890s. There were also gradual establishments of vocational schools specializing in commerce-, technology-, and agriculture-related fields. In 1894, the central government started to subsidize the construction of vocational schools, which led to an increase in their number from 23 in 1892 to 366 in 1902[1].

In this study, I particularly analyze the extent to which the wide-scale construction of middle schools affected the production of "successful" elites, including the executives of large companies, high taxpayers, politicians, notable scholars, and high-ranking public officers and military officers. The number of successful elites is constructed from *Jinji Koushin Roku*, the Japanese Personal Inquiry Records (JPIR hereafter) published in 1928, 1934, and 1939 (the eighth, 10th, and 12th editions, respectively). The successful elites on JPIR represented around 0.3% of the population of Japan. These data provide rich information on such individuals including their birth prefectures, birthdates, schools, firms, job titles, social class (noble or commoner), and tax payments. In particular, I count the number of people on the JPIR in each occupational category by their birth regions and cohorts and use this as an outcome variable.

By simply comparing cohorts before and after new middle school and vocational schools were built, I find that the likelihood of being listed on the JPIR increased for younger cohorts of commoners and decreased for younger cohorts of nobles. This finding appears to be a result of more commoner elites taking high-ranking public jobs in place of nobles. I confirm that an increasing number of elites in younger cohorts appear on the JPIR as having higher educational attainment, after controlling for age and regional economic trends.

Next, I exploit the variation in the timing of school construction across regions and cohorts to identify the extent to which constructing middle schools affected elite production. In other words, I measure the number of people on the JPIR born in the region and examine whether this differs across cohorts depending on the availability of schools in the region at their school eligibility age.

The results from the cohort/prefecture-level panel regressions that control for the cohort and prefecture fixed effects are as follows. First, for schooling outcomes, the results imply that increasing the supply of middle schools positively affected the number of both commoner and noble elites enrolled in higher education, university, and high schools. The construction of commerce schools significantly increased the number of commoner elites on the JPIR who went to commerce schools. The construction of technical and agricultural schools influenced elites' enrollment in technical

[1]This number includes vocational supplementary schools.

schools, possibly because of the small number of observations in the JPIR among such occupations.

For occupational outcomes, the results suggest that the construction of middle schools in a region raised the number of people born in the region who appeared on the JPIR as business managers, family business owners, corporate employees, engineers, elite public officers, elite military officers, or politicians. The estimated effects are stronger for commoners than nobles. The construction of commerce schools also appears to have had positive effects on producing business managers and corporate employees from commoner families. In addition, the results using tax payments by these elites indicate that the construction of both middle schools and commerce schools positively influenced the total income of and corporate tax payments by commoners, while the construction of middle schools positively affected income tax payments by nobles.

This study contributes to the literature on the return to schooling and social mobility. While many studies investigate the return to schooling, most use cross-sectional data to evaluate the correlation between schooling years and occupational outcomes. The major problem of such studies is that selection is based on unobserved ability, which might result in a positive correlation between schooling choice and occupational outcome. To address endogeneity concerns, a growing number of empirical studies thus exploit the exogenous variations in access to education (e.g., **????**). The present study employs a similar identification strategy to that of **??**, who draws evidence from the construction of a large primary school in Indonesia that the increased supply of primary schools leads to an increase in the wages of students. However, evidence based on shifting the supply of schools to examine the extent to which middle or higher education affects occupational outcomes is scarce. On the return to general and vocational secondary education, **?** reviews cross-sectional studies and concludes that the rates of returns to general secondary education are not significantly higher than the returns to secondary vocational schools. Studies have also examined the degree to which the expansion of higher education affects equality in educational attainment in Italy (**?**) and in Sweden (**?**).

This study also contributes to the literature on social mobility, or intergenerational mobility, by providing evidence on the causal effects of schooling on these issues. While **??** document the importance of children's neighborhood characteristics including education quality for intergenerational mobility, they do not use exogenous changes in education supply. Indeed, among studies based on exogenous variations in access to education, evidence on the heterogeneous effects of schools by social background is limited. One exception is the study by **?** that shows the larger marginal effects of schooling for children in socially disadvantaged families in Sweden.

Building on the previous studies on Japanese historical studies about the period pre-WWII, this paper offers new insights on how constructions of post-elementary schools influenced the formation of high income earners. (**?**) document the very high income concentration in the period with around 18% of total income held by the top 1% income earners. This evidence marks an importance of explaining how the nations' top tier had originated. This study is also built on the papers describing the role of education for process of Japanese industrialization (**??**).

The remainder of the paper is organized as follows. In Section 2, I describe the establishment of the new school system in late 19th century Japan. In Sections 3, 4, and 5, I describe the data, empirical strategy, and empirical results, respectively. I end the paper with concluding remarks in Section 6.

2 Background

The study period is the decades after the Meiji Restoration in 1868 when the newly established Japanese government started to modernize the country's institutional systems. Before the Meiji Restoration, for around 250 years of the Edo period governed by the Tokugawa family, the social hierarchy was highly stable and intergenerational mobility was low. Noble families dominated most public sector jobs including roles in the military and police. Only those children born into a noble family attended higher education in order to succeed their family clans. Similarly, the core of business education including basic literacy and arithmetic was taught within families that run large businesses (**?**). For example, a child born into a merchant's family typically learned business from its family and became a merchant by taking over the family business. As such, four occupation classes were strictly segregated in terms of intergenerational mobility and marriage: noble, business, craft makers, and farmers.

While traditional temple schools (*"Terakoya"*) existed across Japan, which taught basic literacy and arithmetic to all social classes, it was only in large business-oriented cities that such temple schools had programs customized for business education (**?**). The traditional view was that business was not something to be learnt at school (**?**). Indeed, any education necessary to choose other occupations than working for the family clan was highly limited. For instance, a boy born into a farmer's family rarely became a businessman, a scholar, or a high-ranking military officer before the Meiji Restoration.

Soon after the Meiji Restoration, the new government abolished the privileges of nobles. First,

it published the Conscription Law (*Chou Hei Rei*) in 1873, by which nobles lost their exclusive right to hold high-ranking military positions. Moreover, in 1876, the Abolition Measure of the Hereditary Stipend (*Chitsuroku Shobun*) eliminated the special privileges of nobles to receive an income from the government. However, even after nobles were deprived of these privileges, elite public jobs continued to largely taken by nobles. According to **?**, the proportion of nobles among high-ranking central government officers, *Han-nin-kan* and *Jun-nin-kan*, was 60% in 1898, while the proportion of nobles in the population was only around 5%.

In 1872, the new Meiji government initiated education reform by publishing *Gakusei*. The law described the main concept of a modern education system and laid out a plan to construct elementary schools, secondary schools, and universities based on a zoning system adopted from France. In particular, it emphasized that contrary to the traditional social norms that one's family's social class determines one's occupation, educational achievement will now determine one's occupation and future income[2]. The law was also the first to describe the ideas of schools providing an education customized to each type of occupation, such as business, manufacturing, medical, and law, stating that individuals should choose their education and occupation according to their ability. This idea is considered to be the basis for modern-day vocational schools that specialize in business, technology, and agriculture, which were more formally institutionalized and constructed rapidly in later years.

The Japanese educational zoning plan in *Gakusei* aimed to divide the country into seven large regions, each consisting of 32 middle regions that had 210 small regions and to place one university, one middle school, and one elementary school in a large region, a middle region, and a small region, respectively. Although the plan was rather 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 first education law was modified and replaced by the 1879 Education Order (*Kyouiku Rei*) preserving its main concepts.

For the first decade after the publication of *Gakusei*, the Ministry of Education used most of its resources to construct elementary schools following the school zoning plan (The Ministry of Education, Culture, Sports, Science and Technology, 1981). Elementary school education started at age six and lasted for eight years[3]. According to the Ministry of Education yearbooks (*Nihon Teikoku Monbushou Nenpo*), the number of elementary schools reached 30,000 in 1883[4]. The

[2]Such concepts are summarized in the words, "Gakumon wa Miwotateru no Zaihon" (*Gakusei* 1872).

[3]According to *Gakusei*, lower elementary school lasted for four years and upper elementary school for four years

[4]The establishment of elementary schools was also rapid. The number of elementary schools was already 12,558

number of schools later declined as the government restructured the elementary school system[5]. For this reason, in reality, school budgets were mostly funded by mandatory citizen payments (43%), donations (19%), subsidies from the central government (12%), and schooling fees (6%) (The Ministry of Education, Culture, Sports, Science and Technology, 1981).

Although this series of elementary school construction in the early period was important, it is not the focus of this study because of the span of the outcome data. As explained in the Data section, data on schooling outcomes are available only for 1935–1939. Therefore, those people who experienced a rapid increase in the number of elementary schools (i.e., cohorts born around 1868) were more than 60 years old in the data. Considering the life expectancy of people in this period, most of the affected cohorts had already died, which would cause small sample and attrition problems. In this study, I therefore focus on the effects of school construction that occurred in the 1880s and 1890s, the second and third decades after the publication of *Gakusei*. These mostly concern the construction of secondary and vocational schools as described next.

2.1 Middle schools

The plan in *Gakusei* on middle schools was vague, and the actual formation of secondary school systems had to wait until 1886 when the government published the 1886 Middle School Order (*Chugakkou Rei*). Middle schools (*Jinjyo Chugakkou*) provided five years of education for those above 12 years who had finished elementary school.

The law in 1886 specified that every one of the 47 prefectures should have at most one middle school funded by the local government. This regulation limited the number of middle schools to be mostly constant during 1886 and 1891. The number of middle schools then started to increase rapidly when the government published the 1891 Revision of the 1886 Middle School Order. One major revision was that more than one middle school per prefecture could be funded by the government. As shown in Figure 1, the number of middle schools rapidly increased from around 50 to 250 within a decade.

Middle school enrollment was still limited to a small fraction of the total population in this period. For example, the fraction of middle school entrants in 1895 in the total number of births of

in 1873 with 1,145,802 students enrolled, representing an enrollment rate of 28.1%. By 1878, the enrollment rate had reached 41.3% (Ministry of Education, 1937).

[5]The government published the "Elementary School Law" (*Shougakkou Rei*) in 1886. Another potential reason for the closures was a lack of funding. Indeed, elementary schooling fees set in the law were too expensive for middle-income families (The Ministry of Education, Culture, Sports, Science and Technology, 1981).

the cohort born in 1883 was 2.8[6]. As the number of schools increased, this fraction reached 5.3% in 1902. Therefore, middle schools were considered to be institutions for high education in this period.

Attending middle schools might have indirect effects on occupational choices through bridging to higher education such as high schools and advanced vocational schools. One year after graduating middle schools, 13% went to high schools, 26% went to advanced vocational or specialized schools, and 27% started to work, according to he Ministry of Education's yearbooks (*Doufukenritsu Gakkou Hyou*) in 1901.

High schools, which were called higher middle schools in this period, were constructed to provide two years of additional education after middle school. These schools aimed to prepare students for entering university. One high school was constructed in each of the seven zones. I treat these schools as high schools separately from middle schools and control for the number of such schools in my analysis.

2.2 Vocational schools

Vocational schools were classified as middle schools in *Gakusei*. Although the concepts were published in *Gakusei* and a few private schools were established, such schools were not institutionalized before 1884. There were three types of vocational schools in this period: commerce, technical, and agricultural schools. For example, one of the first commerce schools aimed at general commerce education[7] was established as a private school by Yurei Mori in 1875. This school later became a national school, *Tokyo Shouka Diagaku*, the predecessor of the current Hitotsubashi University (**?**). Technical and agricultural schools were also constructed before 1884. However, the number of commerce, technical, and agricultural schools was still limited to just nine in 1883.

After 1884, the Meiji government started institutionalizing vocational schools by administrating and establishing them under the umbrella of the Ministry of Education and setting relevant legal frameworks (**?**). In 1884, it enacted the General Regulations for Commerce Schools (*Syougyou Gakkou Tsusoku*) that institutionalized commerce schools in Japan for the first time by specifying the curricula, years, and days of schooling and qualification of admitted applicants for basic and advanced commerce schools. For basic schools, schooling lasted for two years and the curriculum

[6]These numbers were calculated from statistics on birth records (*Nihon Zenkoku Toguchi Hyo*) and the Ministry of Education's yearbooks (*Doufukenritsu Gakkou Hyou*)

[7]The first commerce school in Japan is considered to have been the training institution for bankers in the Bank of Japan, *Kokuritsu Ginkouin Youseijyo*, established in 1874 by the Ministry of Finance (**?**).

included reading, writing, arithmetic, bookkeeping, business writing, business geography, products, business economics, and practical business training. Eligible students were at least 13 years and had finished lower elementary school[8]. On the contrary, advanced schools offered three years of schooling and the curriculum included Japanese and Chinese literature, calligraphy, arithmetic, algebra, bookkeeping, business writing, business geography, painting, products, business economics, business history, business laws, practical business training, and English. Eligible students were aged at least 16 years, which implies that potential students had to have a level of qualification comparable to finishing a middle school. According to **?**, advanced commerce schools were only available in Tokyo prefecture. Overall, the period from 1884 to 1893 witnessed the institutionalization of commerce schools; however, the number of commerce schools was still limited in this period because of the lack of private funding for school construction.

In 1893, a new Education Minister, Kowashi Inoue, took office. Inoue acknowledged the importance of industrial education and strived to expand vocational schools. First, to expand the area of basic vocational education, the government issued the 1893 Vocational Supplementary School Regulations. It created and institutionalized a new type of vocational school for young people[9]. The entrance requirement was graduation from at least an ordinary elementary school and being at least 10 years. The subjects included morals, reading, calligraphy, and arithmetic along with the usual vocational subjects. The length of the course was three years or less, and night school was also recognized. These supplementary vocational schools aimed to teach the knowledge and skills relevant to the vocations that would be followed by their students.

Second, in 1894, the government promulgated the Law for Subsidizing Vocational Education Expenses from the National Treasury that stated that the central government would provide an annual subsidy of 150,000 yen for the construction of commerce, technical, and agricultural schools **?**. The law came into force on September 1, 1894. The rapid construction of commerce and technical schools followed: as shown in the left-hand panel of Figure 2, the number of vocational schools increased from 23 in 1892 to 366 in 1902[10]. **?** describes this law as "(t)he law which had the most epoch-making impact on the development of vocational education in Japan and the greatest impact on the future development of industry."

[8]Lower primary school education was the first half of the eight years of elementary school education.

[9]Previously, few similar schools were treated as schools named only in Article 9 of the 1890 Elementary School Order.

[10]altogether 48 of the commerce schools were public schools in 1904.

3 Data

The data for this study were constructed from three sources: (1) data on the number of schools by type, year, and prefecture; (2) data on the elites listed on the JPIR with their information on birth years and birth prefectures; and (3) data on manufacturing GDP by prefecture and year to be used as control variables.

3.1 Number of schools

The data on the number of schools in each prefecture and year between 1876 and 1906 were constructed by digitizing records from the Ministry of Education yearbooks. For every year from 1873, the Ministry reports the number of schools by type in each of Japan's 47 prefectures[11], which are administrative divisions consistent with the school zoning plan. Figure 1 shows the number of middle and vocational schools by year.

3.2 JPIR

The data on the schooling and occupational outcomes of individuals born around the study period were constructed from the eighth, 10th, and 12th editions of the JPIR. The JPIR records the names, birth prefectures, schools, firm/institution names, and occupations. In this study, I interpret those elites listed on the JPIR as individuals who achieved something sufficiently noteworthy to become well known. In this study, I use the number of such elites that achieved a certain educational attainment or that became a certain professional in each birth cohort/prefecture bin as the outcomes of school construction in the prefecture.

For example, the eighth edition of the JPIR states the sampling criteria thus: "The sampling targeted Japanese men living in Japan or abroad who are well known to the general public or commerce society. Among them, for businesspeople, we sampled people based on *Nihon-Shinshi-Roku* (directory of Japanese nobles and notable people), *Ginkou-Kaisya-Youroku* (bank directory), *Zenkoku-Syogaisya-Yakuin-Youroku* (Japanese company manager directories), and *Teikoku-Ginkou-Gaisya-Youroku* (Bank of Japan directories). For public officers, we used the employment records from the government. We checked the information with *Koseki-touhon* (national birth records). As for the types of companies, we provided information on whether the company is registered as

[11] The number of commerce and manufacturing schools started to be reported only after 1885, which may reflect the school law in 1884 that institutionalized commerce schools. For the JPIR before 1885, I use a book published by the Ministry of Education titled *Doufukenritsu Gakkou Hyou* that provides information on the establishment year of each school that existed in 1889.

a limited company, joint venture, general partnership, or mutual company." The public officers sampled in the JPIR are presumably only high-ranking officers (elites) and include those in the military.

The eighth, 10th, and 12th editions of the JPIR were digitized under a research project funded by the Japanese government[12]. As expected, the 1939 JPIR lists more younger cohorts than the 1928 and 1934 records, supposedly reflecting the ages of being successful in one's career (see Figure A1 in the Appendix for the number of people by cohort in each edition of the JPIR). I used the pooled data of the eighth, 10th, and 12th editions, focusing on the cohorts born between 1876 and 1888, namely just before and after the large-scale construction of middle and vocational schools. A relatively large number of them appear on all three records. For regions, I focus on 45 prefectures in Japan (excluding Hokkaido and Okinawa for which I could not find manufacturing GDP estimates for the period of analysis). After restricting attention to these cohorts and regions, the pooled dataset featured 44,970 cases.

The JPIR provides information on one's final school attended, from which I identified whether it was a high school, university, commerce school, or technical school. A commerce school in this period was called a *Shou-Gyou-Gak-Kou* (Gak-Kou means "school") where each syllabus is written in a corresponding Chinese character. Commerce schools are identified by containing the Chinese letter *Shou* in the school name[13]. Similarly, for commerce schools called *Kou-Gyou* schools, I used the letter *Kou* meaning technology. The notion of high school enrollment comes from the indication of the letter (*Kou*) or *Tei*, which is associated with the name of two national universities [14]. Similarly, university was identified by the word *Tei* in textitTei-koku meaning imperial as in the University of Tokyo. The first and only university in Japan at that time was named Tokyo Imperial University. High schools were identified by the word *Kou*in textitKou-Tou-Gak-Kou meaning high school.

It is worthwhile emphasizing that the information on education taken from the JPIR is likely to be incomplete. The data only contain information on the final school attended. Therefore, if a person attended a commerce school after a secondary school, it is difficult to identify enrollment in the secondary school directly. Note also that the information on school name might be missing. Unfortunately, the criteria of listing this school information is unknown. It is likely that school

[12]The digitization project was managed by Hidehiko Ichimura and Yasuyuki Sawada, who kindly shared the digitized data with the author.

[13]Another type of school also has the word *Shou*, namely business shipping schools. I identified these schools by the word *Fune* meaning ship and excluded them from the set of commerce-related schools.

[14]These two national universities are named *Tei Koku* University.

names were not listed if the school was a lower-level education (only small proportion of individuals report the final education as elementary school). Figure A2 in the Appendix shows the rising rates of school enrollment by birth cohort among the elites listed on the JPIR during this period.

To measure occupation, I used information on occupation and firm/institution name on the JPIR. Table 1 shows the correspondence of the Japanese words and the occupation classification. To identify business elites, I searched for people who worked at or owned a formal company and informal company in different ways. A set of people working for or owning a formal company were identified simply by whether they work for a company registered as a stock listed company, joint venture, general partnership, or mutual company (such information was collected and verified by the JPIR publisher). Next, the set of individuals involved in informal business were identified by searching among firm names for the following Chinese characters, namely textitShou, textitTen (Mise), textitGyou (Akinai), and textitYa, meaning a shop or business. To identify engineers, I looked for in the occupation names for words meaning crafts and engineering. To identify scholars, I used the words textitGaku in textitGaku-Sya (scholar), textitKyou in textitKyou-Jyu (professor), textitKou in textitKoushi (lecturer/assistant professor), textitKen in textitKen-Kyu (research), textitKou in textitGak-Kou (school), and textitHaku in textitHaku-Shi (Dr.). Similarly, engineers were identified by occupation names containing textitGi in textitGi-Jyutu (technology) and textitGi-Shi (engineer). Soldiers were identified by the word textitGun (military) and words referring to the rankings of military generals such as textitTaisyou, textitChujyou, textitSyousyou, textitTaisa, textitChusa, textitShousa, textitTaii, textitChui, and textitSyoui. Nobles were identified by information on ranks for family clans.

By using the above methods, the occupations of 40,704 cases (90.5% of all samples) were identified as business elites, engineers, public officers, military officers, politicians, scholars, or land owners[15]. Figure 3A in the Appendix presents the number of people by occupation and cohort.

3.3 Central government officer

The central government started to employ officers at the administrative department by exams (*Bunkan Koutou Shiken*) since 1887. Although anyone could take the exam, the exam was known to be highly competitive. Tai (1981) provides the biography of successful candidates who passed the exam. The data contains information on individual level data including birth prefecture, nobility, education, year of finishing education, year of entry to ministry, ministry, department, final position.

[15]Some of these cases are the same individuals listed in multiple editions and counted multiple times.

The data show that the exam indeed selected highly educated persons. 99% of the successful candidates had a record of higher education. Among them, 83% were at the Imperial Universities.

Figure 3 plots the number of the new officers over time by nobility. The numbers of commoners and nobles were similar until 1905, after which the number of commoners start to increase more than that of nobles. This timing corresponds to the time when the cohorts who were exposed to the start of increases in middle schools at their age 12 became the age 24, the standard age of university graduation.

3.4 Prefecture GDP and population

I matched the above outcome data with the school supply, manufacturing GDP estimates, and population of nobles and commoners in each prefecture and for each cohort. Manufacturing GDP at the prefecture level was estimated from data provided by the Research Unit for Statistical and Empirical Analysis in Social Sciences (Hi-Stat) at Hitotsubashi University (2009). Because these estimates are only available for 1874, 1890, 1909, and 1925, I interpolated them linearly in each prefecture.

The Japanese academic year starts on April 1 every year. Therefore, I used the date of birth of each person on the JPIR to match him or her to an academic cohort, to which the number of schools in the region when the cohort reached the eligible age is known from the yearbook of the Ministry of Education. In other words, for those born in prefecture j between April 1 of year x and the end of March of year x+1, the number of schools of type k for which they could apply was the number of type k schools found in the JPIR for year $x + \tau_k$ in birth prefecture j, where τ_k is the school eligibility age of a type k school. Table * summarizes the school eligibility age for each type of school.

The population of births for each cohort and prefecture was obtained from *Nihon Zenkoku Toguchi Hyo* for 1886–1889. There were many changes to prefecture boundaries 1875–1886. For these cohorts, I used information on the age/prefecture population from *Nihon Teikoku Minseki Toguchi Hyou* in 1886 to estimate the birth population of those cohorts born in 1875–1886[16]. To my knowledge, no records of the number of births by social class in each prefecture are available. Therefore, to obtain estimates for nobles and commoners, I multiply the birth population by the proportion of nobles in the cohort's birth year in the prefecture.

[16] *Nihon Zenkoku Toguchi Hyo* for 1880–1886 in prefectures without boundary changes was used to estimate the survival rates.

4 Descriptive analysis

What proportion of the Japanese population does the JPIR represent? Table 1 shows the number of people listed on the JPIR published in 1939. To show the trends across cohorts and social classes, the table shows the statistics for the older cohort (born from 1788 to 1876) and the younger cohort (born from 1886 to 1888) by nobles and commoners. Although the absolute number of listed commoners was larger than that of nobles, the proportion of listed commoners in the birth population of commoners was smaller than that of nobles. Notably, the probability of being listed rises for younger commoners compared with older commoners (from 0.29% to 0.35%), while it reduces for younger nobles compared with older nobles (from 0.91% to 0.80%).

The increase in the probability of a commoner being listed on the JPIR reflects the increasing proportions of commoners among those listed on the JPIR having public jobs or jobs with special skills. More specifically, as shown in Table 1, the proportion of commoners among all listed business elites is mostly constant across cohorts. On the contrary, the proportion of public officers, military officers, engineers, and scholars has increased for the younger cohort.

How much more income did the people listed on the JPIR earn compared with the average population in Japan in that period? The last four rows of Table 1 show the income tax payments and estimated income levels of the people listed on the JPIR published in 1939. The estimated average income of the people on the JPIR was around 14,000 Japanese yen compared with an average household income of around 900 yen (**?**). In other words, the people on the JPIR earned on average 15.5 times the earnings of average households in Japan. Moreover, although the income levels of nobles and commoners listed on the JPIR were similar, there was a slight decline in the average estimated income for the listed nobles in the younger cohort.

To explain the success of younger commoners, I investigated the effect of school construction. Figure 4 shows the average number of middle schools and standard vocational schools across prefectures when the cohort turns school eligibility age. Owing to the new school laws in 1879 and 1894, as documented in the previous section, the number of schools dramatically increased for the younger cohort born from 1886 to 1888 compared with the older cohorts born from 1788 to 1876.

Ascertaining whether the people on the JPIR became more educated as a greater number of middle schools were constructed requires caution because the probability of being listed on the JPIR is also affected by age. Therefore, by using birth prefecture-, cohort-, and record-level data on those listed on the JPIR, I regressed the number of people listed on the JPIR who entered higher education

on the control variables including age, squared age, number of high schools and elementary schools in the birth prefecture at the cohort's schooling age, the cohort's birth population, and the log of manufacturing GDP in the birth prefecture at age 10. The upper part of Figure 5 plots the average across prefectures and records the residuals from this regression, showing that the number of people on the JPIR who entered a higher education school increased for the younger cohort compared with the older cohort after controlling for age and local social and economic factors.

Finally, I carried out similar exercise for the number of people listed by occupation. The upper part of Figure 5 plots the average across prefectures and records the residuals from regressing the number of people listed as having private sector jobs (manager, corporate employee, family business, or engineer) or public sector jobs (public officer, military officer, or politician) on the same control variables as above. The figures show that the number of people listed in these job categories increased for the younger cohort after controlling for age and local social and economic factors.

The main concern of these exercise is that other factors may affect the variations across cohorts. The next section therefore uses cohort- and prefecture-level variations in school construction timing, controlling for the cohort fixed effects as well as the prefecture fixed effects. By using the same data on the number of people on the JPIR at the prefecture, cohort, and record level, I divide the prefectures into four groups based on whether there was an increase in the number of middle schools and/or commerce and technical schools between 1879 and 1885. Among the 45 prefectures, 19 had increases in the number of both middle and vocational schools, six schools did not have any increase, six schools had an increase only in vocational schools, and 14 schools had an increase only in middle schools. The upper parts of Figure 4 show the average number of available schools at the cohort's school eligibility age in each group of prefectures. These upper figures confirm the increases in middle and/or vocational schools after 1879 and after 1881/1884, respectively in the groups defined to have an increasing number of schools. The lower figures show the averages of the residuals within the four prefecture groups from regressing the number of people on the JPIR on the same control variables used to construct Figure 5. The left-hand figure shows that the number of people on the JPIR who had private sector jobs rose for the younger cohort in the three groups of prefectures for which the newly constructed middle schools and vocational schools were available. Similarly, the right-hand figure indicates that the number of people on the JPIR who had public sector jobs increased for the younger cohort in the two groups of prefectures for which the newly constructed middle schools were available. The next section confirms this evidence in a regression

framework and shows the heterogeneous effects of school construction across social classes.

5 Empirical analysis

In this section, I describe the main empirical strategy used to examine the impact of increasing school supply on elite production.

5.1 Empirical strategy

Denote the number of schools of type k in prefecture j at time τ by $X_{jk\tau}$ and the sequence of $X_{jk\tau}$ by $X_{jk}(= \{X_{jk\tau}\}_{\tau=\tau_0}^{\tau_T})$. Let S_{ijkt} be an indicator variable that takes 1 if person i born in prefecture j in year t is enrolled in a school of type k. My objective here is to infer the effect of school supply $X_{jk\tau}$ on the probability of school enrollment among the people born in prefecture j in year t, denoted by $P(S_{ijkt}|X_{jk})$. The data from the JPIR offers an estimate of the probability $P(S_{ijkt}, Listed_{ijt}|X_{jk})$, namely the proportion of individuals listed on the JPIR and enrolled in a school of type k among all those people born in prefecture j in year t. by writing these two probabilities with a conditional probability, I have

$$P(S_{ijkt}, Listed_{ijt}|X_{jk}) = P(S_{ijkt}|X_{jk})P(Listed_{ijt}|S_{ijkt}, X_{jk}) \tag{1}$$

This equation illustrates that an increase in school supply (i.e., a change in X_{ij}) may affect $P(S_{ijkt}, Listed_{ijt}|X_{jk})$ through two channels: (1) by changing the likelihood of i's school enrollment, $P(S_{ijkt}|X_{jk})$, and (2) by changing the probability of being listed on the JPIR conditional on i's schooling S_{ik}, $P(Listed_{ijt}|S_{ijkt}, X_{jk})$. Note that I only observe the empirical counterpart of $P(S_{ijkt}, Listed_{ijt}|X_{jk})$, from the JPIR, while it is more interesting to know the extent to which school supply influenced the schooling of the general population, summarized by $P(S_{ijkt}|X_{jk})$. Therefore, for the following analysis to allow us to infer the degree to which school supply affected the schooling of the general population, I must assume that the second effect is absent. This assumption means that conditional on i's actual schooling and the other control variables, a change in school supply in region j does not affect the probability that person i from the region is listed on the JPIR.

Based on the notion above, I estimate the following empirical equation with the data aggregated

at the prefecture j and cohort t levels:

$$N_{k,j,t,r} = \sum_k a_k X_{j,t+a_k} + \sum_p \phi_p \ln GDP_{j,t+p} + \phi_n Pop_{j,t} + F_j + F_t + F_r + e_{k,j,t,r} \tag{2}$$

where $N_{k,j,t}$ is the number of people on the JPIR enrolled in school type k born in prefecture j in year t. Further, $X_{j,t+a_k}$ is the number of schools of type k in prefecture j in year $t + a_k$, where a_k is the school eligibility age of the type k school. r indexes the publication year of the JPIR.

The schooling decision is likely to be reflected by the local economic conditions at the time of the decision, which might have also influenced school construction. For this reason, I control for the prefecture GDP at multiple points of time in each person's lifecycle to control for both the levels and the growth rates of the local economies. The variable $GDP_{j,t+p}$ (for $p = 10, 20$ and 30) is defined as the birth prefecture's GDP in year $t+p$; therefore, it denotes the economic conditions of the birth prefecture of a person born in t when the person was p years old. The prefecture fixed effects are included to control for unobserved factors influencing schooling that are constant across time within prefectures. These include, for example, the time-invariant local culture, governance or history influencing the decisions by parents about schooling. The cohort fixed effects are also included in the regression to control for the unobserved macro-level shocks to each cohort that influenced everyone in the same cohort similarly across regions. The publication year fixed effects are included to control for the unobserved differences in the selection criteria of publications that are fixed across birth cohorts and birth prefectures. Assuming the number of births in cohort t in prefecture j to be a function of F_j, F_t, and an component in the error term uncorrelated with school construction, the left-hand side is the empirical counterpart of $P(S_{ijkt}, Listed_{ijt}|X_{jk})$. Since the differences in population growth across prefectures may affect both school construction and the number of people on the JPIR, I control for the estimates of birth population for each cohort in each prefecture ($Pop_{j,t}$).

5.2 The effects of school construction on successful job outcomes

The JPIR provides information on the individuals sufficiently successful to be well known in a particular occupational field. Therefore, conceptually, each person on the list satisfies the criteria that the level of success is above a certain threshold y^{*o} in each field o:

$$Listed_{ijt} = 1\{\bigcup_o y^o_{ijt} \geq y^{*o}\} \tag{3}$$

My main interest is how shifts in school supply affect the number of people listed on the JPIR in each occupational field. For this purpose, I tested whether additional schools increased the appearance of the relevant cohort in the JPIR. The probability of being listed in the JPIR is

$$P(Listed\ as\ o|X_j) = \sum_m P(Listed\ as\ o|S_m, X_j)P(S_m|X_j) \tag{4}$$

To interpret an increase in $P(Listed\ as\ o|X_j)$ to be an outcome of a change in educational attainment $P(S_m|X_j)$, I must assume that the probability of being listed on the JPIR ($P(Listed\ as\ o|S_m, X_j)$) is constant in the number of schools in the region (X_j) conditional on the person's school attainment (S_m).

I thus estimate the following equation with the data aggregated at the prefecture j and cohort t levels:

$$N_{o,j,t,r} = \sum_k \beta_k X_{j,t+a_k} + \sum_p \pi_p \ln GDP_{j,t+p} + \pi_n Pop_{j,t} + E_j + E_t + E_r + u_{y,j,t,r} \tag{5}$$

where o denotes the occupation category such as business manager, scholar, and soldier. Here, $N_{o,j,t}$ is the number of those listed as occupation o. Since the prefecture fixed effects are included and the number of births in prefectures is not likely to have changed rapidly during the study period, I consider $N_{o,j,t}$ to be the probability of being listed on the JPIR from the prefecture and cohort.

A potential endogeneity concern is that the increase in the number of schools in each prefecture might reflect and be correlated with the economic dynamics of the region, which would affect the probably of being listed on the JPIR among those who originated from the region. Therefore, as in the schooling equation, I control for the estimates of prefecture manufacturing GDP levels at the cohort's age of 10, 20, and 30 ($GDP_{j,t+p}$ for $p = 10, 20, 30$), reflecting the economic conditions at various points in the lifecycle. The prefecture and cohort fixed effects are also included in the regressions to control for the unobserved fixed characteristics of cohorts and regions.

Throughout the following analysis, I use pooled data from the JPIR in 1929, 1934, and 1939. The unit of the data is the birth cohort and birth prefecture level. Table 2 shows the descriptive statistics of the main variables used to analyze the prefecture-, cohort-, and publication year-level data.

5.3 Results of the empirical analysis

Table 4 reports the results of the OLS estimation for the number of highly educated elites. The dependent variables are the number of people on the JPIR born in the prefecture in the year that attended the specified type of school as their final point of education. I count the number of such elites separately by social class. Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The following control variables are included in all regressions: the fixed effects for birth cohorts, birth prefectures, and the JPIR's published years, the log of the estimated level of the manufacturing GDP of the prefecture when the cohort was the age of x (for x = 10, 20, and 30), and the number of cohort births in the prefecture by social class.

The results in Table 4 show the positive effects of the number of middle schools on the number of elites who attended commerce schools, technical schools, and imperial universities. This is presumably because advanced commerce and technical schools in Tokyo required entrants to have finished middle school. The imperial Universities required qualification from high schools, which required a middle school education. The coefficient of the number of commerce schools is positive and highly significant (0.232 with standard error = 0.035) for the number of commoner elites who attended commerce schools. This estimate implies that the construction of a commerce vocational school results in an increase in the number of commoner elites appearing on the JPIR by 20%. By contrast, none of the coefficients of vocational schools is significant for nobles. Further, the coefficient of the number of technical schools for commoner elites is not statistically significant, although the coefficient is positive and relatively large. This fact might be because most of those on the JPIR who attended technical schools went to school in Tokyo, which is one of the oldest and most popular technical schools established several years before these cohorts became eligible. This school in Tokyo requires entrants to have finished middle school, which explains why the construction of middle schools positively affected entrance into technical schools by listed people. Such a characteristic may be a result of the sampling method of the JPIR, which does not sample engineers and artisans that become notable unless they are involved in business. Finally, the coefficients of the number of agricultural schools are all non-significant and small, which is also reasonable according to the sampling criteria of the JPIR.

Table 5 shows the results for the number of people on the JPIR employed in public sector jobs, government officers, military officers, politicians, and scholars (including teachers). The control variables are the same as the specifications in the previous tables. The coefficients of the number

of middle schools are positive and significant for the number of public commoner elites. The coefficients are also large, particularly for government officers and military officers (increases of 11.4% and 8.3%, respectively). On the contrary, the coefficients of middle schools for the number of public noble elites are mixed, while the coefficients for public officers and military officers are small with a non-significant (and possibly negative) coefficient. These results may reflect the social background that nobles had other sources of learning such as their families and did not need to attend middle school to pass their civil service examinations. For similar reasons, nobles may not have needed their graduation from middle school to serve as a signaling devise for promotions, which might have been useful for commoners. Instead, the coefficient of middle schools for the number of noble politicians is large, positive, and highly significant, implying 17% and 10.8% increases in the number of noble politicians and scholars, respectively. Becoming politicians may have required additional knowledge or certification, which noble children could not get from their families. Finally, the coefficients of vocational schools are mostly non-significant and small as expected, because the education in vocational schools did not aim to educate students to be public servants.

Table 6 shows the results for the central government recruits. The coefficient for the number of middle schools is positive and statistically significant both for commoners and nobles. In columns (4) and (8), I examine the short-run effect by using the subsample of data between 1874–1886 instead of 1874–1893. Shortening the period lowers the estimates of the coefficient of middle school, while it increases the estimates for nobles.

Table 7 presents the results for the estimates for the number of elites working in the private sector. I classified a person listed on the JPIR as a business elite if s/he is a corporate manager, corporate employee, or person running or working in a family business. Columns (1)–(4) show that the construction of middle schools had a positive effect on the number of all types of business elites. The sizes of the coefficients are moderate: the construction of a middle school corresponds to an increase in the number of managers by 5.3%, the number of people related to family business by 5.6%, and the number of corporate employees by 7.9%. Column (6) shows that the coefficient of the number of middle schools on the number of noble business elites is significant (0.134 with standard error = 0.071), with a moderately large size, implying an 8.2% increase. The coefficient of the number of middle schools for the number of noble managers is marginally significant, although the coefficient for noble family business elites is both significant and negligible. These results are reasonable considering that nobles did not have businesses with which to succeed or job training on how to run a business from their family. On the contrary, the coefficients of the number of corporate

employees are large, positive, and significant, implying a 22% increase. Finally, middle schools also led to an increase in engineers, both for commoners and for nobles. At least two interpretations of the positive coefficients of the number of middle schools exist: (i) middle schools had direct effects on producing private sector elites and middle schools had indirect effects by enabling progress to higher-level schools such as commerce and technical schools in Tokyo and imperial universities, which had direct effects on producing elites.

In addition, the effects of the construction of commerce schools appear to be positive for producing commoner commerce managers and corporate employees, with the size of coefficients estimated to be around one-third of the coefficients of middle schools. The coefficient of the number of elites in commoner family businesses is small and not significant. One interpretation of this result is that children from traditional merchant families were little affected the building of new commerce schools. This interpretation is consistent with the common view that merchant families in that period considered a school-based education to be useless for running a business (Amano, 1992). In this case, the business elites affected by the construction of commerce schools might have been the children of farmers and craft makers. Another interpretation of this result is that those children from merchant families became less likely to choose to enter their family business and rather established modern companies or became corporate employees. The coefficients of commerce schools for noble business elites are negligible and not significant. Together with the results in Table 3, this result concurs with the possibility that nobles on the JPIR did not attend the standard commerce schools constructed during these periods, although some of them might have went to the advanced commerce school in Tokyo after finishing middle school. One interpretation of this finding is that noble parents preferred a general education to one focused on business skills. The coefficients of the other types of vocational schools are all not significant, possibly owing to the sampling criteria of the JPIR focusing on business and public sector elites.

Table 8 shows the tax payments made by the people on the JPIR born in the prefecture in the cohort. The unit of total tax is 1000 yen. Columns (1)–(3) show the estimates for income tax and corporate tax by commoners on the JPIR, where total tax is defined as the sum of income tax and corporate tax. The results show that the construction of middle schools and commerce schools had positive and significant effects on tax payments. I estimated the level of income from the information on the income tax payments of each individual on the JPIR and calculated aggregate income at the prefecture and cohort levels for each record on the JPIR. Column (4) reports the regression estimate using this aggregated income as the dependent variable. Similar to the regression for income tax,

the coefficients of middle schools and commerce schools are positive and significant, implying 8.1% and 10.8% increases in the income generation of commoners following the construction of a middle school and a commerce school, respectively. Columns (5)–(8) show similar estimates for nobles. These results indicate that the coefficient of middle school is positive and significant for income tax payment and estimated aggregated income. However, the coefficient for corporate tax is not significant and negligible. In addition, the coefficients of vocational schools are all not significant and small for nobles. These results are consistent with the results above, suggesting that the vocational schools constructed in these periods were not effective for nobles to become successful entrepreneurs.

Table 9 and 10 show the results of placebo tests using JPIR data and government officers' data. By focusing on pre-treatment period cohorts (i.e. cohorts that became age 12 by 1891), I used the number of middle and vocational schools in the prefecture at 7 years after the cohort's school eligibility ages. The results show little systematic correlations between the elite outcome variables and the number of future schools.

6 Concluding remarks

This study examined the impacts of a middle school education on the occupational outcomes of different social classes during the period of wide-scale school construction in the 19th century in Japan. I used the JPIR to quantify the number of highly successful elites born in the years before and after the new schools were available. Historically, this is an interesting period as nobles were beginning to be deprived of their exclusive access to public sector jobs, while they were still likely to have had access to high-quality education from their family members. Commoners, on the contrary, were free to choose a much wider variety of jobs based on their efforts, ability, and schooling.

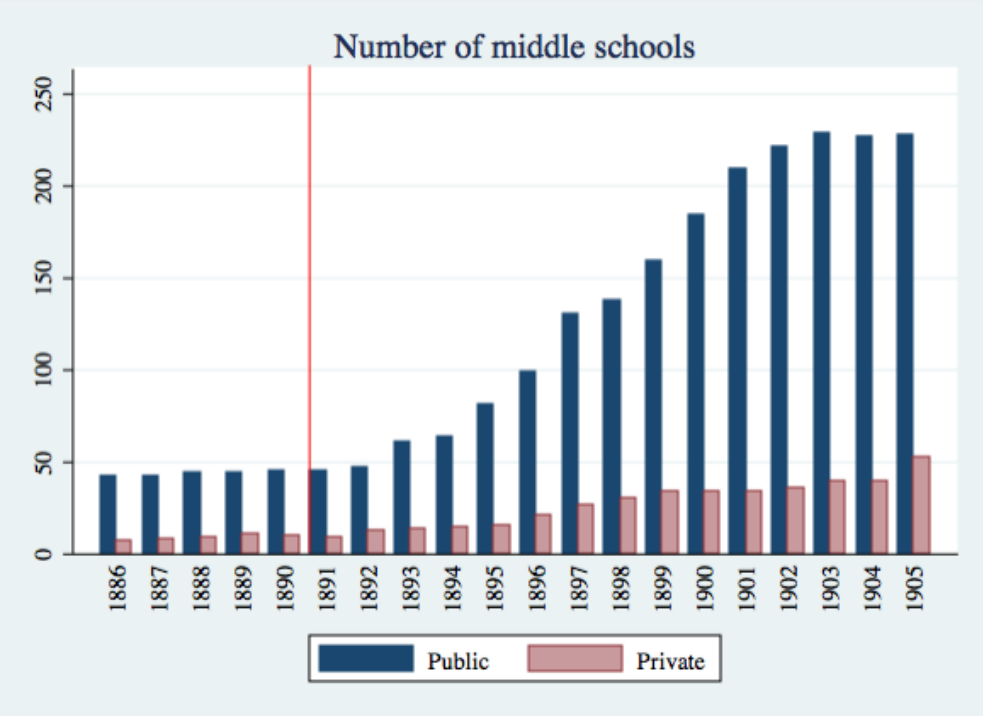
My results suggest that the construction of both middle and vocational schools had positive effects on producing various types of commoner business elites such as managers, family business owners, and corporate employees. Such effects are moderate, showing 5–8% increases following the construction of a middle school and 1.9–5% increases following the construction of commerce and technical schools. For nobles, on the contrary, the presented results suggest that the construction of middle schools had positive strong effects on producing corporate employees, and modest and non-significant effects on producing managers and people in family businesses. Hence, to become a business leader, an additional factor might have been required that could not be gained from

general middle school education. Indeed, by using data on tax payments by these elites, I found that the construction of both middle schools and commerce schools led to an increase in the income tax of and corporate tax paid by commoners. For nobles, the results suggest that middle school construction led to an increase in income tax payments only. In addition, the construction of middle schools allowed an increasing number of commoners to become high-ranking public and military officers, suggesting the positive effects of middle schools on social mobility. On the contrary, these effects were absent for noble children, who were likely to be able to obtain a similar kind of education or qualifications from their family. Overall, my empirical results suggest that the construction of middle schools fostered social mobility to a certain extent, particularly by enabling some nobles to become high-income corporate employees and commoners to become elites in the public sector.

Commerce schools appear to have had moderate effects on producing business elites in modern corporations from commoner families. For nobles, there was no evidence that newly built commerce schools affected their success. One interpretation is that nobles might have preferred a general education to an education focused on business skills.

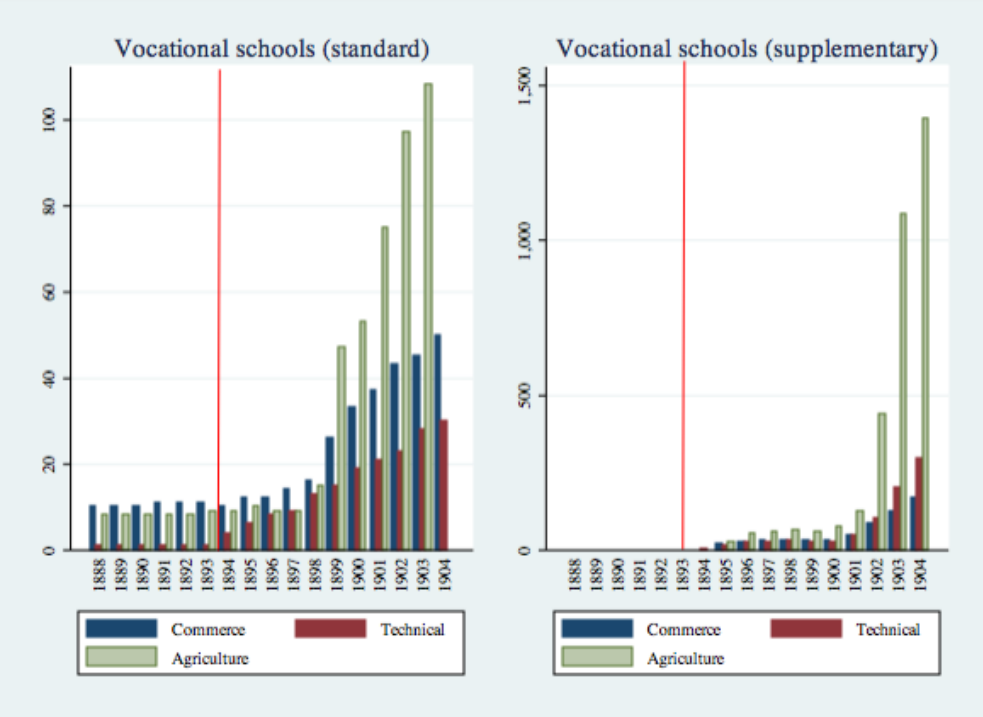
While this study focused on the situation in 19th century Japan, the results have important implications on the school systems in modern-day developing countries. The evidence suggests that the rapid expansion of middle school education fostered a large transition from informal family-based education to institutional education, resulting in the increase in the number of people carving out successful careers from various family backgrounds. Hence, while an increasing number of studies have examined the impacts of business training targeting the company managers in developing countries (e.g., McKenzie and Woodruff, 2014), another effective policy may be to improve access to middle and vocational schools as the Japanese government once did.

Figure 1: Number of middle schools in Japan in 1888–1905



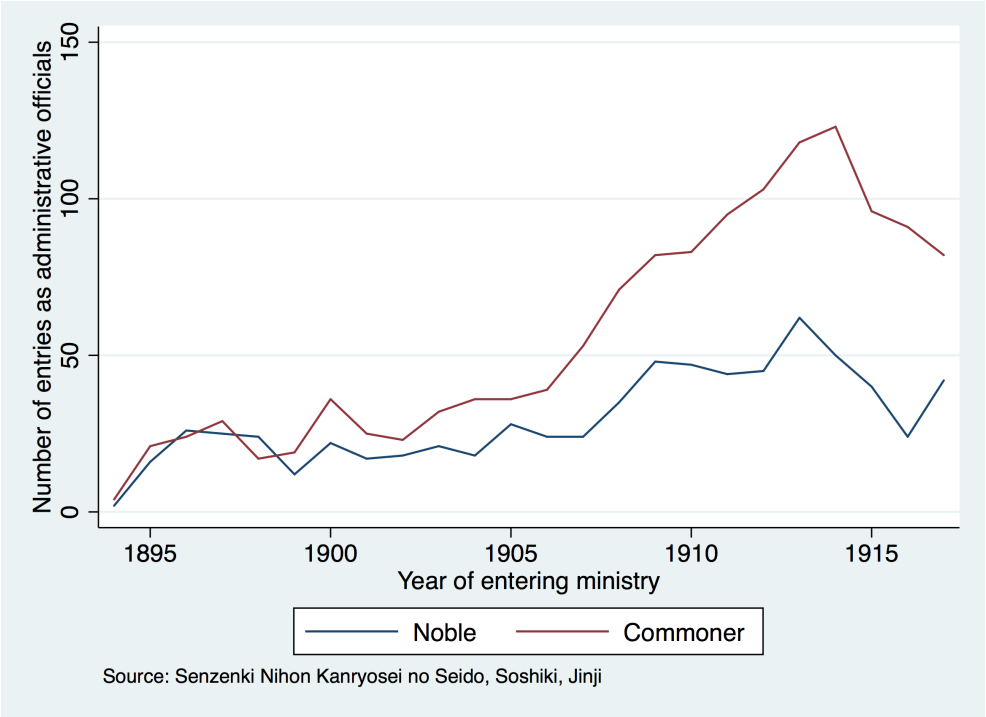
Notes: The figures are constructed based on the Yearbooks of the Ministry of Education from 1888–1899 (*Nihon Teikoku Monbusyou Nenkan*).

Figure 2: Number of vocational schools in Japan in 1888–1905



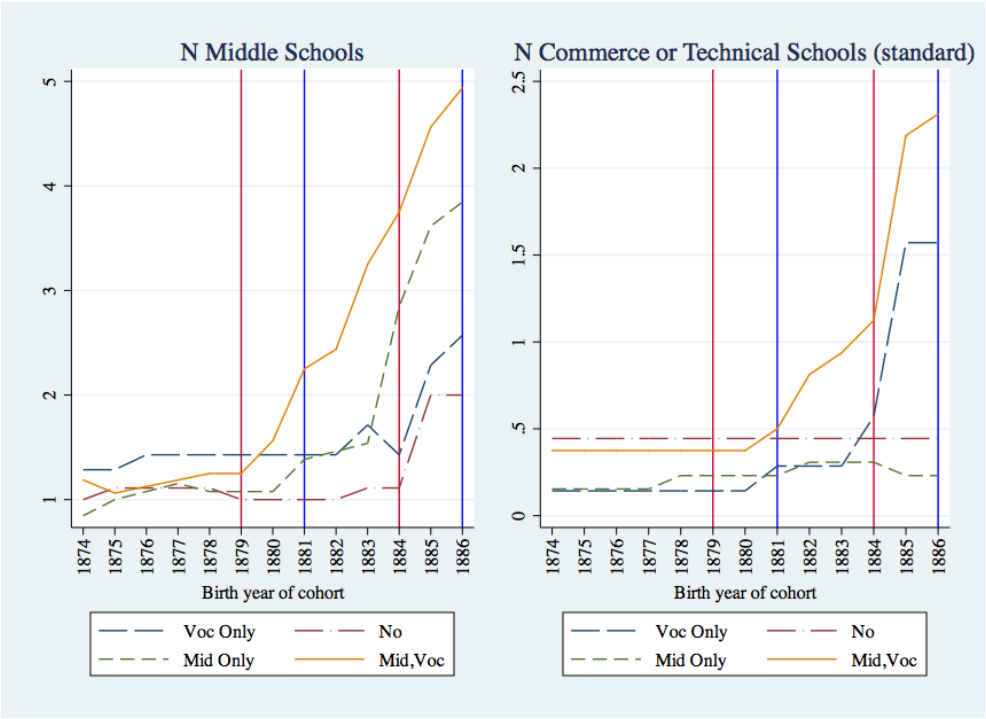
Notes: The figures are constructed based on the Yearbooks of the Ministry of Education from 1888–1899 (*Nihon Teikoku Monbusyou Nenkan*).

Figure 3: Central government officers (Bunkan Koutou Shiken)



Number of successful candidates who passed the exam for government administrative department (*Bunkan Koutou Shiken*) in each year. Source: Tai (1981) "Sengoki Nihon Kanryosei no Seido, Soshiki, Jinji".

Figure 4: Average number of schools by cohort and region



Notes: I divided the prefectures into four groups based on whether there was an increase in (1) the number of middle schools between 1879–1884 and/or (2) the number of commerce or technical vocational schools between 1881–1886. The figures show the average number of available schools at the cohort's school eligibility age within each group of prefectures.

Figure 5: Average number of people listed on the JPIR by cohort and region

Notes: I divided the prefectures into four groups based on whether there was an increase in (1) the number of middle schools between 1879–1884 and/or (2) the number of commerce or technical vocational schools between 1881–1886. The figures plot the within-group average of the residual of regression in which the number of elites were regressed on the number of elementary schools, high schools, age, age squared, log of manufacturing GDP at one's age of 10, and publish year fixed effect. The levels of the residuals were normalized using the group mean and standard deviation of pre-treatment period 1874–1878.

Table 1. Classification of elites' occupations (JPIR)

		Business elites				Public elites				
		corporate		family business	enginner	Officer	Politician	Military	Scholar	landowner
		manager	non_manager							
		not manager								
firm register		Y	Y	N						
occupation	any place				技, 工	官		軍	教	
occupation	last 3	社長				参事	大臣		博士	地主
occupation	last 3	会長				主事	知事		学士	家主
occupation	last 3	頭取				視学	市長		学長	
occupation	last 3	理事				領事	町長		講師	
occupation	last 3	取締役				書記	村長		研究	
occupation	last 3	監査役					議長			
occupation	last 3	企業家								
occupation	last 3	店長								
occupation	last 3	部長								
occupation	last 3	課長								
occupation	last 3	支配人					議員			
rank	any place							将		
rank	any place							尉		
rank	any place							佐		
firm	last 1			商						
firm	last 1			店						
firm	last 1			業						
firm	last 1			屋						
firm	last 2			not 商事			議院			
firm	last 2						内閣			

Table 2. Descriptive statistics of the JPIR (1939)

	1876–1788 birth cohort			1886–1888 birth cohort		
	Commoners	Nobles	Total	Commoners	Nobles	Total
N Total people on the JPIR	3,226	430	3,656	5,463	589	6,052
(% of the social class)	88	12	100	90	10	100
Cohorts' birth population	1,107,873	47,275	1,155,147	1,565,360	73,548	1,638,908
(% of the social class)	96	4	100	96	4	100
% of the people on the JPIR in population	0.29	0.91	0.32	0.35	0.80	0.37
N Business managers on the JPIR	1,387	166	1,553	2,505	277	2,782
(% of the social class)	89	11	100	88	12	100
N Corporate employees on the JPIR	184	20	204	389	46	435
(% of the social class)	90	10	100	89	11	100
N Family business involved on the JPIR	432	14	446	520	9	529
(% of the social class)	97	3	100	98	2	100
N Engineers on the JPIR	12	5	17	152	33	185
(% of the social class)	71	29	100	82	18	100
N Public officers on the JPIR	17	6	23	72	10	82
(% of the social class)	74	26	100	88	12	100
N Military officers on the JPIR	124	54	178	197	32	229
(% of the social class)	70	30	100	86	14	100
N Politicians on the JPIR	227	18	245	303	29	332
(% of the social class)	93	7	100	91	9	100
N Scholars on the JPIR	186	64	250	425	70	495
(% of the social class)	74	26	100	86	14	100
N Landowners on the JPIR	156	4	160	161	4	165
(% of the social class)	98	2	100	98	2	100
N Others on the JPIR	501	79	580	739	79	818
(% of the social class)	86	14	100	90	10	100
Total income tax payment by the people on the JPIR	5,927,674	593,997	6,521,671	8,930,192	488,452	9,418,644
(% of contribution by social class)	91	9	100	95	9	100
Average income tax payment by the people on the JPIR	1783	1363	1734	1592	826	1518
Average estimated income of the people on the JPIR	14751	10646	14271	13515	8803	13057

Notes: Number of people born in 1876–1878 and 1886–1888 in the 45 prefectures listed on the JPIR published in 1939. The last two rows show the estimates of the total number of births of the corresponding cohorts. The income estimates are obtained by using information on the income tax payments of those people on the JPIR and the income tax rate in 1936 (based on *Nihon Shinshi Roku* 1937), assuming that the people on the JPIR without tax payment information earned the average household income, 900 yen (based on the calculation by (**?**)).

Table 3. Summary statistics (prefecture, cohort, and publication year data)

Variable	Mean	Std. Dev.	Min.	Max.	N
Number of schools in prefecture at the school eligible age					
N middle schools	2.879	3.163	0	29	2565
N commerce schools (standard)	0.574	1.077	0	12	2565
N commerce schools (supplemental)	0.374	1.67	0	16	2565
N technical schools (standard)	0.355	0.821	0	8	2565
N technical schools (supplemental)	0.343	1.829	0	44	2565
N agricultural schools (standard)	0.668	1.056	0	9	2565
N agricultural schools (supplemental)	1.053	5.02	0	112	2565
N high schools	0.156	0.363	0	1	2565
N elementary schools	572.013	239.88	0	1538	2565
Age	50.667	7.088	36	65	2565
Number of observations on the Who's Who Records					
N corporate manager (Commoners)	7.738	9.167	0	109	2565
N corporate manager (Nobles)	1.071	1.657	0	20	2565
N corporate non-manager (Commoners)	2.086	2.899	0	29	2565
N corporate non-manager (Nobles)	0.322	0.75	0	10	2565
N running family business (Commoners)	2.618	4.949	0	40	2565
N running family business (Nobles)	0.066	0.271	0	2	2565
N engineers (Commoners)	0.925	1.483	0	22	2565
N engineers (Nobles)	0.32	0.742	0	8	2565
N public officers (Commoners)	0.685	1.048	0	12	2565
N public officers (Nobles)	0.18	0.465	0	4	2565
N politicians (Commoners)	1.281	1.613	0	14	2565
N politicians (Nobles)	0.136	0.391	0	3	2565
N military officers (Commoners)	0.637	1.18	0	15	2565
N military officers (Nobles)	0.249	0.618	0	5	2565
N academic scholars (Commoners)	1.538	2.082	0	20	2565
N academic scholars (Nobles)	0.443	0.926	0	10	2565
N nobles (/1000)	4806.237	3969.336	-600.443	33213.395	2562
N commoners (/1000)	101731.364	49824.976	4898.249	657808.125	2562

Notes: Cohort-prefecture-year-level data on cohorts born from 1874 to 1892 in the 45 prefectures observed in the three JPIR published in 1929, 1934, and 1939.

Table 4. Number of elites by education

	(1)	(2)	(3)	(4)	(5)	(6)
Final education	Imperial Univ.	Imperial Univ.	Commerce	Commerce	Technical	Technical
Birth social class	Commoner	Noble	Commoner	Noble	Commoner	Noble
Cohorts	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892
N middle schools	0.272***	0.135**	0.078***	0.044	0.026**	-0.001
	(0.097)	(0.061)	(0.025)	(0.028)	(0.012)	(0.006)
N commerce schools (standard)	0.194	-0.098	0.152**	-0.046	-0.024	-0.017
	(0.141)	(0.164)	(0.061)	(0.050)	(0.029)	(0.013)
N commerce schools (supplemental)	-0.026	-0.042	0.116**	-0.007	0.001	0.009**
	(0.052)	(0.032)	(0.044)	(0.011)	(0.008)	(0.004)
N technical schools (standard)	0.336	-0.049	0.027	0.005	0.041	-0.005
	(0.208)	(0.094)	(0.084)	(0.030)	(0.043)	(0.015)
N technical schools (supplemental)	-0.025	-0.005	-0.073**	-0.002	0.030**	0.002
	(0.067)	(0.026)	(0.030)	(0.013)	(0.011)	(0.004)
N agricultural schools (standard)	-0.025	0.053	-0.026	-0.000	-0.010	0.004
	(0.092)	(0.041)	(0.046)	(0.016)	(0.020)	(0.010)
N agricultural schools (supplemental)	-0.005	-0.001	0.005	0.001	-0.016***	-0.002*
	(0.027)	(0.010)	(0.011)	(0.005)	(0.004)	(0.001)
N commoners	0.087***	-0.018	-0.015	0.008	0.005	-0.003
	(0.022)	(0.013)	(0.016)	(0.013)	(0.006)	(0.005)
N nobles	-0.416	0.338**	0.256	-0.003	-0.099*	-0.032
	(0.271)	(0.136)	(0.187)	(0.141)	(0.059)	(0.049)
Observations	2,556	2,556	2,556	2,556	2,556	2,556
Mean dep pre-treatment (1874–1879)	2.179	1.144	0.528	0.131	0.135	0.0827
b(N middle sch.)/pre-treatment mean	0.125	0.118	0.148	0.333	0.192	-0.00865

Notes: Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The dependent variables are the number of people listed on the JPIR (1929, 1934, and 1939) born in the cohort and prefecture who attended the type of school. The number of schools in the explanatory variables is the number in the prefecture at the cohort's school eligibility age. The control variables are the cohort's age and age squared at the time of the record publication, the fixed effects for birth cohorts, the fixed effects of prefectures, the fixed effects of the record publication year, the estimated birth prefecture's manufacturing GDP at age x (for x=10, 20, and 30), and the estimated number of commoners' and nobles' births of the cohort in the prefecture.

Table 5. Elites in public sector (JPIR)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Occupation	Public officer	Public officer	Politician	Politician	Military	Military	Scholar	Scholar
Birth social class	Commoner	Noble	Commoner	Noble	Commoner	Noble	Commoner	Noble
Cohorts	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892
N middle schools	0.069**	0.014*	0.065***	0.013**	0.075**	-0.037***	0.027	0.027
	(0.032)	(0.008)	(0.021)	(0.005)	(0.034)	(0.012)	(0.034)	(0.017)
N commerce schools (standard)	-0.006	-0.021	0.030	-0.004	-0.064	-0.051*	-0.076	-0.073
	(0.048)	(0.029)	(0.043)	(0.013)	(0.062)	(0.028)	(0.061)	(0.067)
N commerce schools (supplemental)	-0.031	-0.001	-0.028	-0.006	-0.009	-0.002	0.013	-0.012
	(0.023)	(0.010)	(0.019)	(0.005)	(0.030)	(0.009)	(0.028)	(0.010)
N technical schools (standard)	0.018	0.061**	0.077	-0.007	-0.080***	-0.013	0.253	-0.097*
	(0.032)	(0.027)	(0.081)	(0.016)	(0.025)	(0.025)	(0.171)	(0.057)
N technical schools (supplemental)	0.001	0.011	0.005	0.023***	-0.027**	0.009	-0.017	-0.002
	(0.017)	(0.008)	(0.028)	(0.007)	(0.011)	(0.012)	(0.021)	(0.015)
N agricultural schools (standard)	0.061*	0.005	0.027	0.004	0.009	0.022	-0.025	0.001
	(0.036)	(0.020)	(0.046)	(0.018)	(0.022)	(0.018)	(0.055)	(0.037)
N agricultural schools (supplemental)	0.000	-0.001	-0.001	-0.008***	0.003	-0.003	-0.004	0.000
	(0.006)	(0.003)	(0.011)	(0.003)	(0.006)	(0.005)	(0.008)	(0.006)
N commoners	0.007	-0.010**	0.011	0.001	-0.006	0.021*	0.039***	0.016**
	(0.008)	(0.004)	(0.010)	(0.003)	(0.009)	(0.012)	(0.011)	(0.007)
N nobles	-0.108	0.088*	0.082	-0.076**	0.094	-0.289**	-0.288**	-0.093
	(0.116)	(0.047)	(0.108)	(0.034)	(0.089)	(0.121)	(0.121)	(0.068)
Observations	2,556	2,556	2,556	2,556	2,556	2,556	2,556	2,556
Mean dep pre-treatment (1874–1879)	0.275	0.133	1.246	0.133	0.605	0.344	1.142	0.488
b(N middle sch.)/pre-treatment mean	0.250	0.105	0.0520	0.0975	0.124	-0.108	0.0239	0.0544

Notes: Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The dependent variables are the number of people listed on the JPIR (1929, 1934, and 1939) born in the cohort and prefecture who had the occupation at the time of the record publication. The number of schools in the explanatory variables is the number of schools in the prefecture at the cohort's school eligibility age. The control variables are the cohort's age and age squared at the time of the record publication, the fixed effects for birth cohorts, the fixed effects of prefectures, the fixed effects of the record publication year, the estimated birth prefecture's manufacturing GDP at age x (for x=10, 20, and 30), and the estimated number of commoners' and nobles' births of the cohort in the prefecture.

Table 6. Central government officers (Bunkan Koutou Shiken)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Birth social class	Commoner	Commoner	Commoner	Commoner	Noble	Noble	Noble	Noble
Cohorts	1874–1893	1874–1893	1874–1893	1874–1886	1874–1893	1874–1893	1874–1893	1874–1886
N middle school	0.177***	0.167***	0.148***	0.063**	0.092***	0.079***	0.073***	0.184***
	(0.033)	(0.041)	(0.036)	(0.027)	(0.024)	(0.022)	(0.024)	(0.047)
N commerce schools (standard)		0.071	0.037	0.240		0.086	0.059	0.525***
		(0.105)	(0.117)	(0.211)		(0.055)	(0.055)	(0.164)
N commerce schools (supplemental)		0.026	0.019	-0.018		0.022	0.019	0.013
		(0.043)	(0.043)	(0.024)		(0.019)	(0.016)	(0.017)
N technical schools (standard)		0.052	0.040	0.255		0.139**	0.133**	0.153
		(0.095)	(0.091)	(0.154)		(0.069)	(0.062)	(0.154)
N technical schools (supplemental)		0.031***	0.031***	0.041		-0.008	-0.009	-0.010
		(0.011)	(0.011)	(0.159)		(0.006)	(0.007)	(0.141)
N agricultural schools (standard)		-0.009	-0.019	-0.061		0.031	0.032	-0.078
		(0.053)	(0.051)	(0.126)		(0.056)	(0.058)	(0.113)
N agricultural schools (supplemental)		-0.003	-0.004	0.046		0.002	0.002	0.004
		(0.006)	(0.006)	(0.079)		(0.004)	(0.004)	(0.106)
N commoners	0.266*	0.257*	0.192*	0.578***	-0.209**	-0.217**	-0.295***	-0.624***
	(0.151)	(0.149)	(0.112)	(0.149)	(0.100)	(0.101)	(0.106)	(0.174)
N nobles	-3.670***	-3.765***	-3.202**	-8.292***	4.353***	4.427***	5.332***	11.456***
	(1.203)	(1.190)	(1.293)	(2.454)	(0.929)	(1.040)	(1.256)	(3.701)
GDP control	N	N	Y	Y	N	N	Y	Y
Observations	1,007	1,007	1,007	685	1,007	1,007	1,007	685
Mean dep pre-treatment (1874–1879)	0.530	0.530	0.530	0.530	0.421	0.421	0.421	0.421
b(N middle sch.)/pre-treatment mean	0.335	0.314	0.280	0.120	0.219	0.188	0.174	0.436

Notes: Standard errors are clustered at 45 prefecture levels and shown in parentheses. Number of schools in the explanatory variables are the number of schools in the prefecture at the cohort's school eligibility ages. All regression control for fixed effects for birth cohorts, fixed effects of prefectures, number of elementary schools, and number of high schools. GDP control variables include estimated manufacturing GDP at age x (for x=12 and 24).

Table 7. Elites in private sector (JPIR)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Occupation	Manager	Manager	Non-manager	Non-manager	Family bus	Family bus	Engineer	Engineer
Birth social class	Commoner	Noble	Commoner	Noble	Commoner	Noble	Commoner	Noble
Cohorts	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892
N middle schools	0.349***	0.070	0.043	0.012	0.097	0.006*	0.054**	0.087***
	(0.126)	(0.052)	(0.035)	(0.012)	(0.058)	(0.003)	(0.024)	(0.024)
N commerce schools (standard)	0.447**	-0.147	0.142**	-0.016	-0.362	-0.034***	0.095	0.004
	(0.172)	(0.156)	(0.055)	(0.065)	(0.259)	(0.007)	(0.060)	(0.033)
N commerce schools (supplemental)	0.021	0.016	0.045	-0.002	-0.168***	-0.005	-0.041**	-0.022*
	(0.092)	(0.024)	(0.030)	(0.011)	(0.043)	(0.004)	(0.019)	(0.012)
N technical schools (standard)	0.356	-0.032	0.126	-0.006	0.269*	-0.016	0.186***	0.010
	(0.293)	(0.095)	(0.082)	(0.032)	(0.157)	(0.011)	(0.068)	(0.039)
N technical schools (supplemental)	-0.120**	-0.014	-0.009	0.026	0.009	-0.001	-0.002	-0.010
	(0.055)	(0.025)	(0.030)	(0.016)	(0.044)	(0.005)	(0.029)	(0.010)
N agricultural schools (standard)	-0.110	0.066	0.005	0.032	0.087	-0.012	0.049	-0.020
	(0.112)	(0.074)	(0.042)	(0.040)	(0.076)	(0.011)	(0.041)	(0.025)
N agricultural schools (supplemental)	0.000	-0.005	-0.000	-0.010*	0.019	0.001	-0.006	0.004
	(0.022)	(0.010)	(0.013)	(0.006)	(0.018)	(0.002)	(0.011)	(0.004)
N commoners	-0.049	-0.011	0.019	0.014***	0.024	-0.002	0.017**	-0.001
	(0.037)	(0.017)	(0.012)	(0.005)	(0.024)	(0.003)	(0.007)	(0.006)
N nobles	0.629*	0.137	0.045	-0.117	0.039	-0.012	-0.244**	0.093
	(0.367)	(0.180)	(0.128)	(0.072)	(0.214)	(0.025)	(0.097)	(0.073)
Observations	2,556	2,556	2,556	2,556	2,556	2,556	2,556	2,556
Mean dep pre-treatment (1874–1879)	6.844	1.128	1.810	0.301	2.665	0.0815	0.438	0.254
b(N middle sch.)/pre-treatment mean	0.0510	0.0622	0.0236	0.0387	0.0362	0.0764	0.124	0.343

Notes: Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The dependent variables are the number of people listed on the JPIR (1929, 1934, and 1939) born in the cohort and prefecture who had the occupation at the time of the record publication. The number of schools in the explanatory variables is the number of schools in the prefecture at the cohort's school eligibility age. The control variables are the cohort's age and age squared at the time of the record publication, the fixed effects for birth cohorts, the fixed effects of prefectures, the fixed effects of the record publication year, the estimated birth prefecture's manufacturing GDP at age x (for x=10, 20, and 30), and the estimated number of commoners' and nobles' births of the cohort in the prefecture.

Table 8. Tax payments

Variable	(1) Total	(2) Total	(3) Income tax	(4) Income tax	(5) Corporate tax	(6) Corporate tax
Birth social class	Commoner	Noble	Commoner	Noble	Commoner	Noble
Cohorts	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892	1874–1892
N middle schools	1.597***	0.151	1.556***	0.147	0.041**	0.004*
	(0.434)	(0.105)	(0.421)	(0.105)	(0.017)	(0.002)
N commerce schools (standard)	-0.085	-0.491	-0.037	-0.478	-0.048	-0.013
	(0.776)	(0.485)	(0.729)	(0.471)	(0.059)	(0.016)
N commerce schools (supplemental)	1.182*	0.114	1.149	0.119	0.033*	-0.005
	(0.703)	(0.136)	(0.687)	(0.130)	(0.018)	(0.006)
N technical schools (standard)	2.094	-0.385*	1.925	-0.393*	0.169**	0.008
	(2.184)	(0.212)	(2.111)	(0.209)	(0.081)	(0.009)
N technical schools (supplemental)	-0.540	0.041	-0.530	0.041	-0.009	-0.001
	(0.360)	(0.084)	(0.351)	(0.083)	(0.019)	(0.003)
N agricultural schools (standard)	-1.501***	0.098	-1.487***	0.096	-0.014	0.001
	(0.515)	(0.125)	(0.501)	(0.123)	(0.024)	(0.008)
N agricultural schools (supplemental)	0.060	-0.032	0.059	-0.033	0.002	0.001
	(0.183)	(0.037)	(0.179)	(0.037)	(0.007)	(0.001)
N commoners	-0.142	0.068	-0.146	0.069	0.004	-0.001
	(0.175)	(0.053)	(0.167)	(0.052)	(0.011)	(0.001)
N nobles	1.861	-0.826	1.804	-0.852	0.057	0.026
	(1.801)	(0.590)	(1.759)	(0.577)	(0.078)	(0.023)
Observations	2,556	2,556	2,556	2,556	2,556	2,556
Mean dep var	19.92	2.016	19.28	1.991	0.639	0.0247
b(N middle sch.)/pre-treatment mean	19.92	2.016	19.28	1.991	0.639	0.0247

Notes: Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The dependent variables are the total tax payments by the people listed on the JPIR (1934 and 1939) born in the cohort and prefecture. The number of schools in the explanatory variables is the number of schools in the prefecture at the cohort's school eligibility age. The control variables are the cohort's age and age squared at the time of the record publication, the fixed effects for birth cohorts, the fixed effects of prefectures, the fixed effects of the record publication year, and the estimated birth prefecture's manufacturing GDP at age x (for x=10, 20, and 30).

Table 9. Placebo test (JPIR)

	(1)	(2)	(3)	(4)
Occupation	Manager	Public	Manager	Public
Birth social class	Commoner	Noble	Commoner	Noble
Cohorts	1870–1879	1870–1879	1870–1879	1870–1879
N middle schools	-0.011	0.140	-0.075	0.068
(after 7 years)	(0.078)	(0.279)	(0.070)	(0.063)
N commerce schools (standard)	0.212	-0.178	0.071	0.273
(after 7 years)	(0.412)	(0.578)	(0.156)	(0.174)
N commerce schools	-0.068	0.130	0.027	-0.022
(after 7 years)	(0.042)	(0.105)	(0.035)	(0.023)
N technical schools (standard)	0.014	1.286**	0.169	0.061
(after 7 years)	(0.268)	(0.564)	(0.101)	(0.197)
N technical schools (supplemental)	0.044	0.555	-0.027	-0.469***
(after 7 years)	(0.325)	(0.601)	(0.381)	(0.130)
N agricultural schools (standard)	0.251	-0.077	0.084	-0.025
(after 7 years)	(0.226)	(0.385)	(0.124)	(0.075)
N agricultural schools (supplemental)	0.006	0.107	0.043	-0.102*
(after 7 years)	(0.121)	(0.267)	(0.056)	(0.054)
Observations	1,215	1,215	1,215	1,215
Mean dep var	1.816	6.232	0.566	1.079

Notes: Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The dependent variables are the variables constructed from the JPIR (1929, 1934, and 1939). The numbers of middle schools and vocational schools are the numbers of these schools available for those born after 7 years from the cohort when they become the school eligibility age. The control variables are the cohort's age and age squared at the time of the record publication, the fixed effects for birth cohorts, the fixed effects of prefectures, the fixed effects of the record publication year, and the estimated birth prefecture's manufacturing GDP at age x (for x=10, 20, and 30).

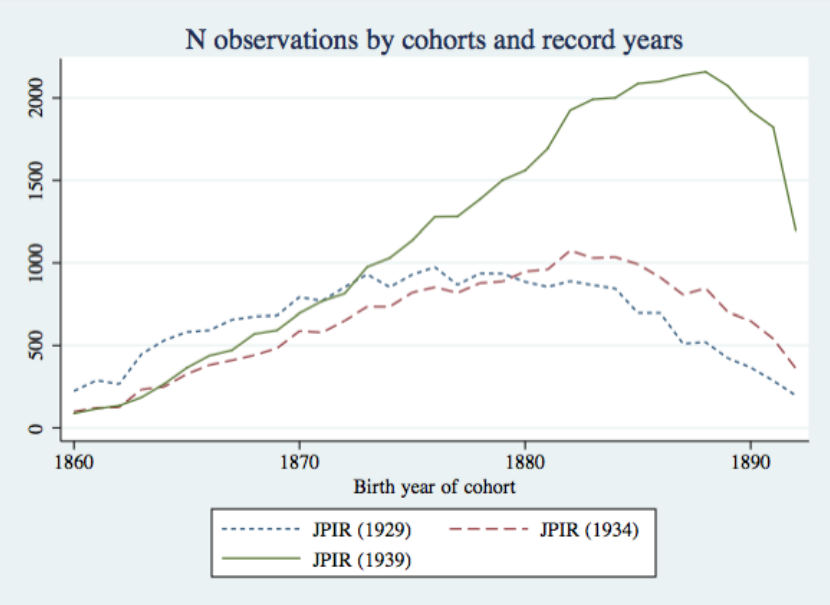
Table 10. Placebo test (Central government officers)

	(1)	(2)	(3)	(4)
	Placebo	Placebo	Actual	Actual
Birth social class	Commoner	Noble	Commoner	Noble
Cohorts	1870–1879	1870–1879	1877–1886	1877–1886
N middle schools	-0.030	0.013	0.113**	0.232***
(after 7 years for placebo)	(0.036)	(0.035)	(0.051)	(0.059)
N commerce schools (standard)	-0.021	0.063	0.199	0.537***
(after 7 years for placebo)	(0.148)	(0.115)	(0.255)	(0.187)
N commerce schools (supplemental)	0.037	-0.016	-0.022	-0.001
(after 7 years for placebo)	(0.023)	(0.019)	(0.029)	(0.019)
N technical schools (standard)	0.142	0.090	0.312	0.132
(after 7 years for placebo)	(0.128)	(0.077)	0.312	0.132
N technical schools (supplemental)	0.072	-0.025	0.011	0.008
(after 7 years for placebo)	(0.061)	(0.042)	(0.166)	(0.144)
N agricultural schools (standard)	0.090	0.037	-0.042	-0.136
(after 7 years for placebo)	(0.115)	(0.073)	(0.143)	(0.122)
N agricultural schools (supplemental)	0.037	-0.003	0.057	0.012
(after 7 years for placebo)	(0.033)	(0.047)	(0.079)	(0.109)
Observations	460	460	461	461
R-squared	0.336	0.399	0.552	0.605

Notes: Standard errors are clustered at the 45 prefecture levels and shown in parentheses. The dependent variables are the variables are the number of successful candidates who passed the exam for government administrative department from each prefecture-cohort. The numbers of middle schools and vocational schools are the numbers of these schools available for those born after 7 years from the cohort when they become the school eligibility age. The control variables are the cohort's age and age squared at the time of the record publication, the fixed effects for birth cohorts, the fixed effects of prefectures, the fixed effects of the record publication year, and the estimated birth prefecture's manufacturing GDP at age x (for x=10, 20, and 30).

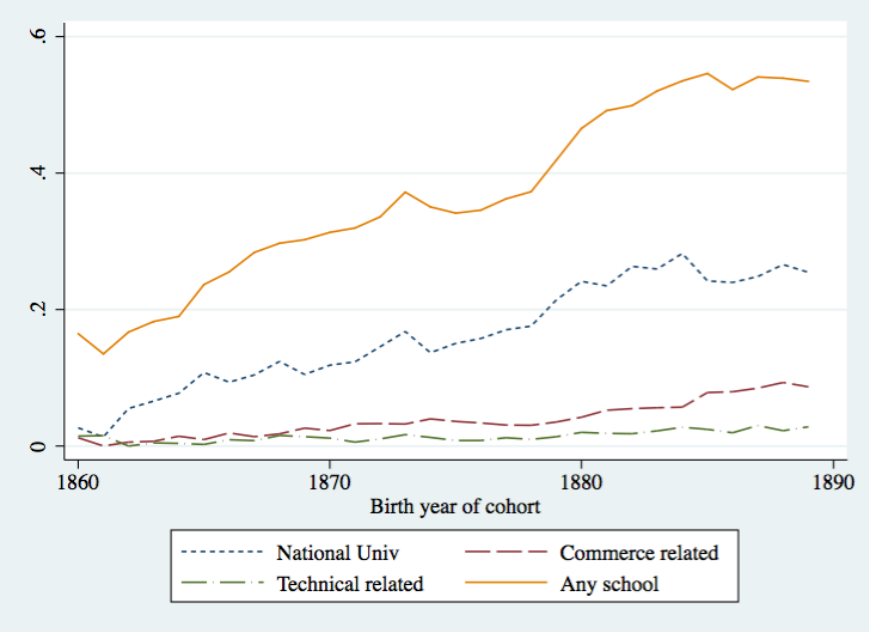
7 Appendix

Figure A1: Number of people on the JPIR by record publication year



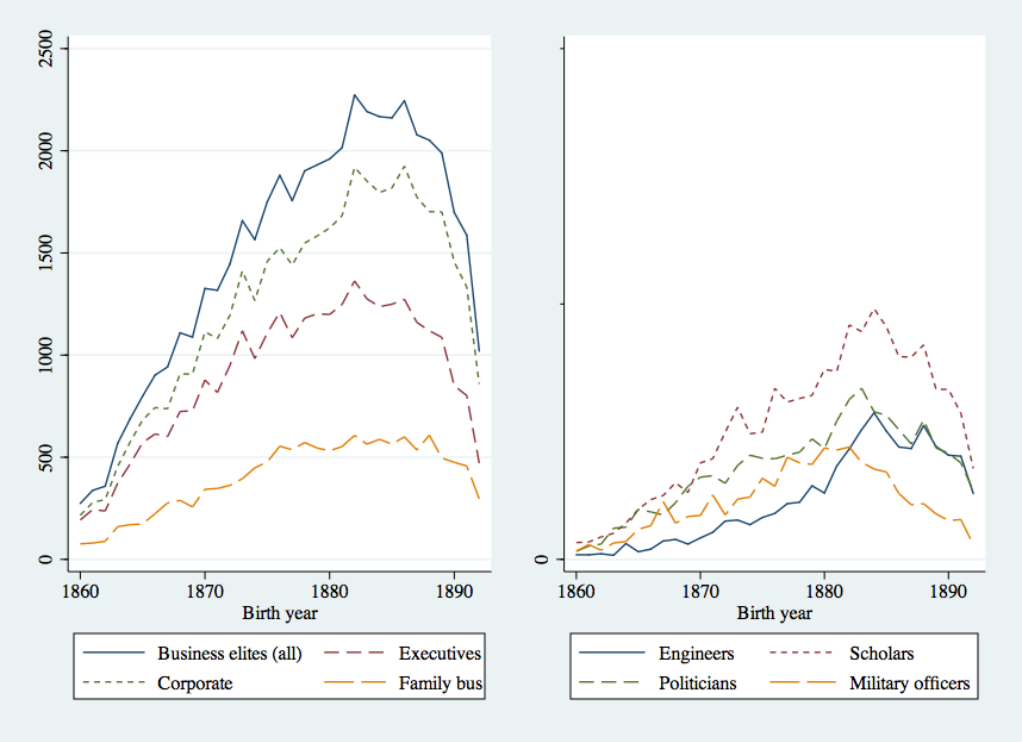
Notes: The graph shows the number of people on the JPIR by cohort and publication year: 1935, 1937, or 1939.

Figure A2: Proportion of people on the JPIR enrolled in schools



Notes: The graph shows the proportions of people on the JPIR (1929, 1934, and 1939) with information on the final education institution for each cohort.

Figure A3: Number of people on the JPIR by occupation



Notes: The graph shows the total number of people on the JPIR (1929, 1934, and 1939) with information on occupation.