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Immigration and Human Capital Adjustments: Evidence from the 1990 Reform of Japan's Immigration Act*

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Abstract

This study examines the effects of the increased influx of immigrants triggered by the 1990 Reform to Japan's Immigration Act on high school students' career choices—specifically, whether they pursue higher education or enter the workforce after graduation. We employ the instrumental variable approach using a shift-share instrument based on historical settlement patterns. The results suggest that the influx of immigrants led more high school students to seek employment outside their home prefectures and to pursue higher education. These findings indicate that immigration can drive adjustments in human capital formation.

Keywords: Immigration, the 1990 Reform to Japan's Immigration Act, Human capital
JEL classification: J15, J61, F22, O15

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1 Introduction

Societies with low birthrates and aging populations tend to face a shrinking labor force, which may prompt policymakers to implement immigration policies aimed at addressing labor shortages. For example, the number of foreign workers in Japan has exceeded 2.3 million, driven in part by growing labor shortages (Ujigane, 2025).[1] Despite ongoing demographic shifts in Japan, academic studies examining the effects of an influx of foreign labor—or foreign residents more generally—within the context of the Japanese economy remain relatively scarce.

The policy change examined in this paper is the 1990 Reform to the Immigration Control and Refugee Recognition Act. This reform was introduced in response to a labor shortage, primarily driven by increased labor demand during the economic boom in Japan throughout the 1980s. In addition, the appreciation of the Japanese yen enhanced Japan's attractiveness as a destination for foreign workers seeking to remit earnings to their home countries. At the same time, the debt crises experienced by several Latin American countries during the 1980s provided strong incentives for workers to seek employment abroad, prompting some to migrate to Japan.

This study aims to examine the impact of an influx of foreign residents on the Japanese economy. As the majority of migrants who arrived during that period were relatively less educated, our analysis centers on high school graduates, who are the group most likely to face direct labor market competition from these migrants.

This study contributes to the literature on the effects of immigration on the host country's labor markets. In particular, this study contributes to the literature on the effects of immigration on changes in the composition of tasks performed by native workers . Prior studies show that an influx of immigrants induces native workers to specialize in more complicated tasks (Peri and Sparber, 2009, 2011; Amuedo-Dorantes and de la Rica, 2011; Foged

[1] South Korea and Taiwan are experiencing similar demographic trends, prompting both countries to accept more foreign labor than ever before (Nihon Keizai Shimbun, 2024a,b).

and Peri, 2016; Storm, 2022; Kim and Lee, 2023), tasks requiring more social skills (Lin, 2019), occupations with regular work hours rather than non-regular hours such as night shifts (Giuntella, 2012), and induce skill upgrading (Mandelman and Zlate, 2022) and higher education (McHenry, 2015; Hunt, 2017).

Additionally, the current study relates to the literature on the effects of globalization on education attainment. Previous studies find that import competition, due to NAFTA and China's integration to the global economy, led to an increase in education attainment (Lee, 2021; Greenland and Lopresti, 2016; Gómez-Ramírez and Padilla-Romo, 2022; Burga and Turner, 2025), and that export expansion also affects the country's education attainment Blanchard and Olney (2017); Liu (2023); Cai et al. (2024); Jiang et al. (2023); Khanna et al. (2023); Zhang and Zhou (2023).

The vast majority of existing studies examine the effects of migrant inflows in historically migrant-receiving countries such as the US (Frey, 1996; Card, 2001; Peri and Sparber, 2011; Ottaviano et al., 2013) and those in Europe (Amuedo-Dorantes and de la Rica, 2011; Foged and Peri, 2016; Storm, 2022). A few exceptions come from recent studies in the context of South Korea (Kim and Lee, 2023, 2024; Kim et al., 2025).

The effects of immigration in the context of the Japanese economy remain relatively underexplored in the existing literature. A pioneering contribution in this area is Nakamura et al. (2009), where they examine the effects of an increase in foreign residents led by the 1990 Reform to Japan's Migration Act. The present study complements their work in several ways. First, it extends the sample period and examines the dynamic responses to immigration. Second, it employs the instrumental variable strategy using a shift-share instrument to address the potential endogeneity of the immigration shock.

The remainder of the paper is organized as follows. Section 2 presents descriptive statistics to illustrate the changes associated with the policy shift. Section 3 outlines the empirical strategy and data sources, and discusses the results. Section 4 offers a concluding remark.

2 Background

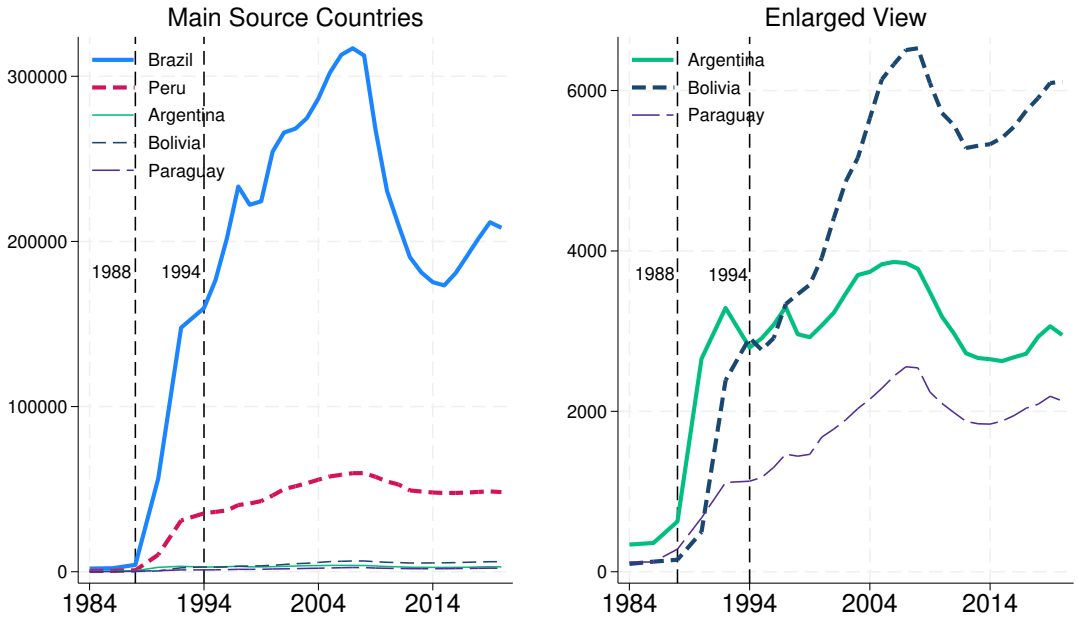
The 1990 Reform of the Immigration Control and Refugee Recognition Act—which was amended in 1989 and came into effect n 1990—is one of the substantial changes in the immigration laws in the modern history of Japan. The reform introduced a new residence status called "long-term resident," which effectively granted third-generation descendants of Japanese emigrants the right to work in any occupation, regardless of job type (Nagayoshi, 2020).

The economic and social background behind the change includes: strong labor demand resulting from Japan's economic growth in the 1980s; the appreciation of the yen, which made Japan an attractive destination for migrant workers; and economic instability in South American countries—driven by factors such as debt crises—which led many workers to seek employment abroad. Additionally, the idea of providing "long-term resident" status was considered as well suited to *jus sanguinis* ("right of blood") of the Japanese system of granting nationality to individuals (Nagayoshi, 2020; Kajita et al., 2005). The 1990 reform to the Immigration Control Act can be considered a significant institutional reform because it established a system that allowed individuals with certain residence statuses to apply for permanent residency. The 1990 reform created a framework that recognized the possibility of permanent settlement at the time of entry (Korekawa, 2025).

Figure 1 shows the number of foreign residents coming to Japan from major Latin American countries—Brazil, Peru, Argentina, Bolivia, and Paraguay. The figure indicates that the number of migrants from these countries to Japan was extremely small prior to 1990. However, the number of foreign residents from Brazil surpassed 200,000 by the late 1990s. The second largest group came from Peru, exceeding 50,000 during the same period. Although the numbers were relatively smaller for other countries, the number of foreign residents from Argentina and Bolivia each exceeded 3,000, while those from Paraguay surpassed 1,500 by the late 1990s.

These drastic changes in the number of foreign residents were not a macroeconomic

Figure 1: Time-series Changes in Migrant Stock from Selected Origin Countries

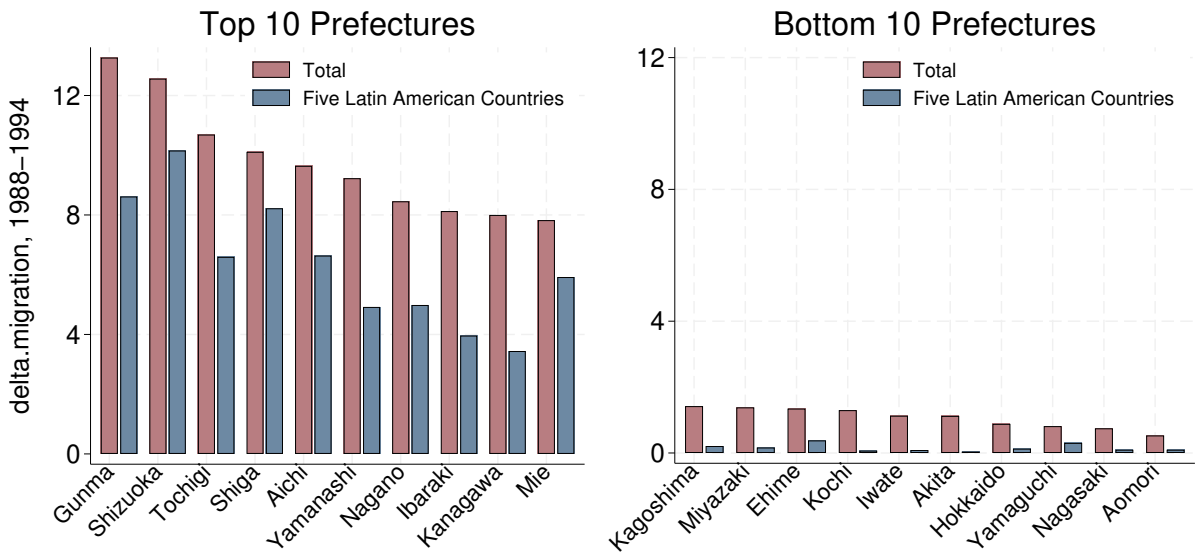


NOTE. Authors' calculation based on the data from the *Statistics on Foreign Residents of Japan* (*Zairyu Gaikokujin Toukei*) of Japan's Ministry of Justice.

shock that uniformly affecting all the locations within Japan. Figure 2 shows the top 10 and bottom 10 prefectures in terms of changes in the number of foreign residents—both total foreign residents and those from the five Latin American countries—as a share of the working-age population. It shows that there are prefectures experienced a greater influx of foreign residents. For example, during the 1988–1994 period, the increase in the share of total foreign residents (of any age) relative to the working-age population was particularly greater in Gunma (13%), Shizuoka (12%), and Tochigi (10%). On the other hand, the changes were small in Aomori (1%), Nagasaki (2%), and Yamaguchi (2%).

We exploit these changes to examine the effects of an acute increase in foreign residents on Japanese labor markets, particularly those for high school graduates. Figures 3, 4, and 5 present the dynamics of key variables of interest for two groups of prefectures: the treatment group, where the influx of foreign residents (as a share of working-age population) during the 1988–1994 period exceeds the 75th percentile, and the control group, which includes the

Figure 2: Cross-sectional Differences in Influx of Immigrants



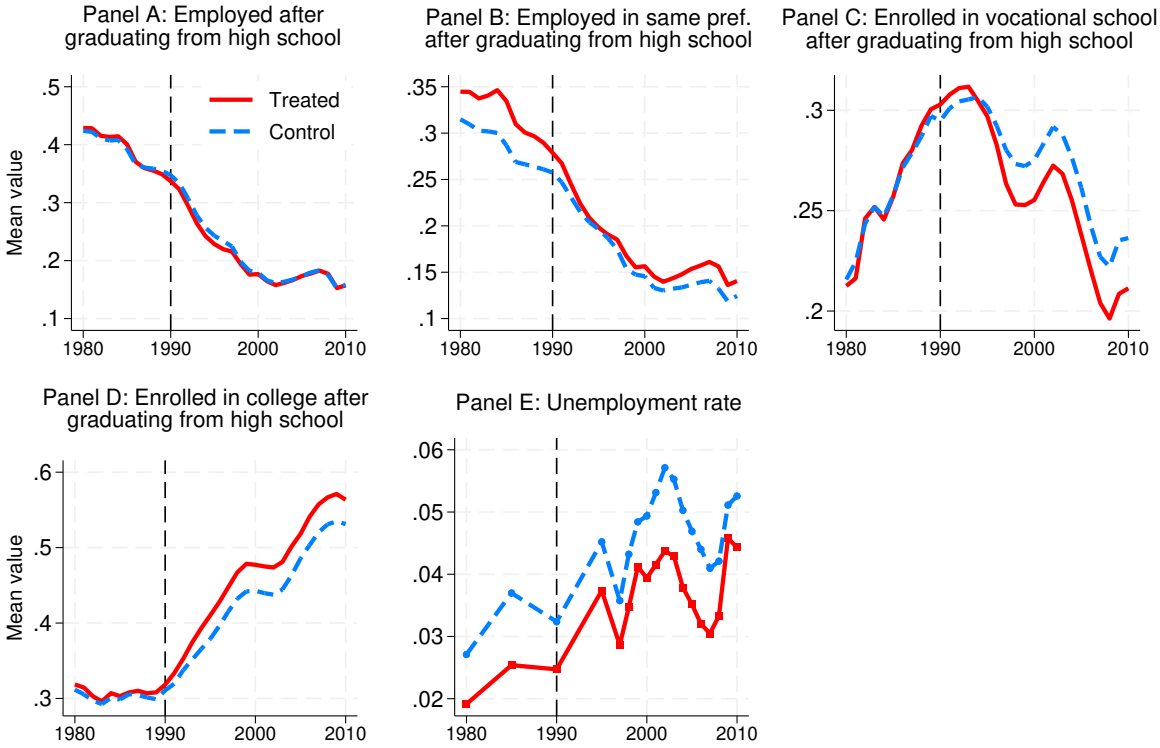
NOTE. Authors' calculation based on the data from the *Statistics on Foreign Residents of Japan* (*Zairyu Gaikokujin Toukei*) of Japan's Ministry of Justice.

remaining prefectures.

Figure 3 presents variables related to the career choices of high school graduates. Panel A shows the share of high school graduates who entered the workforce immediately after graduation (as a share of total number of high school graduates in that year) each year. It indicates that there is essentially no difference between the treatment and control groups. Panel B reports the annual share of high school graduates who began working immediately after graduation in a prefecture different from where they attended high school (as a share of total number of high school graduates in that year). It shows that the share was higher in the treatment group than in the control group prior to the 1990 policy reform. However, the gap narrows after 1990, suggesting that the reform may have induced high school graduates to seek employment in prefectures other than their own.

Panel C shows the share of high school graduates who enrolled in vocational schools (as a percentage of the total number of high school graduates in that year). It indicates that there was essentially no difference between the two groups prior to 1990. However, the share

Figure 3: Population-weighting Mean Dynamics, Career Choice Variables



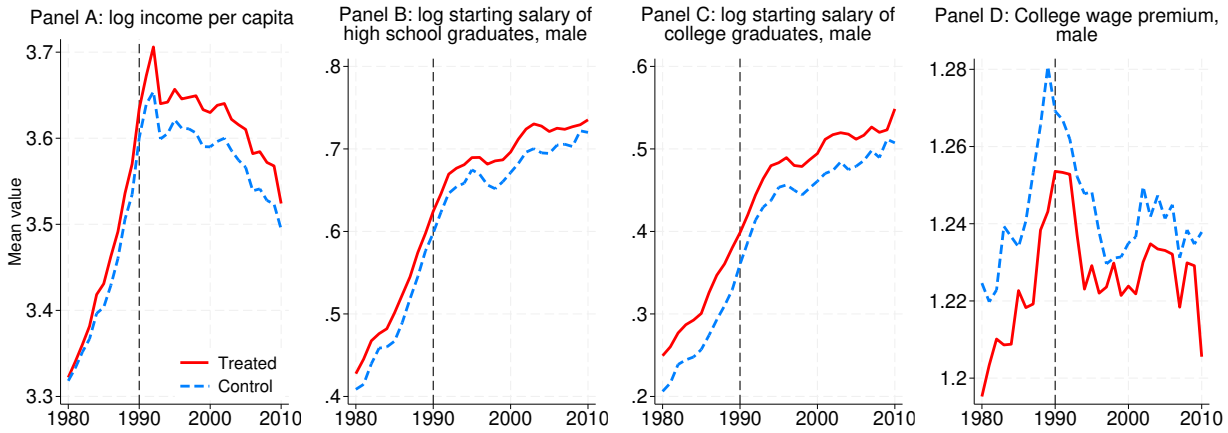
NOTE. Authors' calculation based on the data from the *Basic School Survey* (*Gakkō Kihon Chōsa*) of the Ministry of Education, Culture, Sports, Science and Technology (Panels A–D) and the *Population Census* (*Kokusei Chōsa*) of the Ministry of Internal Affairs and Communications (Panel E).

declined more sharply in the treatment group than in the control group. Panel D presents the share of high school graduates who enrolled in college (also as a percentage of total graduates in that year). Similar to Panel C, there was no notable difference between the two groups before 1990. However, in contrast to the trend observed in Panel C, the share increased more in the treatment group than in the control group. Lastly, Panel D shows the unemployment rate, indicating that there is virtually no difference in its dynamics between the two groups.

Figure 4 presents average trends in income levels and salaries. Panel A shows the log of income per capita (taxable income per tax payers) for both the treatment and control groups, indicating that income levels began to diverge slightly after 1990, remaining higher

in the treatment group thereafter. Panels B and C show the log of average starting salaries for high school graduates and college graduates, respectively. In both cases, starting salaries were consistently higher in the treatment group. However, there are no clear differences between the two groups in terms of time-series trends. Panel D presents the college wage premium—defined as the ratio of average starting salaries for high school graduates to those for college graduates. It shows that the college wage premium was consistently lower for the treatment group throughout the entire sample period.

Figure 4: Population-weighting Mean Dynamics, Income and Starting Salaries

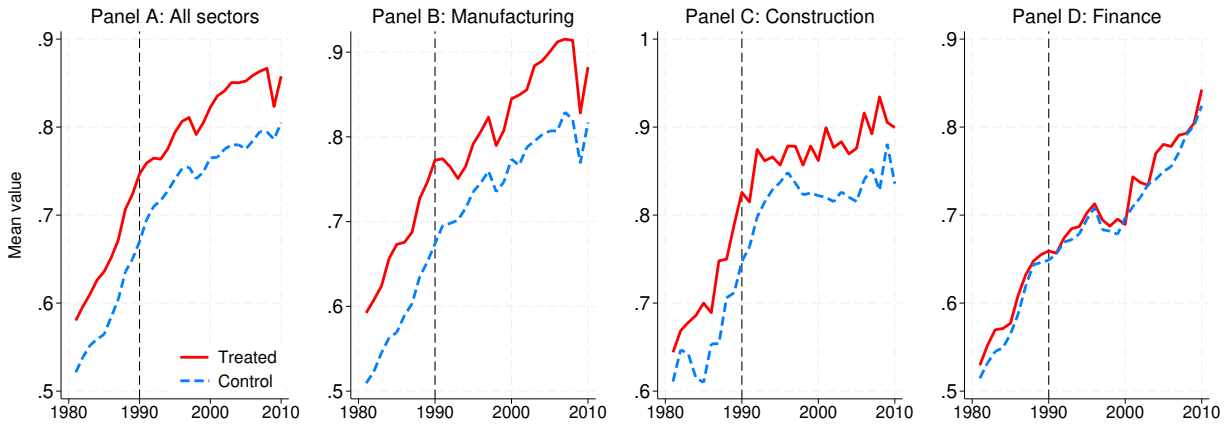


NOTE. Authors' calculation based on the data from the *Prefectural Economic Accounts* (*Kenmin Keizai Keisan*) of the Cabinet Office, the *Survey on Municipal Taxation Status* (*Shichōson Zei Kazei Jokyō nado no Chō*) of the Local Tax Bureau, Ministry of Internal Affairs and Communications, and the *Basic Survey on Wage Structure* of Japan's Ministry of Health, Labour and Welfare.

Figure 5 presents the average trends in overall and sectoral wages, with wages shown for all sectors (Panel A), the manufacturing sector (Panel B), the construction sector (Panel C), and the finance sector (Panel D). Panels A–C show that prefectures in the treatment group consistently have higher wages overall, as well as in the manufacturing and construction sectors. Panel D indicates that wages in the finance sector are nearly identical between the two groups. None of the four panels shows a clear shift in wage trends after 1990.

While these mean dynamics are helpful for understanding the overall trends of key variables, the figures do not account for several important issues, including the endogeneity of

Figure 5: Population-weighting Mean Dynamics, Sectoral Wages



NOTE. Authors' calculation based on the data from the *Basic Survey on Wage Structure* of Japan's Ministry of Health, Labour and Welfare.

immigrants' location choices, the omission of control variables, and the lack of proper weighting across observations. The next section discusses the econometric methods used to address these issues and identify the causal effects of the influx of foreign residents.

3 Analysis

This section conducts an analysis. Section 3.1 explains data sources. Section 3.2 carries out the analysis employing the instrumental variable approach.

3.1 Data

Our dataset is comprised of several sources. The data on the number of foreign residents are obtained from the *Statistics on Foreign Residents of Japan* (*Zairyu Gaikokujin Toukei*) of Japan's Ministry of Justice. The data on prefecture-level income are based on income data from the *Prefectural Economic Accounts* (*Kenmin Keizai Keisan*) of the Cabinet Office and the number of tax payers retrieved from the *Survey on Municipal Taxation Status* (*Shichōson Zei Kazei Jokyō nado no Chō*) of the Local Tax Bureau, Ministry of Internal Affairs and

Communications, via e-Stat.[2] The high school students' career choice variables such as the share of high school students employed after graduation and the college advance rate come from the *Basic School Survey* (*Gakkō Kihon Chōsa*) of the Ministry of Education, Culture, Sports, Science and Technology, via e-Stat. The unemployment rates are retrieved from the *Population Census* (*Kokusei Chōsa*) of the Ministry of Internal Affairs and Communications, via e-Stat.

The wage variables such as high school graduates' starting salaries, college graduates' starting salaries, and sectoral wages (manufacturing, construction, and finance) are obtained from the *Basic Survey on Wage Structure* of Japan's Ministry of Health, Labour and Welfare.

3.2 Instrumental Variable Approach

3.2.1 Regression Model for the Instrumental Variable Approach

We estimate the following regression model:

$$100 \times (y_{i,1994+h} - y_{i,1985}) = \alpha_{0h} + \alpha_{1h}\Delta mig_{i,88-94} + \mathbf{X}_{i,t}\boldsymbol{\alpha}_3 + e_{i,h}$$

where $y_{i,t+h}$ is an outcome variable (i.e., the share of high school graduates who immediately entered workforce after graduation as a share of total number of high school graduates in the same cohort) in prefecture i in year $t+h$. The key explanatory variable is the change in the share of the foreign resident population within the working-age population during the 1988–1994 period:

$$\Delta mig_{i,88-94} = \frac{MIG_{i,1994} - MIG_{i,1988}}{Pop_{i,1988}/1000},$$

where $MIG_{g,i,t}$ denotes the number of foreign residents from country g residing in prefecture i in year t; and $Pop_{i,t}$ denotes the working-age population of prefecture i in year t. The

[2] e-Stat is the Portal Site of Official Statistics of Japan, available at https://www.e-stat.go.jp/en.

variable $\mathbf{X}_{i,t}$ denotes the vector of control variables. The variable $e_{i,h}$ denotes the error term. Scaler parameters, α_{0h} and α_{1h}, and a vector of parameters, $\boldsymbol{\alpha}_3$, are to be estimated. We estimate separate regression for each horizon h using a cross-section of 47 prefectures.

As the key explanatory variable $\Delta mig_{i,88-94}$ is an endogenous variable, we employ a shift-share instrument based on past settlement patterns, following the literature (Card and DiNardo, 2000; Card, 2001; Kim and Lee, 2023; Sasahara et al., 2023). Specifically, we use the following variable as an instrumental variable:

$$\Delta mig^{Bartik}_{i,88-94} = \frac{1}{Pop_{i,1988}/1000} \sum_{g \in G} \frac{MIG_{g,i,1988}}{\sum_i MIG_{g,i,1988}} \times (MIG_{g,1994} - MIG_{g,1988}),$$

where the first component in the summation mark, $MIG_{g,i,1988}/\sum_i MIG_{g,i,1988}$, is the share of residents coming from country g residing in prefecture i as of 1988. The second component, $MIG_{g,1994} - MIG_{g,1988}$, denotes overall change in total foreign resident population from country g residing in Japan. The variable G denotes the set of the five Latin American countries. Special Permanent Residents from Korean not included when constructing these migration variables because we are particularly interested in an "influx" of immigrants.

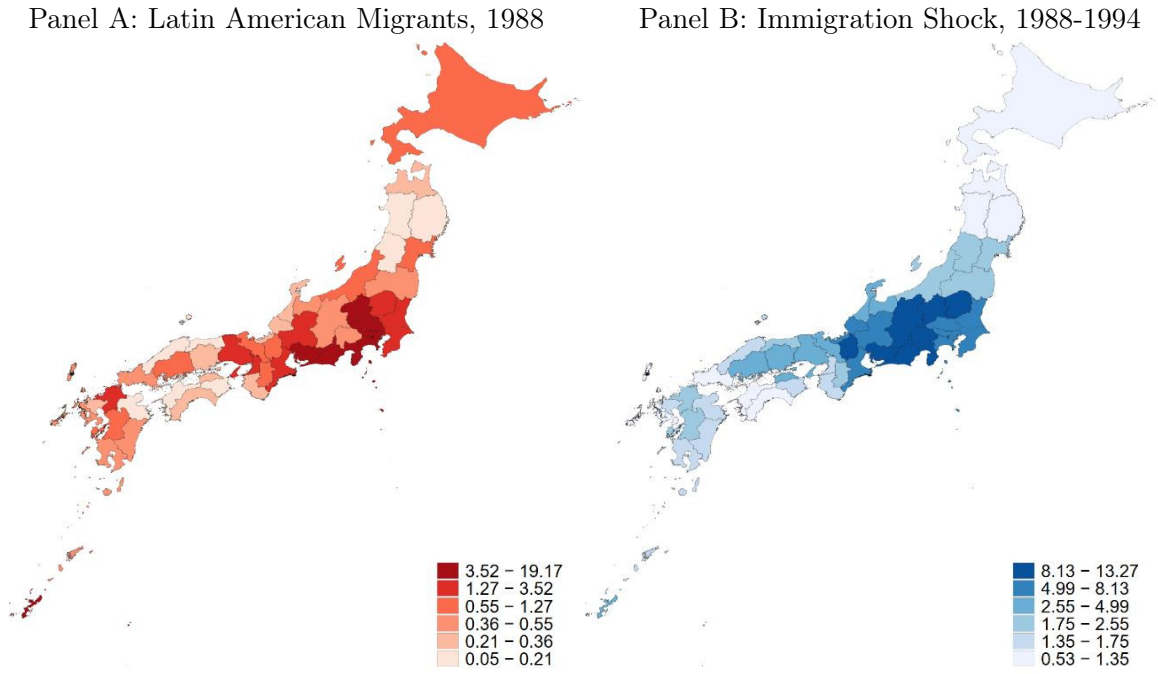
3.2.2 Validity of the Instrumental Variable

This section tests the validity of the instrumental variable by examining the correlation between the initial distribution of foreign residents and the magnitude of the 'immigration shock' induced by the 1990 Reform of the Immigration Act.

Panel A of Figure 6 shows the geographical distribution of foreign residents from the five Latin American countries as of 1988. Panel B shows the geographical distribution of the immigration shock, $\Delta mig_{i,88-94}$. The two panels imply that these two variables are positively correlated.

Figure 7 shows the correlation between the initial residential share $\frac{MIG_{i,g,1988}}{\sum_i MIG_{i,g,1988}}$ and the change in the migrant share $MIG_{i,g,1994} - MIG_{i,g,1988}$ for each of the five Latin American

Figure 6: Geographical Distribution of Migrants

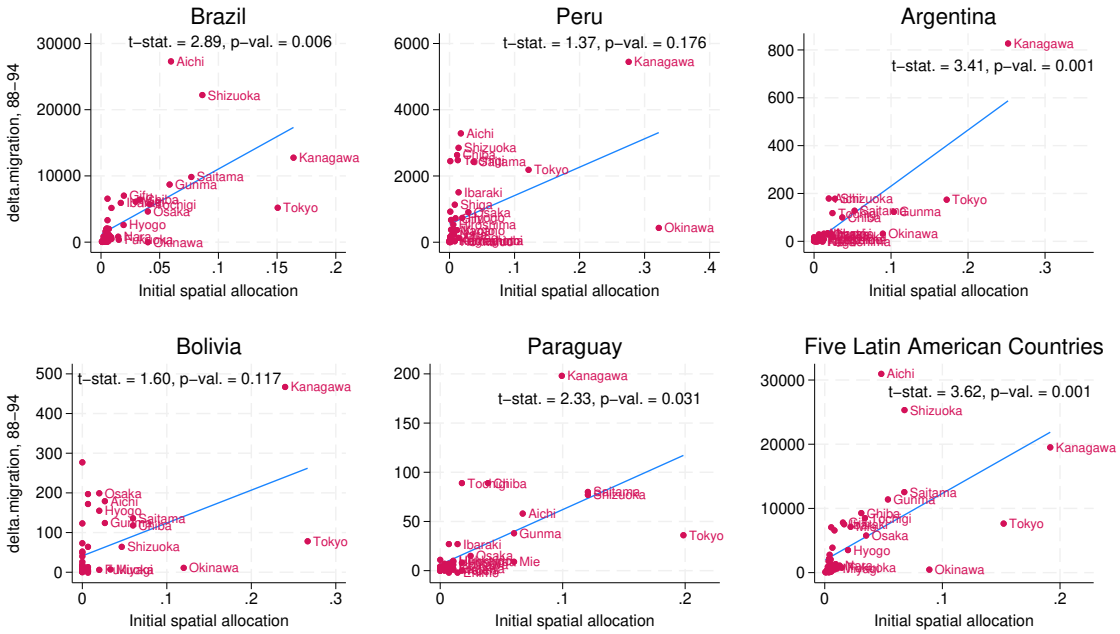


NOTE. Authors' calculation based on the data from the *Statistics on Foreign Residents of Japan* (*Zairyu Gaikokujin Toukei*) of Japan's Ministry of Justice.

countries—Brazil, Peru, Argentina, Bolivia, and Paraguay—in the first five panels, and for all five countries combined in the last panel. It shows that the initial geographical distribution of residents from all countries as of 1988 strongly predicts the subsequent immigration shock during the 1988–1994 period, except in the case of Peruvian residents.

Table 1 shows results from the first-stage regressions, regressing $\Delta mig_{i,88-94}$ on $\Delta mig^{Bartik}_{i,88-94}$. Column (1) uses the immigration shock calculated from inflows of migrants from all countries, while Column (2) uses the shock based on inflows of Latin American immigrants. Both columns employ the same instrumental variable. The results show that the instrument has a statistically significant effect on changes in the foreign resident share in both columns. The first-stage F-statistics for the excluded instrument are 39.12 and 21.80 in columns (1) and (2), respectively. Based on these results, we use the immigration shock derived from foreign residents from all countries as the explanatory variable in the second-stage regressions.

Figure 7: Initial Settlement Patterns and Subsequent Inflows



NOTE. Authors' calculation based on the data from the *Statistics on Foreign Residents of Japan* (*Zairyu Gaikokujin Toukei*) of Japan's Ministry of Justice.

Table 1: First-stage Results

Dependent Variable is $\Delta mig_{i,88-94}$

	All migrants	Latin American migrants
	(1)	(2)
$\Delta mig^{Bartic}_{i,88-94}$	0.18***	0.79***
	(0.03)	(0.17)
Controls	Yes	Yes
Sample size	47	47
R-sq.	0.88	0.89
F-stat. for excluded instrument	39.12	21.80
p-val. of F-stat. for excluded instrument	0.000	0.000

NOTE. Authors' estimation. See the main text for sources of the data used in the analysis. *** indicates statistical significance at the 1% level.

3.2.3 Results from the Instrumental Variable Approach

This section discusses results from the instrumental variable approach. Figure 8 shows the effects of an increase in foreign residents on individuals' career choice variables. Dashed lines indicate OLS estimates, while solid lines represent IV estimates. Darker bands denote 90% confidence intervals based on the IV estimates, and lighter bands denote 95% confidence intervals based on the same estimates. Estimated coefficients measure the effect of a one interquatile change (from the 25th percentile to 75th percentile) of the distribution of the immigration shock $\Delta mig_{i,88-94}$ across 47 prefectures.

Panel A shows a slight decline in the share of individuals who entered the workforce immediately after graduating from high school between 1988 and 1994. It is barely statistically significant at the 10% level. However, the share returned to its pre-shock level by the mid-2000s, suggesting that the effect was short-lived. Panel B also shows a slight decline between 1988 and 1994 in the share of individuals entering the workforce *in prefectures other than where they attended high school*. However, again, the effect was short-lived.

Panel C shows that the share of individuals entering vocational school immediately after high school declined by the late 1990s, and this lower level persisted through the end of the sample period in 2022. The point estimates based on IV suggest that moving from the 25th percentile prefecture to 75th percentile prefecture in terms of the size of migration shock $\Delta mig_{i,88-94}$ decreases the change in the share of vocational school attendees by 4–5 percentage points throughout the 2000s.

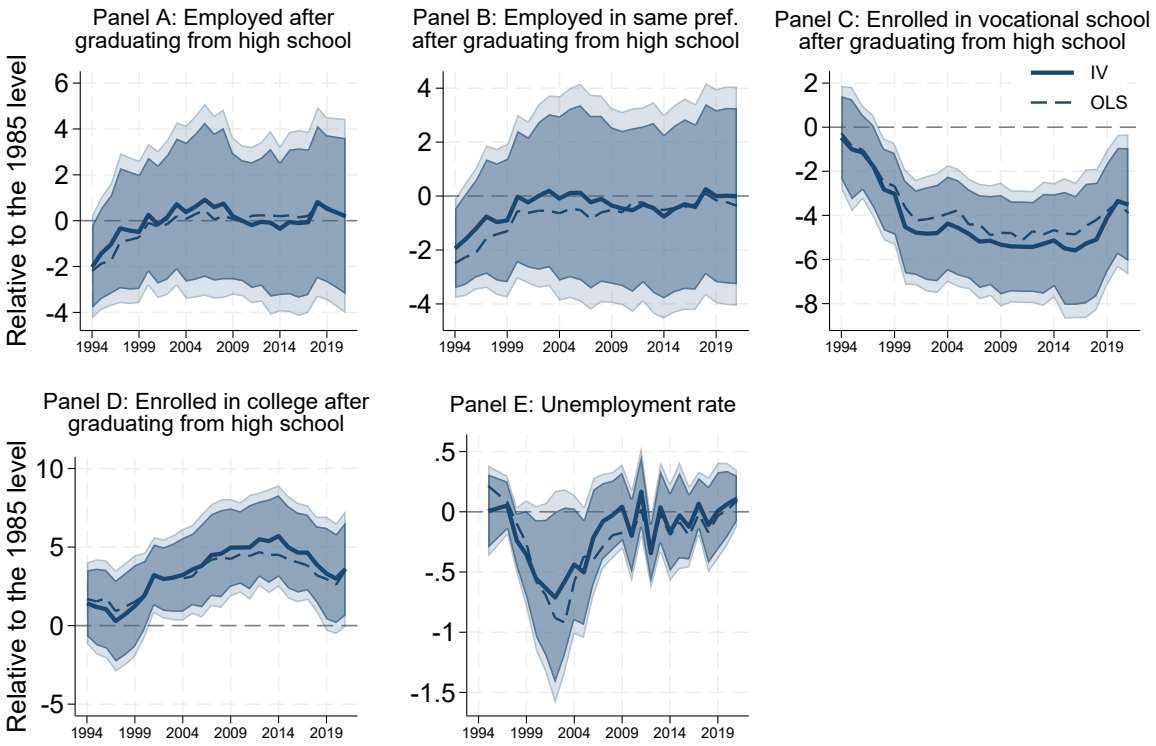
Panel D shows that the share of individuals entering college immediately after high school increased by the late 1990s, with this higher level also persisting through 2022. The IV estimates suggest that moving from the 25th percentile prefecture to 75th percentile prefecture in terms of $\Delta mig_{i,88-94}$ increases the change in the share of college attendees by 4–5 percentage points throughout the 2000s.

Lastly, Panel E shows the effects on the unemployment rate, which, unlike Panels A–D, reflects the overall rate across all age groups. It shows that the unemployment rate slightly

decreased in prefectures with greater inflows of foreign residents in the late 1990s, although the effect is barely statistically significant at the 10% level.

Overall, the results suggest that immigrant inflows influenced young individuals' career choices by increasing the share of those entering the labor market in prefectures other than their home prefectures and encouraging them to pursue higher education by attending college. The implied human capital adjustment—increased college attendance—may reflect individuals' efforts to avoid direct competition with newly arrived workers in the labor market.

Figure 8: Results from the IV Approach, Career Choice Variables

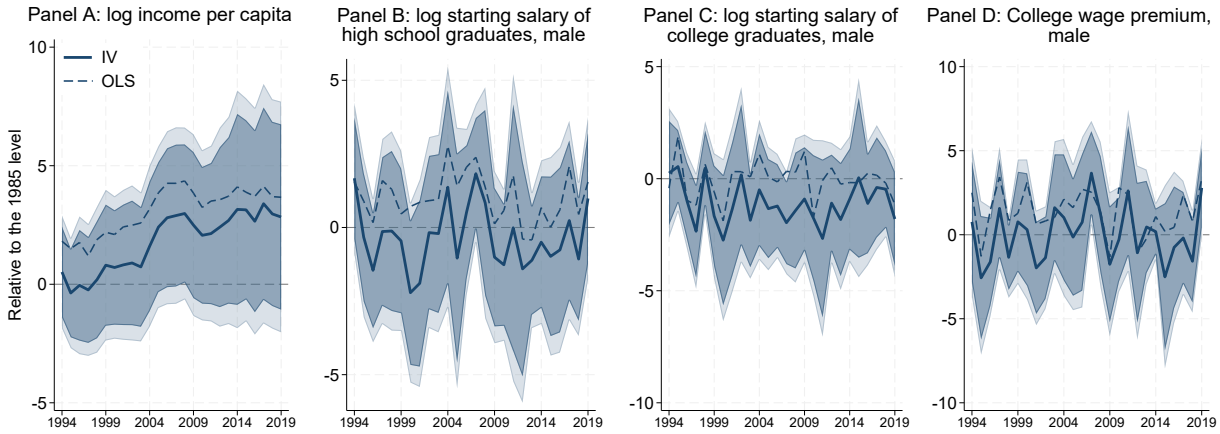


NOTE. Authors' estimation. See the main text for sources of the data used in the analysis. OLS estimates are shown with dashed lines, and IV estimates with solid lines. These point estimates measure the effect of a one interquatile change (from the 25th percentile to 75th percentile) of the distribution of the immigration shock $\Delta mig_{i,88-94}$ across 47 prefectures. The 90% confidence intervals, based on the IV estimates, are indicated by darker bands, while lighter bands represent the 95% intervals.

Figure 9 shows the effects of the 'immigration shock' on income levels, starting salaries,

and the college wage premium (defined as the ratio of starting salaries for college graduates to those for high school graduates). Panel A shows that prefectures with greater inflows of immigrants experienced higher growth in income per capita, although the effect is not statistically significant. Panels B and C show that there is essentially no impact on the starting salaries of high school and college graduates. Panel D shows that the college wage premium does not change in response to immigration.

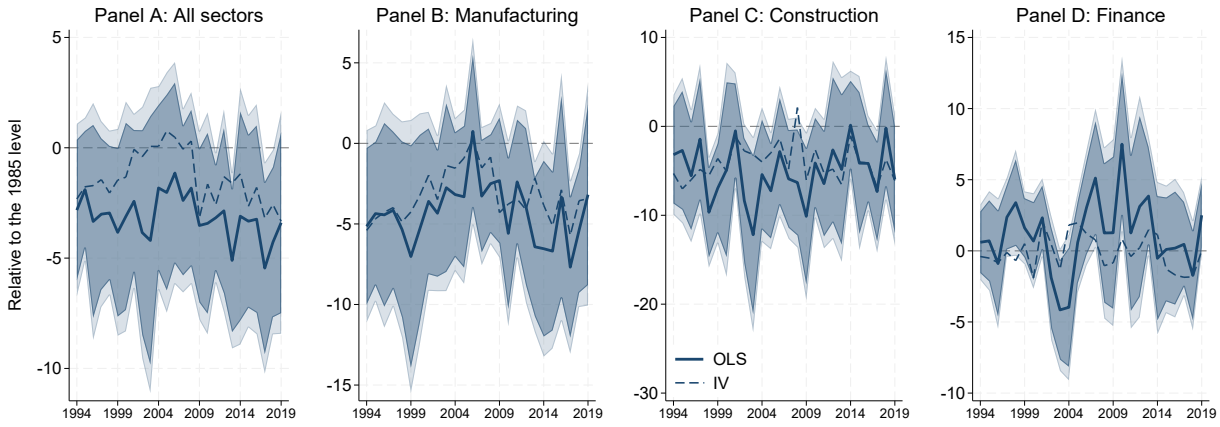
Figure 9: Results from the IV Approach, Income and Starting Salaries



NOTE. Authors' estimation. See the note for Figure 8.

Figure 10 displays the effect of the 'immigration shock' on overall wages (Panel A) and sectoral wages—manufacturing (Panel B), construction (Panel C), and finance (Panel D). Panel A shows that immigration exerted slight downward pressure on wages, though the effect is statistically insignificant. Panels B and C also show slight declines in manufacturing and construction wages, which are statistically significant. However, Panel D indicates that the effect on wages in the financial sector is essentially zero. These negative coefficients for the manufacturing and construction sectors are consistent with the fact that most migrants worked in these sectors rather than in the financial sector.

Figure 10: Results from the IV Approach, Sectoral Wages



NOTE. Authors' estimation. See the note for Figure 8.

4 Conclusions

We have examined the effects of an influx of foreign residents on the Japanese economy, using the 1990 Reform to Japan's Immigration Act as a quasi-natural experiment. As the majority of migrants who entered the Japanese labor market were relatively low-skilled workers, this study has examined the effects on the group most likely to be in direct competition with these newly arrived workers. To address the endogeneity issue commonly encountered in this literature, we use the instrumental variable approach using past settlement patterns as an instrument.

The results show that young individuals responded to an influx of foreign workers by altering their career paths. The share of individuals entering the workforce in the same prefecture as their high school declined in prefectures with larger increases in foreign residents. Since the overall share of individuals entering the workforce did not change, this suggests that the influx of immigrants induced out-migration to other prefectures. Furthermore, the share of individuals advancing to college after high school increased in response to immigration. An interquartile change (from the 25th to the 75th percentile) in the increase in the share of foreign residents led to a 3 percentage point rise in the share of individuals advancing to college. These results suggest that immigration induced human capital accumulation among young individuals by encouraging them to pursue higher education to avoid competition with newly arrived workers in the labor market.

Although the results of this study are highly insightful, a comprehensive evaluation of the effects of immigration on the economy through human capital adjustments requires a model-based approach that incorporates the dynamic impact of human capital accumulation on productivity and welfare. This remains an important task for future research.

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Appendix

A Pre-trend

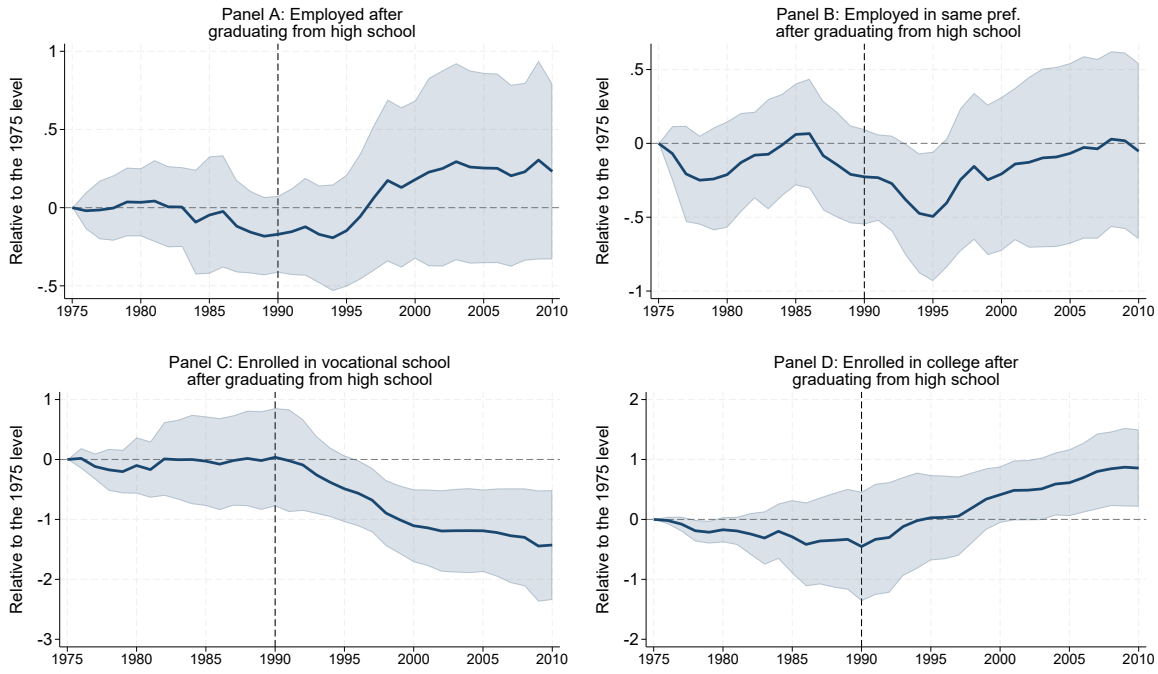
This section examines the pre-trend of the key dependent variables. To do so, we run the following regression model:

$$100 \times (y_{i,1975+h} - y_{i,1975}) = \alpha_{0h} + \alpha_{1h}\Delta mig_{i,88-94} + e_{i,h}$$

where the dependent variables are changes in a key outcome variable from 1975 to 1975+h. The explanatory variable is the change in the number of migrants from 1988 to 1994 as a share of the working age population, $\Delta mig_{i,88-94}$, which is instrumented by the shift-share IV. The error term is denoted by $e_{i,h}$.

Figure A1 plots estimated coefficients for the four key variables: the share of students who (A) employed after graduating from high school, (B) employed in same pref after graduating from high school, (C) enrolled in vocational school after graduating from high school, and (D) enrolled in college after graduating from high school. These panels show that there were essentially no pre-trend in the key dependent variables before the 1990 Reform of the Immigration Act.

Figure A1: Pre-trend



NOTE. Authors' estimation.

B Difference-in-Differences Approach

B.1 Regression Model for the Difference-in-Difference Approach

The previous section examines the effects of immigration using the instrumental variable approach with a shift-share instrument. However, an increasing number of studies have pointed out potential issues with this approach (Jaeger et al., 2018; Adão et al., 2019; Goldsmith-Pinkham et al., 2020; Borusyak et al., 2022). As a robustness check, this section employs the DID approach to re-examine the effects.

In particular, we estimate the following regression model:

$$100 \times [\ln(y_{i,1994+h}) - \ln(y_{i,1985})] = \beta_{0h} + \beta_{1h} D_i^{Treated} + u_{i,h}$$

where $D_i^{Treated}$ denotes the dummy variable taking unity if the change in the number of migrants between 1988 and 1994 (as a share of the initial working age population) in prefecture i exceeds the 75th percentile of the cross-sectional distribution of the variable. Estimate this regression using the cross-section of prefectures for each horizon h.

As suggested by Figures 3, 4, and 5, the treatment and control groups have different initial conditions, which may account for the differing dynamics of the outcome variables between the two groups. To account for potential bias arising from different initial conditions between the two groups, we estimate the DID model using entropy weighting (Hainmueller, 2012), in addition to population weighting.

Table A1 shows the weight used in the entropy-weighting DID method. It assigns greater weights to prefectures that unexpectedly experienced large inflows of migrants and lower weights to those that were expected to experience such inflows.

Table A1: Entropy Weighting

Prefecture	Δmig	Weight
Treated prefectures		
Aichi	9.6	0.04
Kanagawa	8.0	0.05
Saitama	7.6	0.04
Chiba	7.4	0.04
Tokyo	6.2	0.08
Hyogo	2.7	0.04
Control prefectures		
Nara	2.6	0.12
Fukushima	2.5	0.22
Niigata	2.3	0.03
Osaka	1.7	0.13
Sum of weights		0.79

NOTE. Authors' estimation. See the main text for sources of the data used in the analysis.

Table A2 shows the differences between the treatment and control groups across eight variables representing the initial economic conditions. It shows that, under the population weighting, the prefectures in the treatment group had a statistically significantly lower share

of elderly population and female workers, higher income levels, lower unemployment rates, higher shares of employment in manufacturing, and lower shares in agriculture, mining, and the public sector. Furthermore, the differences are statistically significant at either the 5% or 1% level. However, with entropy weighting, these differences disappear, and there are essentially no differences between the treatment and control groups in terms of these variables.

The results in Table A2 suggest that, with entropy weighting, the DID method can identify the causal effects of immigration by ensuring that treatment and control prefectures have nearly identical initial conditions, thereby eliminating the possibility that differences in initial conditions drive divergent outcome dynamics.

Table A2: Comparison between Treatment Group and Control Group

	Treated − Control	
	Population weighting	Entropy weighting
Share of 60+ years old	-0.026**	-0.016
	(0.011)	(0.016)
Share of female workers	-0.052***	-0.040
	(0.017)	(0.023)
ln(Income per capita)	0.156***	0.085
	(0.050)	(0.090)
Unemployment rate	-0.010***	-0.003
	(0.003)	(0.004)
Share of manufacturing workers	0.098***	0.038
	(0.032)	(0.026)
Share of agriculture workers	-0.028***	-0.008
	(0.010)	(0.009)
Share of mining workers	-0.002**	-0.001
	(0.001)	(0.002)
Share of public sector workers	-0.016***	-0.006
	(0.005)	(0.005)

NOTE. Authors' estimation. See the main text for sources of the data used in the analysis. *** and ** indicates statistical significance at the 1% and 5% levels, respectively.

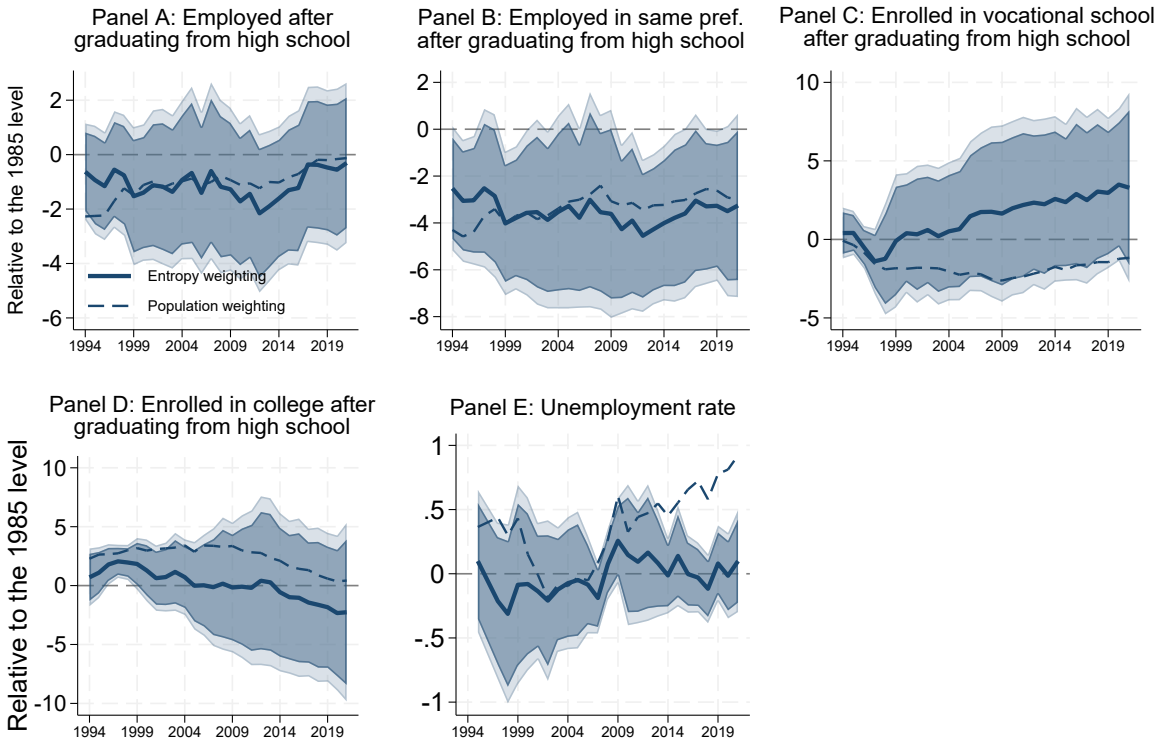
B.2 Results from the Difference-in-Differences Approach

This section discusses results from the DID method. Figure A2 shows the effects on career choice variables. Solid lines indicate point estimates based on the entropy-weighted DID method. Dashed lines indicate point estimates based on the population-weighted DID method. Darker bands are 90% confidence intervals based on the entropy-weighted DID and lighter bands are 95% confidence intervals based on the same DID estimates.

Figure A2 presents the effects of immigration on career choice variables based on the DID approach. We focus on the results from the entropy-weighted DID. The findings are broadly consistent with those in Figure 8. Panel A shows that the treatment group experienced a slightly greater decline in the share of individuals entering the labor force immediately after high school graduation tends to be lower in the treatment group, although the difference is not statistically significant.

Figure A2: Results from the Difference-in-Differences Approach, Career Choice Variables

amend



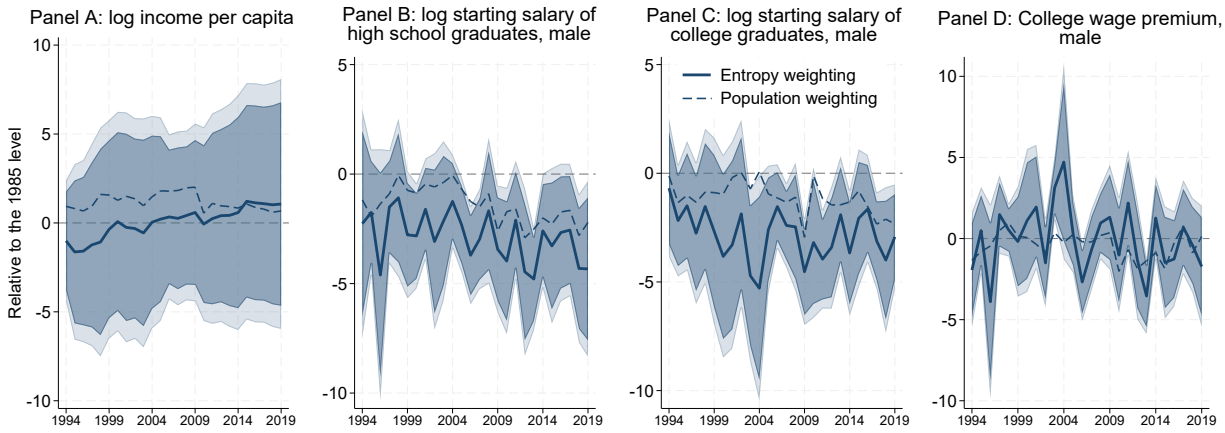
NOTE. Authors' estimation. See the main text for sources of the data used in the analysis. The solid lines represent point estimates obtained using the DID method with entropy weighting, while the dashed lines show estimates based on population weighting. The darker shaded areas denote 90% confidence intervals for the entropy-weighted estimates, and the lighter shaded areas indicate the corresponding 95% confidence intervals.

Panel B shows that the treatment group experienced a greater decline in the share of individuals who entered the labor force in prefectures other than where their high schools were located. This difference persisted throughout the sample period and is statistically significant.

In contrast to Figure 8, Panel C of Figure A2 shows that the treatment and control groups exhibit essentially the same changes in the share of individuals who enrolled in vocational schools after high school. Panel D shows that the share of individuals who enrolled in college after graduating from high school increased slightly more in the treatment group than in the control group. However, the effect was short-lived.

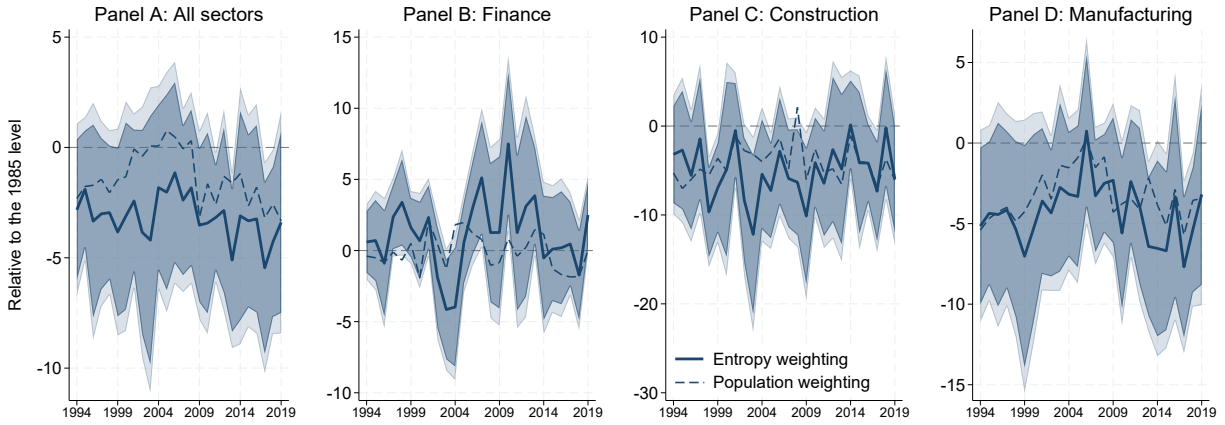
Figure A3 shows the effects on income levels, starting salaries of high school graduates, starting salaries of college graduates, and the college wage premium—defined as the ratio of college to high school starting salaries. Panel A shows that income levels are unaffected by immigration. However, Panels B and C imply a slight downward pressure on starting salaries. Panel D shows that immigration had no effect on college wage premium.

Figure A3: Results from the Difference-in-Difference Approach, Income and Starting Salaries



NOTE. Authors' estimation. See the note for A2.

Figure A4: Results from the Difference-in-Difference Approach, Sectoral Wages



NOTE. Authors' estimation. See the note for A2.

Figure A4 shows the effects on overall wages (Panel A), wages in the finance sector (Panel B), the construction sector (Panel C), and the manufacturing sector (Panel D). These panels show that immigration exerted slight downward pressure on overall wages, as well as on wages in the construction and manufacturing sectors, since the estimated coefficients are negative but not statistically significant. Overall, the results are broadly consistent with the results from the instrumental variable approach.

C Share of Individuals by Education, Sector, and Type of Work

C.1 Share of Individuals by Education

This section provides descriptive figures help understand the composition of immigrants. Figure A5 shows the share of individuals by education category and nationality since 1980, for Japanese, Chinese, Koreans, Americans, and others. Each dot represents $Pop_t^{n,e} / \sum_e Pop_t^{n,e}$ where n, e, and t indicate nationality, education category (less than high school, high school, vocational school/junior college, and college), and year, respectively. The data come from the *Population Census* of the Ministry of Internal Affairs and Communications. It shows that Japanese and Korean individuals in Japan tend to have similar educational achievements. It also shows that Chinese and US individuals in Japan tend to have higher shares of college graduates.

Figure A6 shows the share of individuals by education category for other nationalities, Filipinos, Brazilians, Peruvians, Thai, and British, since 2000. It covers the data since 2000 only for these nationalities. Figure A7 extracts Japanese, Brazilians, and Peruvians, indicating that the share of high school graduates is higher and the share of those with higher education (vocational school/junior college and college) is lower for Brazilians relative to Japanese.

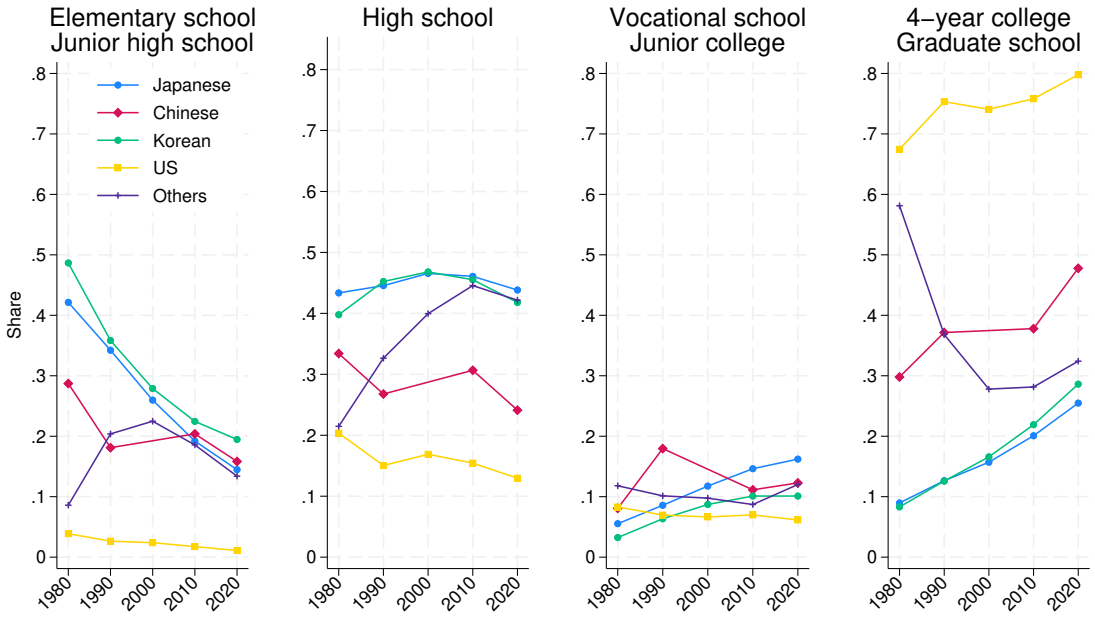
C.2 Share of Individuals by Sector

Figure A8 shows the share of individuals by sector and nationality since 1980, for Japanese, Chinese, Koreans, Americans, and others. Each dot represents $Pop_t^{n,s} / \sum_s Pop_t^{n,s}$ where n, s, and t indicate nationality, sector, and year, respectively. Figure A9 shows the share of individuals by education category for other nationalities, Filipinos, Brazilians, Peruvians, Thai, and British, since 2000. Figure A10 extracts Japanese, Brazilians, and Peruvians from Figure A9. Figure A10 shows that the majority of Brazilians and Peruvians work in the manufacturing sector.

C.3 Share of Individuals by Type of Work

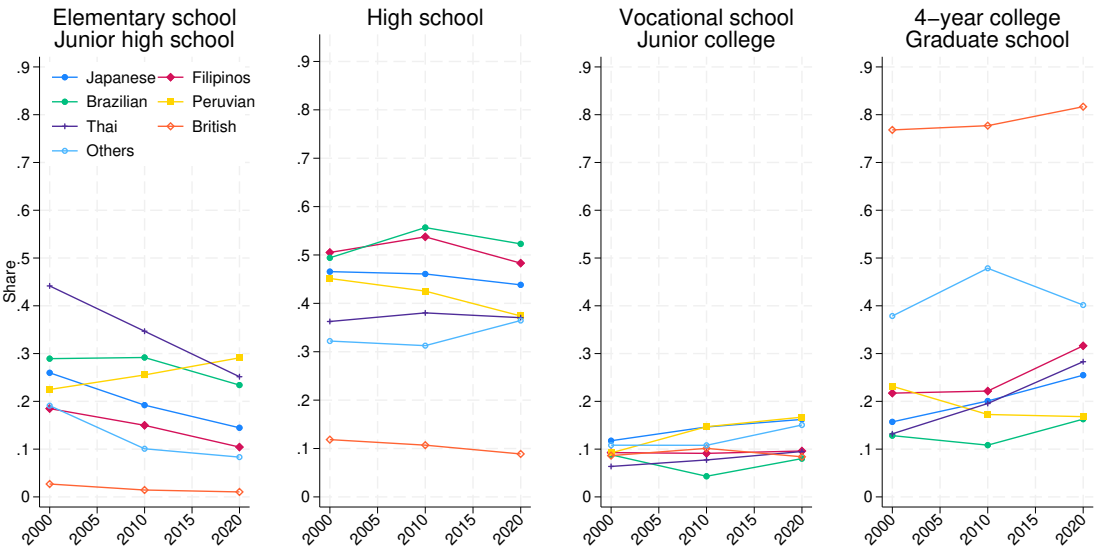
Figure A11 shows the share of individuals by type of work and nationality since 2000, for Japanese, Brazilians, and Peruvians. Each dot represents $Pop_t^{n,w} / \sum_w Pop_t^{n,w}$ where n, w, and t indicate nationality, type of work, and year, respectively. It shows that the majority of Brazilians and Peruvians work as production workers.

Figure A5: Share of Individuals by Education Category and Nationality, since 1980



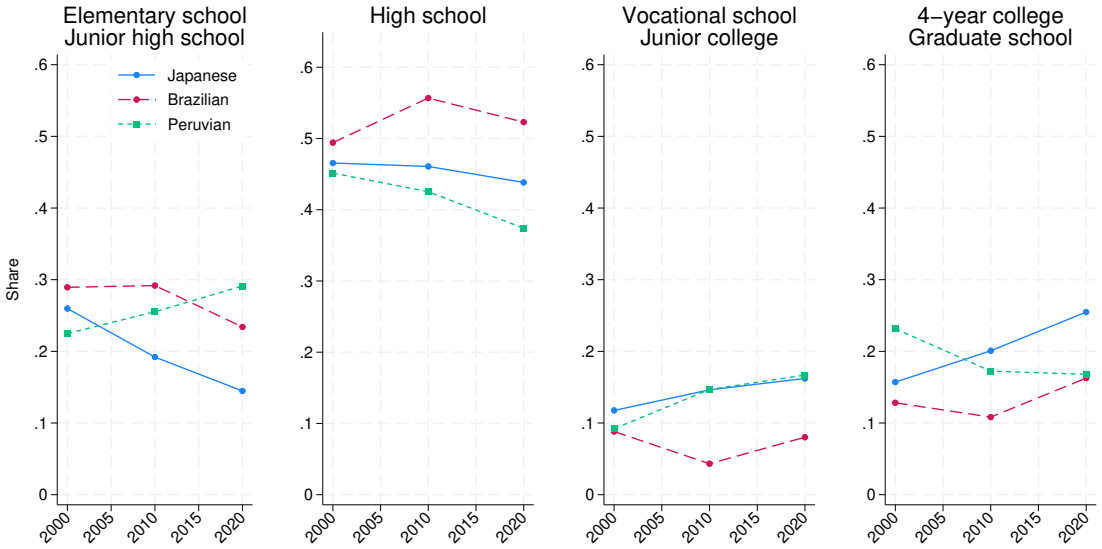
NOTE. Authors' calculation. See the text for data sources.

Figure A6: Share of Individuals by Education Category and Nationality, since 2000



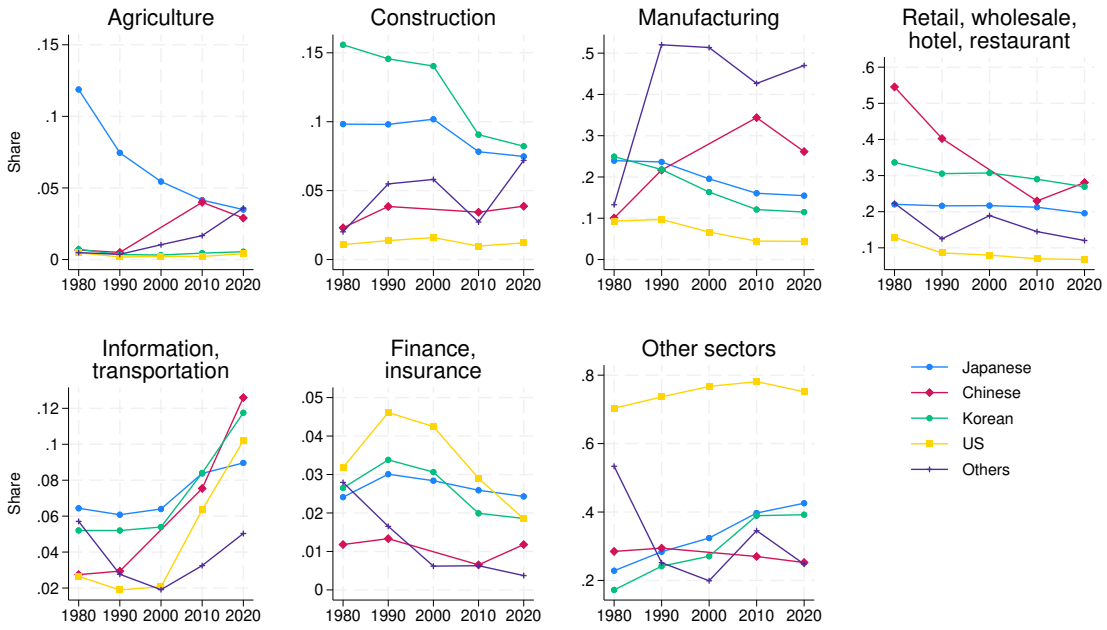
NOTE. Authors' calculation. See the text for data sources.

Figure A7: Share of Individuals by Education Category and Nationality, Residents from Latin America, since 2000



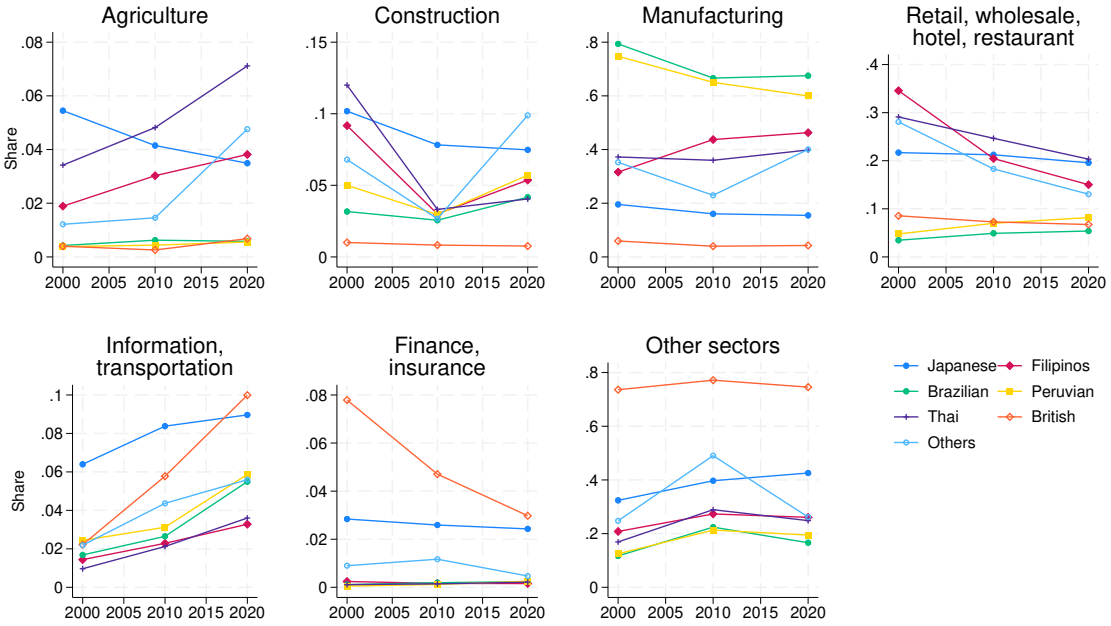
NOTE. Authors' calculation. See the text for data sources.

Figure A8: Share of Individuals by Sector and Nationality, since 2000



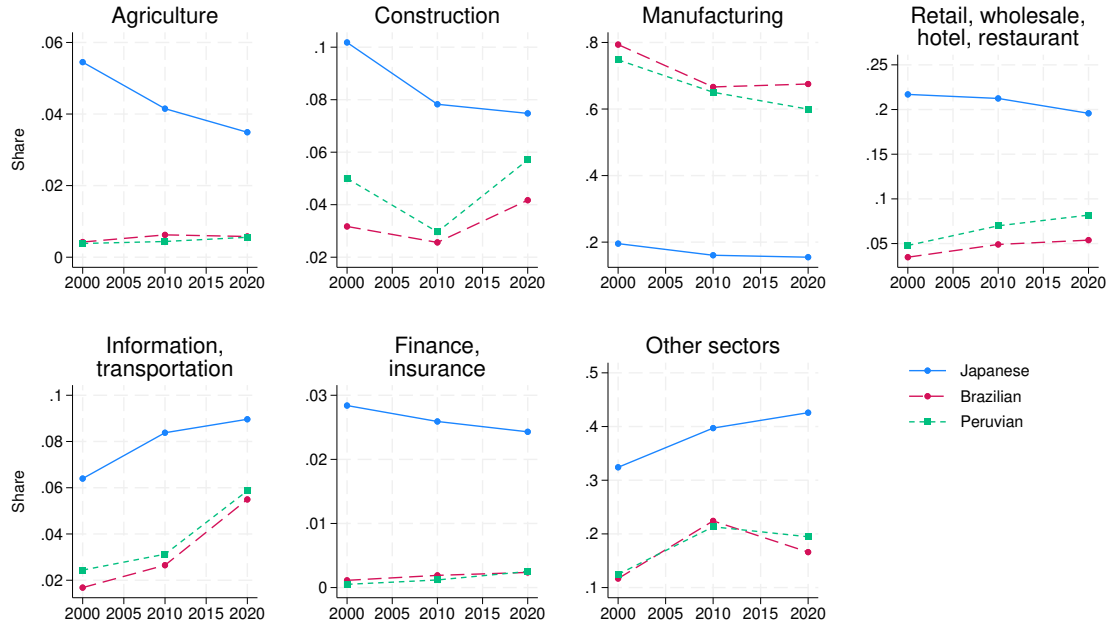
NOTE. Authors' calculation. See the text for data sources.

Figure A9: Share of Individuals by Sector and Nationality, since 2000



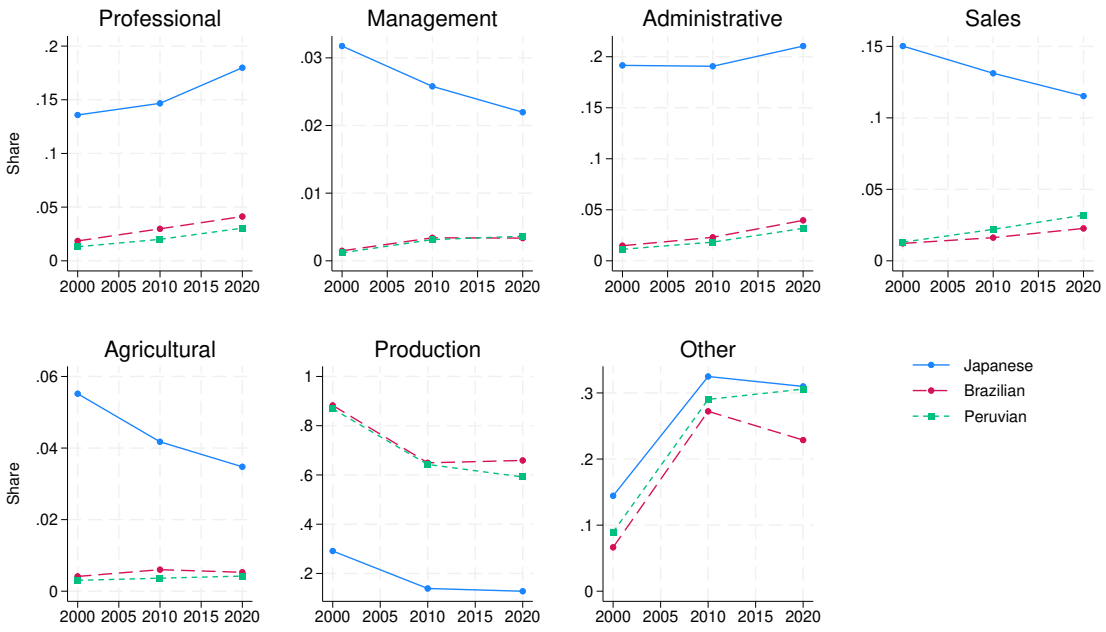
NOTE. Authors' calculation. See the text for data sources.

Figure A10: Share of Individuals by Sector and Nationality, Residents from Latin America



NOTE. Authors' calculation. See the text for data sources.

Figure A11: Share of Individuals by Type of Work and Nationality, Residents from Latin America



NOTE. Authors' calculation. See the text for data sources.

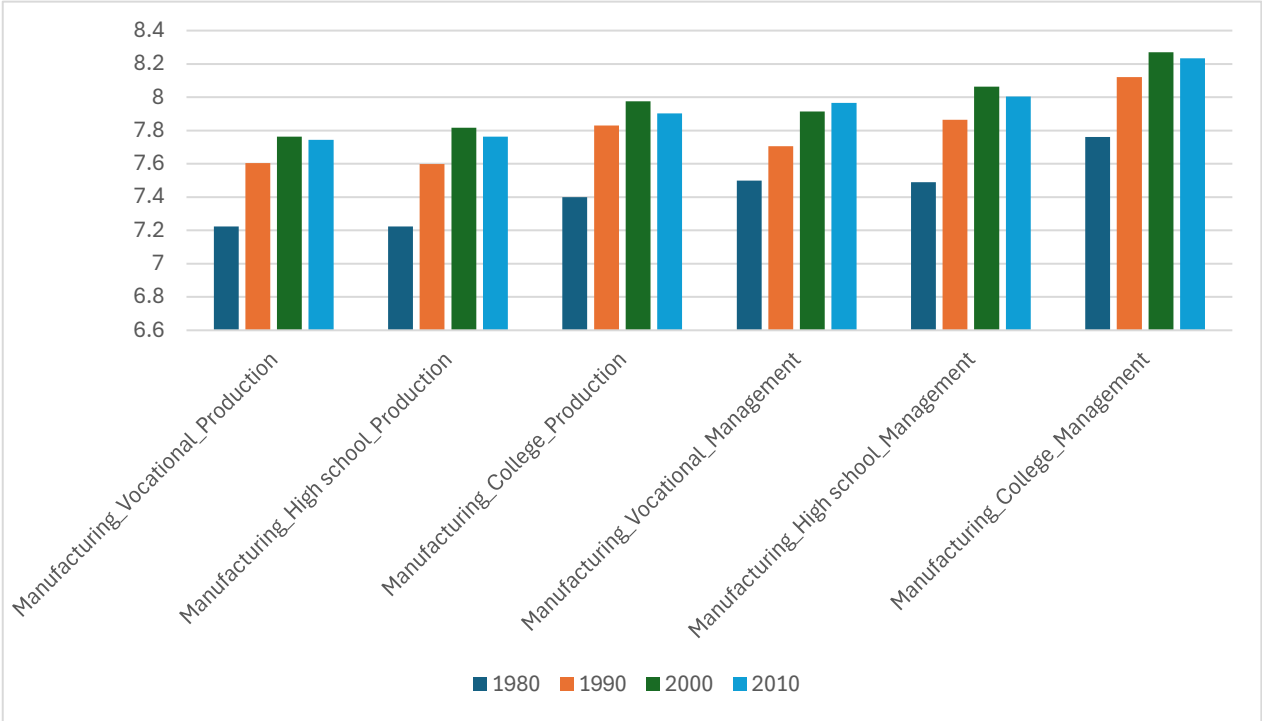
C.4 Average Wages

Figure A12 shows log average wage (scheduled earnings refer to the monthly wage paid for predetermined working hours, excluding overtime pay, *shoteinai kyūyo-gaku*) in the manufacturing sector by education level and by type of work. The data come from the *Basic Survey on Wage Structure* of the Ministry of Health Labour and Welfare of Japan.

It shows that more educated workers (college graduates than vocational school graduates or high school graduates) earn higher wages. It also shows that management workers earn higher wages than production workers.

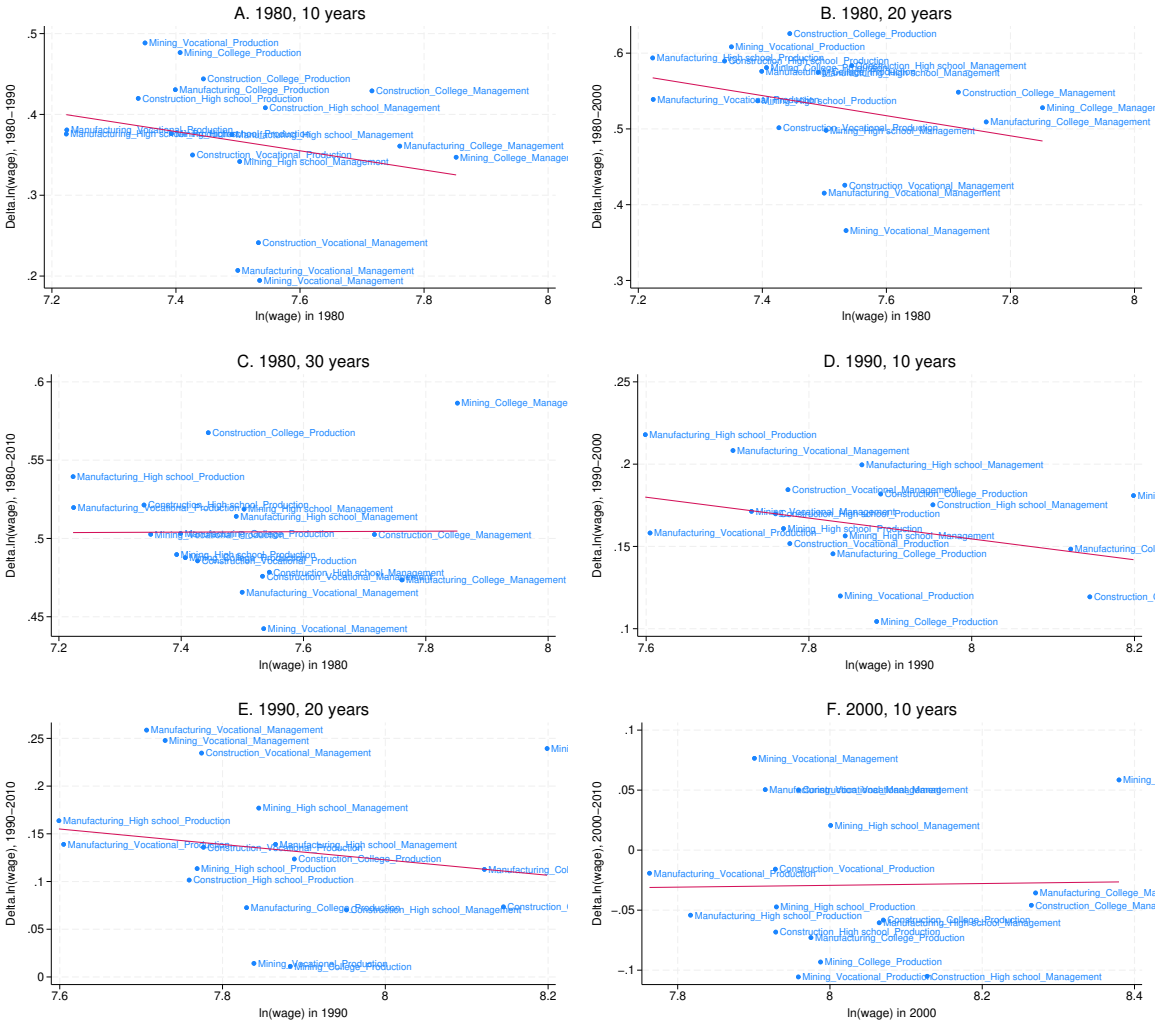
Figure A13 shows scatter plots examining correlations between the initial wage (based on scheduled earnings, *shoteinai kyūyo-gaku*) and the subsequent long-run growth of the wage. In Panels A-C, the horizontal axis measures log average wages in 1980, and the vertical axis measures 10-year, 20-year, and 30-year horizon wage growth rates in Panels A, B, and C, respectively. In Panels D-E, the horizontal axis measures log average wages in 1990, and the vertical axis measures 10-year, and 20-year horizon wage growth rates in Panels D and E, respectively. In Panel F, The horizontal axis measures log average wages in 2000, showing a 10-year horizon wage growth in the horizontal axis.

Figure A12: Average Wages in Log



NOTE. Authors' calculation. See the text for data sources.

Figure A13: Average Wages in Log



NOTE. Authors' calculation. See the text for data sources.